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NOAA Series on U.S. Caribbean Fishing Communities

Entangled Communities: Socioeconomic Profiles of Fishers, their Communities and their Responses to Marine Protective Measures in Puerto Rico (Volume 1: Overview)

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PREFACE

NOAA Series U.S. Caribbean Fishing Communities is result the Southeast Fisheries Science Center's Caribbean Sustainable Fishing Communities Initiate, which was brought about by the recognition that the success of coral reef conservation strategies hinged on the ability to reconcile the need to protect coral reef and associated environments with the local cultural, economic, political and social requirements of coastal communities. While valuable socio-economic work had been conducted, there was no comprehensive program to collect baseline socio-economic data is in place for entire U.S. Caribbean. Most of the earlier research was driven by specific management concerns and had a restricted geographic scope. Moreover, a significant share of this research is now outdated and inadequate to support management actions and meet the new legal definitions and requirements put forth by Magnuson Stevens Act (MSA), particularly National Standard 8, National Environmental Policy Act (NEPA), and Executive Order 12898.

To address the above challenges, the Southeast Fisheries Science Center has commissioned a number of studies to develop a comprehensive overview of the historical, cultural, economic, and social condition of fishing communities in the Commonwealth of Puerto Rico and the Territory of the U.S. Virgin Islands. This report entitled "*Entangled Communities: Socioeconomic profiles of fishers, their Communities, and their Responses to Marine Protective Measures in Puerto Rico*" crafted by Drs. David Griffith, Manuel Valdés-Pizzini, and Carlos García-Quijano shows that there is a need to redefine the concept of 'fishing community' in light of local, regional and global realities, particularly in small-scale fisheries where fishermen engage in multiple livelihood strategies. They also show that there are a number of forces and processes that are gradually transforming our notion of a traditional Puerto Rican fishing community. Thus, the development of sound policies that seek to conserve and protect marine resources and habitats and maintain the economic and social viability of fishing communities need to recognize the challenges and opportunities that forces and processes bring about.

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J. J Agar and B. Stoffle

Editors

EXECUTIVE SUMMARY

Over seven centuries of human interaction with the Caribbean's coastal and marine resources have brought us to the challenges and opportunities that Puerto Rican fishing communities, households, and individual fishers face today. This interaction, whether extractive or aesthetic, protective or destructive, has been irregular, sporadic, and uneven across space and time, resulting in wide variations in such factors as the compositions of *Villa Pesqueras* (fishing associations), the density of fish marketing outlets, the presence of charter boat captains, and the roles that tourism and gentrification play in a fishing community's failure or success. This report, based on two years of ethnographic and survey research and analysis, addresses the underlying reasons for this variation, focusing on assessing the impacts of recent marine protective measures known as Marine Protected Areas (MPAs), and on profiling fishing communities with an eye toward assessing their dependence on and engagement with marine resources. According to the Magnuson-Stevens Fishery Conservation and Management Act (hereafter referred to as the Magnuson-Stevens Act),

> "Substantially dependent implies that loss of access may lead to some change in the character of the community, perhaps a major change, or may even threaten its existence. Substantially engaged, on the other hand, implies a level of participation in commercial, recreational, or subsistence fisheries that includes social and economic networks that are directly and indirectly associated with these fisheries (such as the harvesting and/or processing sector)" (NOAA, 2004; see, 63 FR 24235, May 1, 1998).

In Puerto Rico, our research suggests that it is difficult to find many communities so heavily dependent on fishing that a decline in fishery resources would result in the entire community's collapse, yet the communities we designate highly dependent on fishing certainly would experience widespread economic dislocation with a substantial decline in fishing resources or activity. Commercial fishing in Puerto Rico has remained a viable economic niche through the 20th century and into the 21st century, and recreational fishing, including charter boat fishing, has increased in importance with the general growth of tourism around the island. At the heart of the commercial fishery of Puerto Rico are *Villa Pesqueras.* Villas Pesquera is the term used to name those government-built facilities since the 1960's in the traditional fishing communities and landing centers of the island. A Villa Pesquera comprises a pier, lockers for the fishermen's equipment, and an area for freezers and selling fish. Since the 1960's, Villas Pesqueras have been the home of fisher organizations or associations. In order to deal with the fishers in an orderly and effective manner, the government, under the agency of CODREMAR, which has since been disbanded, helped organize fisher associations. Associations grouped fishers by place, provided them the benefit of the facilities of the Villa Pesquera, and served as a medium to deal with government officials.

Subsistence fishing—or fishing for food—has been important throughout the Caribbean since prehistoric times. Counts of recreational and subsistence fishers have been difficult to estimate, but the number of commercial fishers in Puerto Rico has been around 2000 (±500) since the United States took control of Puerto Rico in 1898, indicating a stable population whose members come and go but whose base remains important to coastal landscapes. Throughout this report, we will emphasize, again and again, that Puerto Rican fishing has always been entangled in other, more heavily capitalized coastal pursuits, including, most importantly, military uses of the coast, sugar cane production, shipping, and, most recently, tourism and coastal construction. This observation applies to full-time commercial fishers as well as those who fish recreationally or for subsistence, supplementing household incomes with food or escaping to the sea to enjoy and experience some attributes of coastal lifestyles that have made fishing important to Puerto Rican identity and cultural nationalism.

Nearly every social scientific analysis of commercial fishing peoples around the world opens with a litany of problems threatening their livelihoods; nearly everywhere, too, recreational and casual uses of coastal zones are implicated in those problems, including recreational, sport, subsistence, and part-time fishing. This report does not significantly deviate from this reporting tradition, yet neither does it take the fatalist position that Puerto Rican commercial fisheries are dying or that alternative occupational paths are inevitable for coastal peoples.[1] The opinions, perceptions, observations, quotes, and quantitative and qualitative data presented here speak to the issues of the viability and future of the fisheries of Puerto Rico as much as they describe current and past fishing practices, circumstances surrounding fishing in the islands, and problems over coastal development.

This work has been accomplished three decades after passage of the Magnuson-Stevens Fishery Conservation and Management Act (hereafter referred to as the Magnuson-Stevens Act), during which time increasing attention has been devoted to studying the socioeconomic characteristics of fishing families and fishing communities across the United States. These studies have been directed toward understanding how these entities have been and will be impacted by various legislative initiatives and estimating the extent to which these entities are dependent on marine resources. Several relatively new pieces of legislation have fortified this effort, including Executive Order 12898 (*Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*), which requires that social impact studies recognize that regulations are likely to affect different groups differently, and similar regulations from the EPA.

The importance of profiling fishing populations accurately is particularly timely in the current environmental/ ecological and regulatory environment. Fish stocks and marine resources generally are under stress from a variety of pressures, including harvesting pressures by commercial and recreational fishers, misguided management and enforcement practices, coastal development, the destruction of wetlands and nursery areas, and deteriorating water quality. Management techniques developed to deal with these problems include season and area closures, MPAs, limited entry, size limits, and gear restrictions and modifications (e.g. Turtle and Fish Excluder Devices, mesh sizes for traps and nets). Since the Magnuson-Stevens Act, imposing new federal regulations and their corresponding management alternatives has required social impact assessments, specifically stating, "Conservation and management measures shall…take into account the importance of fishery resources to fishing communities in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities." The more recent pieces of legislation noted above, from the executive branch, expand this mandate by understanding that "fishing communities" can be either place based or non-placed based; with developments along the coast that have reconstructed coastal areas and marginalized or displaced commercial fishing families, non-place based fishing communities have become more and more common, with place based fishing communities nevertheless serving as important loci for cultural expression that serves to legitimize commercial fishing as a way of life. Non-place based fishing communities may also include professional communities such as charter boat fishers, or interest group communities such as sports or recreational fishers.

This report profiles fishing families and communities of the 42 of 43 coastal municipalities of Puerto Rico.[2] The specific goals of the research underlying the report were to:

[1] In Puerto Rico, at least, the notion of alternative economic paths becomes lost in the historical reality that few fishers have ever relied on fishing full-time throughout their lives; multiple livelihoods have been a facet of Puerto Rican fishing for nearly as long as people have been writing about the islands' fisheries. This was the central theme of Griffith and Valdés Pizzini's book on Puerto Rican fishing (2002).

[2] Yauco was not included. It does not have a lengthy coastline and does not report landings data.

1. Conduct community profiles to satisfy the legal requirements of the Magnuson-Stevens Act, particularly National Standard 8, the National Environmental Policy Act, and Executive Order 12898 in Puerto Rico;
2. Conduct a socioeconomic evaluation of the performance of the region's federal MPAs, including 'Reserva Natural de Canal Luis Peña' (Culebra Island, Puerto Rico), Laguna del Condado, the Marine Conservation District (US Virgin Islands), the seasonal closures off the west coast of Puerto Rico (Buoy 8/Tourmaline Bank, Buoy 6/Abrir la Sierra Bank, and Bajo de Sico) on the fishers, their families, and their communities of Puerto Rico. We also evaluated Desecheo. We emphasize that the notion of *performance* here refers to how they have performed vis-à-vis fishing lifestyles, and not how they have performed in a biological sense (except in terms of how fishers perceive their benefits to fish stocks and habitats).

In the course of this work, we pay particular attention to the notion of *community* as it applies to the fishing populations of Puerto Rico. We define a community as a group of people living and working together, exchanging services and goods, who share some common interests while diverging at times according to different class backgrounds, where many also share a common cultural and linguistic background. Communities are social fields, comprised of overlapping networks of kin, neighbors, friends, co-workers, and others who interact with one another regularly. Communities may be place-based, network-based, knowledge-based, or may transcend specific geographic locations, although many community members usually share attachments to a specific place.

Again, we emphasize that, in Puerto Rico, it is impossible to characterize any specific municipality and few communities as "fishery dependent," given that fishing families in Puerto Rico tend to be dispersed rather than concentrated and that, through occupational multiplicity and other activities, fishing families are entangled in several economic sectors of coastal and more distant environments. Despite this, we argue that fishing communities continue to occupy an important economic and cultural niche in Puerto Rican society, and that their entanglements with other sectors are in fact critical to this importance, enhancing the economy, society, and culture of the region in many ways. The profiles we present below are designed to bring fishing families' contributions to the forefront in the process of satisfying the objectives noted above.

a. Aspects of Puerto Rican Fishing

Information presented here is based on research conducted from November 2003 to July 2006, combining a variety of ethnographic and survey methods as well as drawing on several secondary sources for background to the current work. Secondary sources included landings data, U.S. census data, the census of Puerto Rican fishers conducted in 2002, historical and ethnographic writing about Puerto Rican fishing and ways of life, published life histories and interviews with fishers, and technical reports. We present the work in three volumes: Volume I includes this executive summary and six other sections that synthesize the data and give overviews of the fisheries; Volumes II and III include 13 regional profiles that provide more detailed descriptions of the fisheries and fishing communities, along with the work's appendices and references. This work, designed to profile fishing communities, fishing households, individual fishers, and significant fishing locations and practices across the islands of Puerto Rico, has resulted in several key findings and recommendations. We have organized these into six groups:

1) Profiles of fishing populations, which present the basic characteristics of commercial, recreational, and subsistence fisheries based on our synthesis of the ethnographic work, survey work, and secondary data sources.
2) Issues relating to MPA performance, such as the impacts of MPAs on different fishing communities or regions.

3) Issues relating to coral reefs, including the ways in which fishers' local knowledge and practices protect or influence the health of coral reefs.
4) Issues of importance to fishing communities around the islands, such as gentrification, coastal development, and marketing.
5) Policy and Management Issues.
6) Recommendations for Future Research.

The Executive Summary ends with a table, beginning on page 16, which provides more details regarding the relevance of these issues to the specific coastal regions of Puerto Rico. This table can be used as a guide to further reading in Volumes II and III, for those who wish more details than are presented either in the executive summary or the syntheses and overviews.

1) Profiles of Puerto Rican Fisheries

- Puerto Rico's commercial fishery is primarily small-scale in nature and often referred to as "artisanal," lacking many vessels larger than 40', with most between 18' and 25' in length. Commercial fishing effort is highest during the months of May through July and lowest in October and November, although average fishing effort only ranges from 15 to 18 days per month. It is a multi-gear, multi-species fishery, with nearly two-thirds (63.2%) regularly using at least three gear types. The three most common primary gear types are hooks & lines (20.2%), fish traps (15.3%), and gill nets (12.7%). The most common species captured with these gear types are snapper-grouper species (reef fish) and lobster, which account for 42.8% and 12.9% of landings, respectively.

- Numbers of commercial fishers have remained relatively stable for the past century, fluctuating between 1,500 and 2,500, although local long-time fishers consider this number an underestimate. The most recent, 2003 census of commercial fishers included 1,132 fishers. During workshops held with commercial fishers during June of 2006, nearly all fishers contested these figures as far too low.

- Numbers of recreational fishers in Puerto Rico have been growing over the past few years and current estimates place them at around 160,000 to 170,000. The most recent, 2004 estimate placed numbers of resident recreational fishers at 141,000, down from 185,000 in 2003. An additional 25,000 to 35,000 recreational fishers from outside Puerto Rico fish in Puerto Rican waters.

- Fishing provides the sole income for around 40% to 45% of commercial fishing families, yet nearly half (46.5%) of commercial fishers interviewed in the survey reported working outside of fishing, most primarily in the construction trades, including masonry, carpentry, welding, plumbing, painting, and manual labor. At the household level, this figure rises to 56.5%, which includes working spouses, children, and others. This suggests that fishing and other coastal occupations subsidize one another. Earlier studies of fishers have found that over 90% of commercial fishers work outside of fishing at some time during their lifetime.

- Recent government data on the local fisheries underscores the increasing importance of SCUBA diving in the total amount of fish and shellfish landed. This is a major change in the Puerto Rican fisheries, as the key producers are young newcomers who are removed from the traditional ways of using fishing territories. For the first time in the history of fishing, SCUBA was the most important gear, measured in terms of the percentage of the catch landed; revenues from diving are high as well, as divers tend to target high value species such as lobster and conch. At the same

time, SCUBA requires less capital than many other gear types in Puerto Rico, and thus is an easy fishery to enter.

- From 1999 to 2003, the last five years for which we have landings data, the commercial fisheries of Puerto Rico landed 14,313,149 pounds of fish and shellfish worth an estimated $32,489,237. This constitutes an annual average estimate of between 2.8 and 2.9 million pounds with an ex-vessel value of around $6.5 million. These figures are slightly higher with correction factors, or calculations that compensate for underreporting, based on repeated site visits to fish marketing centers. In 2003, using a correction factor of 56%, the amount landed was 4,265,645 pounds valued at $7,848,786; in 2004, using a correction factor of 61%, the amount landed was 3,056,852 pounds valued at $7,519,857 (Matos-Caraballo 2005: 4).

- Recreational landings in Puerto Rico totaled 1,527,000 fish and 3,768,000 pounds in 2003 and 887,000 fish and 2,214,000 pounds in 2004. These landings were spread over 1,111,000 trips in 2003 and 1,055,000 trips in 2004, indicating a decrease in catch per unit of effort (CPUE) from 3.9 pounds per trip to 2.0 pounds per trip. While numbers of fish and pounds landed decreased, numbers of released fish increased, from 150,000 in 2003 to 249,000 in 2004.

- Crews of two per trip are most common, usually consisting of the owner of the vessel and equipment and a hired hand (*proel*) who works for a share (usually one-third) of the catch. Half of the commercial fishers surveyed reported using friends as crew, 30.5% reported using relatives (12.9% of these were sons or daughters), 16.7% reported using "fishing partners," and the remainder listed "others." This contrasts with recreational fishers, 70% of whom reported that they fished with friends, 7.6% with fishing partners, 4.3% with siblings, and the remaining 18.1% with other relatives.

- Beyond providing fresh fish for their families and communities, most commercial fishers contribute economically to their communities in their purchases of locally constructed vessels, gear, and bait, and in vessel and gear maintenance. Around 70% purchase their vessels locally, 98% maintain their vessels locally, 94% service their motors locally, 70% purchase their non-electronic gear locally, 43% purchase their electronic gear locally, and 60% purchase their bait locally. Commercial fishers also generate local employment through hiring crew and through the use of family members and others in seafood markets and restaurants.

- Puerto Rico's commercial fishery is family-based, similar to commercial fisheries in many other parts of the United States: specifically, women play important supportive roles in fishing and children usually learn fishing from their parents or from other family members. Family involvement in fisheries seems to increase with the elaboration of fish markets, and especially when *Villas Pesqueras* (fishing associations) and private fish markets add seafood restaurants to their facilities. Women often manage or staff seafood restaurants, add value to or process seafood, and assist with fish marketing; children often work in these areas as well. Fishers' households tend to be between 3 and 4 people in size, with most fishers (60-70%) married. These figures do not vary significantly among commercial, recreational, or subsistence fishers.

- The exact number of fishing communities in Puerto Rico has been difficult to determine, in that many former fishing communities have been altered significantly by coastal development and gentrification. However, there are between 88 and 100 official landing centers across the island and we visited 93 locations that were important commercial or recreational fishing locations in Puerto Rico. We were able to collect detailed enough information on 54 fishing communities to estimate their level of dependence on fishing. Of these 54, 16 (29.7%) were network-based and

38 (70.3%) were place-based communities. While the 38 constitute nearly all of the place-based fishing communities in Puerto Rico, most of the other 55 locations we visited are network-based.

- Fishing communities in Puerto Rico can be place-based, network-based, or knowledge-based, with the first becoming less common and the other two increasing in importance. Place-based communities are those in which a majority of fishing families lives in a specific, relatively small, geographical location, such as a neighborhood or small town. Network-based communities are comprised of fishers who work together but live mostly apart, dispersed over several towns or neighborhoods in one or two municipalities. Knowledge-based communities tend to overlap with both place-based and network-based communities, consisting of groups of fishers who share knowledge about, for example, fishing territories, gear, fishing practices, political aspects of fishing, etc. Knowledge-based communities often serve as the basis for opposition to, or cooperation with, fishery management.

- As place-based communities become less common and network-based communities become more common, the significance of coastal gathering places as places where fishers exchange knowledge has increased. In addition, network-based communities have become repositories of *social capital*, or social relationships that enable members of meaningful groups (e.g. groups of fishers) to influence the economic well-being of the group and group members. Social capital can benefit individual group members or it can constrain group members' behavior. The more fishery managers learn about the ways network-based fishing communities marshal their social capital, the more they may be able to assist fishers in adding value to fishery products and to join them in their own efforts to pressure network members to learn about and abide by existing fishery regulations.

- The recreational fishery of Puerto Rico draws participants from all walks of life, from professionals and government officials to factory workers, the temporarily employed, the unemployed, and the retired. The survey elicited 76 occupations spread over 98 working respondents, suggesting that recreational fishers do not cluster in any specific occupation. Recreational fishing effort is highest from May through August and lowest from November through February, with participation averaging between 8 and 12 days per month. Most common gear are hooks & lines (54.4%) and SCUBA diving equipment (10.4%). Fishers using the first two gear types tend to catch snapper-grouper species, including silk snapper (14%) and yellowtail snapper (12%); SCUBA divers tend to catch lobster (23.1%) and conch (15.4%).

- A majority of recreational fishers contribute to local economies by purchasing vessels, gear, bait, and other services locally. Of the 70% who own vessels, nearly 90% have purchased vessels constructed locally and have their vessels and motors maintained locally. Most fishing gear and bait are purchased locally as well, although electronic gear is purchased elsewhere (e.g. Miami) about half the time.

- Puerto Rico's recreational fishers range from professional charter boat captains to individuals fishing with a hand line wound around a can. Its charter boats industry is unevenly spread over the island, with the San Juan area, the Northeast, and the Southwest regions supporting the most charter boats and other regions witnessing an occasional fisher entering the industry seasonally or on a temporary basis, often supplementing commercial fishing. There are at least 15 Club Nauticos (nautical clubs for recreational fishers and boaters) around the islands that sponsor tournaments, and these are important to the recreational fishing community politically.

- The subsistence fishery in Puerto Rico—or people who fish primarily for food for their households—is made up mostly of people from working class backgrounds who target snapper-

grouper species (40%) and pelagic species such as dolphin (7.4%) and king mackerel (5.9%), but almost no shellfish. Their gear varieties are similar to those of recreational fishers, but with fewer who use SCUBA gear.

- Recreational, subsistence, and commercial fishers most frequently learn the craft of fishing from their fathers and second most frequently from friends.

- Dependence on fishing varies around the islands by several factors. For the commercial fishery, in addition to high average annual landings (> 100,000 lbs) and revenues (> $250,000), most fishing dependent communities are place based (as opposed to network based), where at least one third of its fishers fish full time, where ties between the commercial fishery and the tourist sector are complex, where both commercial and recreational fishing infrastructure are highly developed, and where the cultural significance of fishing is reaffirmed in festivals, statues, sculptures, murals, or other icons. Many fishing dependent communities also have close ties with the state, receiving government funding for vessels or infrastructure, and many are actively involved in conflicts over coastal development, new regulations, or other issues. Examples of communities that are highly dependent on fishing include: La Parguera, Lajas; Puerto Real, Cabo Rojo; La Playa, Ponce; Punta Santiago, Humacao; Pozuelo, Guayama; La Estella, Rincón; and the Downtown Harbor neighborhoods of Fajardo (Maternillo, Mansion del Sapo, and Puerto Real). The north coast has the fewest communities that are highly dependent on fishing.

- While there is not enough background data on the recreational fisheries of Puerto Rico to estimate levels of dependence on fishing for them, many marinas and several Club Nauticos in Puerto Rico regularly have annual fishing tournaments that generate income and employment for Puerto Ricans. Estimates of the economic impacts of billfish tournaments, for example, range from $25,000,000 to over $43,000,000, accounting for over 200 seasonal or part-time jobs. In general, however, recreational fishing from marinas and other boat-storage locations is far less important than recreational boating, usually accounting for less than 10% of the activity.

2) Issues Related to MPA Performance

We emphasize here that the points that follow derive from fishers *perceptions* of the performance of MPAs, *not* from actual biological studies that show that, in fact, MPAs protect fish stocks or habitats, or create problems for fishing community members. The same holds true of our points regarding coral reefs in the following section. We do not wish to downplay their importance, however, by suggesting that human perceptions may not conform to biological realities: whether they reflect the actual performance of MPAs or the health of coral reefs is secondary to the fact that fishers perceive them as reality. Understanding these perceptions is important to the process of improving communication between resource users and resource managers, particularly in cases where the science of fisheries management does not conform to the perceived realities of fishing folk.

- In general, most fishers believe that most of the MPAs of Puerto Rico are achieving their biological goals of protecting fish stocks, spawning aggregations, etc., but have more mixed views about the sociological effects of MPAs.

- MPAs present a problem for navigation, in that fishers need to sail around them when they have fish in their vessels. During stormy seas this increases the danger of seagoing travel and on a routine basis this increases trip expenses, particularly fuel costs.

- The seasonal closure for conch, which some fishers believe occurs at the wrong time of year in terms of conch breeding, has caused two problems: 1) it encourages "derby fishing" among divers, or fishing at high levels, making repeated hazardous dives, in the days immediately prior to the closure; 2) conch shells provide protection from predators from juvenile species.

- For Tourmaline, Bajo de Sico, La Mona/ Monito, Abrir la Sierra, and Desecheo, between 70% and 90% of those interviewed in the survey strongly agree that MPAs maintain spawning aggregations, improve the quantity of fish inside the MPA, improve the quantity of fish adjacent to the MPA, protect species in vulnerable areas, and restore or maintain habitat quality.

- Experienced fishers interviewed in the survey were less sanguine about Canal de Luis Peña in Culebra and Laguna Condado in San Juan, however. For Canal de Luis Peña, while over 70% believed that the MPA improved the quantity of fish inside and adjacent to the MPA and protected species in vulnerable areas, only 65.8% believed it maintained spawning aggregations and only 68% believed that it restored or maintained habitat quality. Around 70% of fishers familiar with Canal de Luis Peña cite contamination from the boating traffic and coastal construction projects as responsible for the declining health of marine resources.

- The MPA viewed as least effective by those interviewed was the Laguna de Condado, in San Juan. Only between 50 and 60% of fishers believed that this MPA maintained spawning aggregations, improved fish quantities inside and adjacent to the MPA, protected species, or restored or maintained habitat quality. Over 60% of those familiar with Condado viewed contamination, primarily from boating and construction but also from industrial sources, as the principal cause of resource decline.

- Puerto Rican fishers, whether commercial, recreational, or subsistence in nature, have almost no experience with the MPAs of the U.S. Virgin Islands. They are very likely unaffected by them, except indirectly, in so far as they may contribute to the protection of fish that eventually make their way into Puerto Rican waters.

3) Issues Related to Coral Reefs

- Overall, fishers believe that the health of coral reefs has been declining over the past ten years and that it will continue to decline in the next five years. Asked about the health of reefs, 64.8% believe they were healthy 10 years ago while only 3.2% believe they were dead or nearly dead. By contrast, 10.9% believe they are healthy today while 50.1% believe they are dead or nearly dead.

- Survey respondents cited "contamination" as the principal cause of the declining health of coral reefs, with boating traffic, coastal construction, and industrial run-off as the three principal sources of contamination. Direct interaction with reefs by fishers was considered a cause of declining reef health by less than 5% of those interviewed.

- Regarding boating traffic in particular, many fishers viewed it as detrimental to coral reefs primarily because of anchoring behavior. Especially recreational boaters are liable to place their anchors directly on coral reefs. Fishers sensitive to this are less likely to damage reefs in this way.

- Commercial divers report that they have witnessed recreational divers damaging coral reefs by standing on top of them instead of swimming over them. The increase in divers in Puerto Rico in recent years is important to coral reef health in that commercial divers are often the first to spot

problems with coral reefs such as bleaching, damage from anchors, etc. Fishery managers and others interested in the health of coral reefs would benefit from engaging in more cooperative efforts with commercial divers to monitor coral reef health.

- Fishers in Gúanica claimed that they had defended coral reefs by discouraging, through direct confrontation, the use of *filetitos* (small gill nets), which snagged on coral reefs and caused damage.

- Divers in the east and south possess two conflicting theories regarding the impacts of discarding conch shells: 1) that conglomerations of empty conch shells attract conch; and 2) that conglomeration of conch shells repel conch by giving them the impression of a conch graveyard. Whichever view a fisher holds is likely to influence where they dispose of empty conch shells. Those who hold the first view are likely to leave them on coral reefs, while those who believe the second are likely to leave them on sandy bottoms where they will be covered, or in grass beds where they will be hidden. Other divers report that conch shells provide shelter for juvenile species on and near reefs.

- Traps are a major gear that can affect coral reefs, both as working traps, as they sit on top of coral reefs, or as ghost traps, that continue fishing (and rolling) over coral reefs after they have been lost. Commercial trap fishers in Fajardo and Yabucoa design and place traps in ways that are sensitive to coral reefs, and most commercial fishers are careful to place their traps alongside coral reefs, on sandy bottoms, rather than on top of them.

- In both the ethnographic work and the survey, fishers reported that they had witnessed people fishing for octopus, on coral reefs, with Clorox.

4) Issues of Importance to Fishing Communities

- Despite their small numbers relative to all Puerto Ricans, the numbers of commercial fishing families have remained stable over time because fishing continues to provide symbolic and material resources to coastal communities. Among their most important services is that they provide high quality, fresh fish to locally-owned and -operated seafood restaurants. Commercial fishers commonly hold the view that they "defend themselves with *fresh* fish" (or, sometimes, they "defend themselves with lobster"), contrasting their product to imported frozen, canned, dried, or other preserved products.

- Although the high quality of their seafood enables commercial fishers to compete with lower-cost imports, most fishers view imports as a problem, particularly when imported fish is smaller than legal size limits on fish captured in Puerto Rican waters. The issue of imported fish, however, is more complicated than their competition with local seafood. At especially busy times of the year, imports enable small, family-owned coastal restaurants to provide seafood to customers in the absence of a sufficient supply of fresh local seafood.

- Some commercial fishing in Puerto Rico is done as part of the informal or underground economy. All communities that sit directly on the coast in Puerto Rico have members who fish, but in some cases, fishers are reluctant to report earnings from fishing, fearing they will jeopardize their ability to receive social services or increase their tax bills. In some rural and isolated communities, the links between fishing, contraband trade, smuggling, and other uses of coastal environments continue to the present, undermining the extent to which fishing has been able to develop as a legitimate (i.e. officially recognized) occupation.

- Dependence on, and engagement with, Puerto Rican fisheries varies geographically, from rural to urban settings, and in tandem with trends in tourism and other leisure, aesthetic, or recreational uses of coastal, littoral, and sea environments. The most viable fisheries are those that have managed to take advantage of a combination of state resources and tourism revenues. The most fishery dependent regions of Puerto Rico are the Southwest, Northeast, and Northwest; the least fishery dependent region is the North coast. However, there are families dependent on fishing in all the coastal municipalities.

- Fishers and their families vary in attachment to marine resources, from most attached to least attached, as follows: 1) full-time commercial fishers with direct personal ties to fish marketing (i.e. they also own or operate fish markets, seafood restaurants, or other sales outlets); 2) full-time commercial fishers without direct personal ties to fish marketing beyond selling their catch; 3) professional recreational or sport fishers, such as charter boat captains; 4) part-time commercial fishers; 5) subsistence fishers, whose fishing is directed primarily toward providing high quality fish proteins for themselves and their families; and 6) recreational fishers, whose fishing is directed primarily toward enjoyment. The most fishery dependent communities tend to have all six types of fishers.

- Fishing in Puerto Rico is intimately tied to trends in coastal gentrification, in both positive and negative ways. Relations between commercial fishers and the tourist industry are ambivalent: on the one hand, some fishing groups have utilized coastal tourism to increase revenue streams, establishing seafood restaurants that cater to tourists, providing water taxi services, selling bait to recreational fishers, and so forth; on the other, particularly near luxury resorts, fishers become involved in disputes with tourist developers over the destruction of mangroves and other critical habitats, slip space and coastal access, and crowding and contamination from recreational boating traffic.

- Fishers' reactions to coastal development/ construction are similarly mixed, with over 20% of the fishers interviewed in the survey believing that coastal development destroys mangrove forests and causes contamination that leads to the deaths of coral reefs and declining fishery resources. Other fishers, however, view coastal development positively, as a source of increased demand for seafood and tourist services that fishers can provide; in addition, coastal construction provides work for many fishers and their family members when they are not fishing, and in this sense subsidizes fishing operations.

- When fishers view coastal development as positive, this derives from the historical role of fishing in the Puerto Rican economy and its tendency to be dependent on other economic sectors and activities. Fishing operates as a function of other economic endeavors, namely, sugar cane cultivation, manufacturing, *chiripas* (odd jobs), and construction, among others. In the new context of coastal development, fishing is synchronized with sportfishing, boating and marine recreation. In La Parguera, fishers are critical of development, but also work in the recreational boats, or take care of boats for the visitors. In Puerto Real, perhaps the most traditional fishing community, fish dealers saw in development the future and the well being of the community. Development is viewed as equivalent to more local opportunities for economic growth and income. However, fishers also see the deleterious effects of that development and their physical displacement from their traditional communities and fishing areas.

- Puerto Rican fishing has always been intertwined with other pursuits in the insular society and economy. Recreational fishing offers a respite from work and high quality protein additions to family diets while taking advantage of public and private infrastructure. Commercial fishing

historically supplemented work in the sugar fields and other seasonal agricultural endeavors, and today is most often a component of multiple livelihoods in the lives and households of fishing families. Further, fishing and coastal lifestyles have been a part of the region's shipping, maritime commerce, boating, and tourist traffic from the early days of European occupation of Puerto Rico through the Spanish-American war and U.S. colonization to the present. They have enriched coastal society and culture in many symbolic and material ways. It is this dimension of Puerto Rican fishing that underlies the title of this work.

- Full-time Puerto Rican commercial fishers view fishing as a "moral" enterprise, even in the context of attempts to professionalize the fishery through the modernization of equipment and improvements in record keeping. This implies that they view fishing as a productive use of natural resources that provides some food or subsistence security and is directed toward socially beneficial outcomes, such as raising families and providing consumers high quality, fresh seafood. As such, they regard wasting fish, as occurs when they have to discard undersized species, as morally reprehensible.

- Commercial fishers in Puerto Rico possess a great deal of local knowledge about the fishery resources of the region that could constitute a valuable cultural resource for fisheries management. Currently, it forms a basis from which fishers criticize current regulations. Their knowledge includes information on reproductive, schooling, feeding, and other habits of fish and shellfish; factors that lead to resource decline; threats to water quality and nursery grounds; conditions of coral reefs, grass beds, and other substrates; conditions of estuaries; relations between lunar cycles and marine life behavior; seasonal changes in fish stocks; migration patterns of fish and shellfish; spawning aggregation sites; the health of stocks of different species of fish and shellfish; and so forth.

5) Policy and Management Issues

- To the extent that fishing effort varies seasonally, regulatory officials may wish to consider the timing of seasonal closures to coincide with periods in which fishing activity is lower, if such closures can still meet their biological objectives. May through July are the busiest months for commercial fishing, and March through August for recreational fishing (particularly billfish tournament fishing), while fishing activity during October and November is somewhat lower. Marketing factors also affect levels of fishing activity, in that the demand for seafood is particularly robust during Lent but less robust during the period leading up to Christmas, when pork is in particularly high demand for the holidays.

- *Departmento de Recursos Naturales y Ambientales* (Department of Natural Resources and the Environment—DRNA) officials believe they are doing their best to protect marine resources under the current limitations that government agencies face in Puerto Rico. Similarly, NOAA Fisheries and Caribbean Fishery Management Council (CFMC) personnel also aim to protect marine resources with the tools available to them. Unfortunately, many problems with fish stocks derive from sources outside of their jurisdiction or control. The lack of connection between resource managers and resource users would seem to encourage more participatory co-management. This could build on the widespread consensus that coral reefs, fishery resources, mangroves, and other coastal and marine environments and resources are in dire straights. Our survey found that between 60 and 70% of active fishers are highly pessimistic about the future health of coastal and marine resources and habitats.

- State efforts to protect marine species and stocks are relatively recent in Puerto Rico. Regardless of the qualms and complaints of the fishermen, local authorities (the DRNA and the CFMC) do make an effort to conserve species and protect the environment. More needs to be done, and that is almost unanimous in the voice of the fishers interviewed and visited for this study. One of the missing aspects of policy is the conservation and protection of fishing communities, through economic opportunities, cultural protection of their patrimony and architectural and cultural integrity. Change, development and gentrification are altering the landscape of coastal communities, and also restructuring labor and economic interest in those communities that served as the stewards of marine and coastal resources. Policies on conservation of habitats and species do not take into consideration the future integrity and well being of those communities, and the individuals. This report is the first step into the process of delineating a comprehensive plan for the protection of fishing communities.

- Due to the events associated with the development and implementation of fishing regulations by the DRNA, local fishers are boycotting the process of data gathering on fish landings. An essential component of the information used for the management of species and stocks, the situation threatens to harm the management process and increase the gap in communication and understanding between managers and fishers. Fishers are far removed from the process and few understand it. Government officials, researchers, and extension agents must make an effort to explain the social, biological, economic and management importance of providing landings data. They, however, must also be incorporated into the process of designing methods and procedures for the acquisition of that data, and other relevant information for the process.

- Commercial fishers routinely report that DRNA officials have not been properly trained in fish identification, and that they often attempt to fine fishers because the officials misidentify a legal species for a protected species. This undermines the legitimacy of the DRNA as an agency that is knowledge about the resource and, hence, as an agency charged with responsibility for protecting the resource. This suggests that training of DRNA officials in fish identification would be advisable. Such training would be most effective if combined with additional training about the biological, social, economic, and management goals of marine resource protection.

- Given that communication between fishery managers and fishing populations in Puerto Rico has suffered from a lack of trust in recent years, and that soliciting support for and educating fishers about MPA placement and design has not been accomplished through traditional channels, fishery managers should consider other methods of communicating with fishing populations than public hearings, written communications (e.g. newsletters, posters), or other formal methods. DRNA officials themselves acknowledge that many of those who complain about the new regulations have not read them, and that misinformation is common among fishers. This research has reaffirmed the effectiveness of an ethnographic approach to communicating with fishers: this consists of several interconnected, largely informal methods of meeting and talking with fishers in their homes and at their fishing centers, establishing rapport, and listening to their opinions more than imposing "top-down" perspectives from state and federal agencies.

- Improving communication between fishers and fishery managers could benefit from reinstating port agents in fishing communities. Formerly, these individuals officially received landings reports, yet they also responded to fishers' complaints, communicated the reasons behind new regulations, and addressed other issues relating to marine resource management. They were also instrumental in forging ties between managers and fishers, as well as fishers and marine scientists, that resulted in increased understanding and awareness about the perspectives of various stakeholder groups.

- One of the key complaints of the fishermen visited and interviewed for this project was the government's failure to incorporate their opinions effectively into the policy process. This resulted in the perceived fiasco of the fishing regulations, and the constant fracas with the DRNA. There is an urgent need for a well thought process to incorporate the fishers' knowledge, data on species, perceptions and opinions into the fisheries management process. Such a process must go beyond the present *Junta Pesquera*, or Fisheries Board with representatives from different sectors. The Caribbean Fishery Management Council (CFMC) developed a protocol for the incorporation of the fishermen, based on data from the Coral Reef Ecosystems Studies project, and data from this community profile.[3] The protocol addresses many of the communication and trust matters that are reviewed in this report, and provides a blueprint for action.

- Various groups of fishers around the island are engaging in marine protective measures and other behaviors that could serve as models for fishers in other regions. For example, Yabucoa and Fajardo fishers have been designing traps that are more coral-reef friendly, and Rincón fishers are educating one another on the importance of reporting landings data and keeping accurate records for fishery management as well as business/ loan purposes.

- Fishery managers may use the information on dependence on fishing by community to locate communities where they are likely to find knowledgeable and well-respected fishers and locations where fishers are likely to exchange information. Place based communities are preferable to network based communities for communication purposes, but when working in network based communities managers need to locate significant coastal locations where fishers gather.

- The most pervasive fisher perception regarding the failure of fishery management is the regulation against keeping undersized species, specifically because this results in the waste of fish landed from great depths. This issue was repeated in nearly every fishing community we visited and always in conjunction with a generally negative view of DRNA and other fishery management personnel. Many fishers added that they see undersized imported fish in Puerto Rico's supermarkets.

- Secondary source data, such as landings data and the fisher census, sometimes do not correspond to the views of fishers regarding their most important species, based on ethnographic interviews. For example, while both the landings data and the ethnographic interviews agree that lobster and yellowtail snapper are two of the most important species, most fishers also mentioned *sierra*, or king mackerel, as a highly prized, important species to them, as well as other, similar pelagic fish. However, the landings data indicate that king mackerel accounted for only around 3% of the total landings from 1999 to 2003 (the last five years for which we have landings data). On the other hand, some species that show up in the landings data as frequently landed fish, such as white grunt, are mentioned far more rarely than king mackerel as important species.

- Relations between the state and Puerto Rico's fishers are ambivalent. While some state support derives from the Department of Agriculture, as it did formerly from CODREMAR, coming in the form of investment in *Villas Pesqueras* and other infrastructure and technology, other parts of the state apparatus in Puerto Rico have erected barriers to fishing activities to protect fish stocks. Most fishers we interviewed, recreational and commercial alike, view the DRNA, the organization responsible for enforcing most fisheries regulations in Puerto Rico (all within 9 miles), as overly aggressive in their enforcement and their protection of fish stocks, as misguided

[3] The protocol is available at: http://www.caribbeanfmc.com/pdfs/Vald%E9s%20Trumble%20Methodology%20and%20protocol%20for%20fishers%20partic%85.pdf

in their development of fishery regulations, and as unqualified to adequately protect fishery resources.

- Fishers perceive current licensing requirements as costly, burdensome, and biased against older, experienced fishers who do not happen to keep accurate records or do not keep records in an officially recognized way. Some highly experienced fishers have been humiliated when they receive licenses that designate them as beginners, which other fishers perceive as a serious blow to their dignity and to the dignity of the noble, moral, and at times dangerous craft of fishing. DRNA officials believe that this could be resolved simply by changing the name of the license.

- Some influential fishers and fish merchants have been promoting civil disobedience vis-à-vis fishery regulations, encouraging their peers or their clients to ignore or violate regulations that they consider poorly conceived.

- In addition to ambivalent relations between the state and fishers, investment in fishing has proceeded unevenly and at times without great benefit to the fishing community at large. The construction and outfitting of *Villas Pesqueras* are often accomplished through political mechanisms, as a kind of "pork" to communities, without enhancing the local fishing population's ability to make a living from fishing. As such, the composition, management, and organization of *Villas Pesqueras* are highly variable across the islands, with some *Villas* having been effectively privatized.

6) Recommendations for Future Research

- Detailed multidisciplinary research, combining economics and sociological or anthropological approaches to an analysis of the specific linkages among fishing, tourism, and coastal development, focusing on transfers of human and social capital among economic sectors and their implications for fishing effort, investment in fishing, wage structures, returns to labor and capital, and other economic factors. Such analyses should also address the multiplier effects of the recreational fisheries of Puerto Rico and the ways in which the commercial catch enhances local restaurants, markets, and other coastal businesses.

- Multidisciplinary research comparing fishers' knowledge with scientific knowledge about the fisheries of Puerto Rico would determine where the two knowledge bases correspond to or conflict with one another, establish a basis for consensus and areas in need of additional research and education, and enhance current baseline studies in biology and anthropology that have collected data on fishers' knowledge and on the biology of Caribbean marine resources. This work might also enable managers to determine where fishers' knowledge bases could be relied on to inform management decisions.

- Fishing as a productive process is well understood, and there are technical and ethnographic descriptions of fishing with gillnets, reel-lines and traps, among others. However, there has been very little research on the activities of the SCUBA divers, including their life histories and their lifestyles. Divers bring a new dimension to fishing, and they appear to be a group with socio-demographic characteristics different from the rest of the fishers. They are perceived as a threat to conservation, having a faulty conservation ethic, prone to trap theft, and belonging to the underclass of coastal communities. Shifts in gear, from traps to hand lines and to gillnets, is attributed to their success in fishing. SCUBA is at the present time the most important gear, responsible for most of the landings. This merits an effort to understand them in a social and economic context.

- The distribution of fish, its circulation as a commodity, its cultural significance, dietary and nutritional impact, and the local restaurant market remain ill understood aspects of fishing despite a handful of studies. This is the weakest link in management. The market usually remains untouched when regulations and prohibitions are in place, as long there is a paper-trail documenting catch and transactions of the species. As stated by Valdés Pizzini (1985) and others, fresh fish in coastal communities is a hook to entice customers to the local restaurants, where frozen and imported fish and shellfish are served as local. Puerto Rican fishermen have always complained on the frailty of the market as they felt victims to dumping by longliners, cheap fish imported by fish dealers during Lent (and other times of the year as well), and stringent regulations by the management agencies. Yet, it is in the circulation of fish, as presents, foodstuffs and commodities, that fishing acquires its true values in coastal communities. Fish for subsistence, as part of the local system of reciprocity, as a special item for the restaurant market, as food for local communities, and as a priceless delicacy for the tourist and visitors, the circulation of fish continues to add value to coastal communities, and sense to an activity in a difficult situation.

- Research on the relationship between recreational boating/ diving and recreational fishing, including practices that some currently believe to be harmful to coral reefs and to seafood markets, would increase our ability to predict the scope, character, and impact of recreational fishing in Puerto Rico based on existing licensing records and other indicators or boating traffic.

- Research on two fishing practices that are currently poorly understood: 1) fishing for aquarium fish, including its prevalence, regional variation, and its market; and 2) research on bait fish, including the relationships between recreational and commercial sectors that derive from the sale of bait fish. Aquarium fishing is particularly important in that it usually removes undersized and juvenile fish from the resource.

- Outbreaks of *ciguatera,* a marine toxin that bio-accumulates in certain species of fish (e.g. barracuda) and is prevalent in some reef-feeding species, have unnecessarily negatively affected fish markets in Puerto Rico, with consumers rejecting fish after news coverage of a harmful algae bloom or other toxic marine event. Research into the perceptions of Puerto Rican consumers toward seafood, and their relationship to various sources of information, could be used to design more effective educational campaigns to inform consumers, perhaps through the public schools, which species of fish are susceptible to *ciguatera* poisoning and which are not. This work could be directed toward improving consumers' overall "seafood literacy," or their appreciation of the benefits and drawbacks of consuming various species of fish.

- Research on current systems of folk management of resources, including where and how fishers have protected coral reefs, mangroves, and other important marine resources, would increase DRNA's abilities to utilize practices already in place to protect marine resources. Included in this study would be cases of where the political organization of fishers has resulted directly from efforts to protect resources.

- An oral history project on the history of specific components of the marine ecosystem, as understood by elder fishers who have interacted with different components of the marine environment throughout their lives.

- Research on the cultural significance of fishing to non-fishing Puerto Ricans would enable an understanding of the subtle ways that the loss of fishing may diminish the ambiance of coastal landscapes for more than fishers and their families.

The above issues constitute a necessarily incomplete list of what we believe to the salient issues currently facing Puerto Rican fishing communities and fishery managers. Part of the difficulty we face in characterizing the many attributes of Puerto Rican fishing and fishery management derives from their being complex and deeply entangled with other coastal lifestyles and developments, as well as from the variation we have noted from region to region and fishery to fishery. To attempt to isolate key issues from the rich mosaic we call Puerto Rican fishing is at best a challenge, and at worst a disservice to a centuries-old Caribbean tradition.

Table A. Issues by Region							
Region	**MPA Issues**	**Coral Reef & Habitat Issues**	**Fisher Knowledge**	**Management Issues**	**Social & Cultural Issues**	**Livelihood/ Economic Issues**	**Conflicts**
Southwest ***Cabo Rojo Lajas***	Boqueron fishers used to fish Bajo de Sico & Abrir la Sierra; Fishers risk fines to fish MPAs; Divers still fish MPAs; Fishers displaced from fishing turn to smuggling.	Puerto Real fishers careful to place lobster pots to side of reefs.	Landing deep water species kills/wastes them; trap placement based on lobsters' habits; grouper restrictions are sound but other protected species are plentiful; dorado migrate from Dominican Republic to Africa and feed around gill nets; *sierra* feeding habits reflect lunar cycles.	Regulations create a black market for fish; fishers aren't reporting landings or filling out trip tickets; licensing requirements costly and cumbersome; perception that regulations are designed to put fishers out of business; size limits ridiculous if can't help catching deepwater species and if imports are undersized; recreational fish sales depress the market.	Dealers and prominent fishers encouraging civil disobedience with regard to fishery regulations; relations with dealers based on trust; "fishing village" identity important to Parguera residents; moral basis to fishing includes the reproduction of the family by fishing; DRN regulations have promoted fisher solidarity.	"We defend ourselves with lobster;" relations between fish dealers and retail outlets based on trust, loyalty; boat storage for seasonal residents important for Parguera fishers; growth of seasonal population has created jobs for fishing households (Boquerón, Parguera); increased tourism boosts seafood sales.	Gentrification has caused problems in Boquerón; ambivalent reactions to development in Puerto Real; commercial fishers oppose charter boat and recreational fishers selling fish.

Region	MPA Issues	Coral Reef & Habitat Issues	Fisher Knowledge	Management Issues	Social & Cultural Issues	Livelihood/ Economic Issues	Conflicts
Northeast ***Fajardo*** ***Ceiba*** ***Vieques*** ***Culebra***	Conch closures lead to "derby fishing"/ hazardous diving; Culebra fishers were early proponents of an MPA in the Canal Luis Peña.	Hurricane Hugo damaged east coast reefs; reef conserving trap placement/ trap designs common in Fajardo; military control of Ceiba coast preserved mangrove forests; Ceiba divers limit their direct interaction with reefs; need to let marine environments lie fallow (shift fishing territory); part-time fishers in Vieques less conscious about reef protection; boaters and inexperienced fishers damage reefs with anchors; Culebra fishers sought coral reef protective measures early.	Conch breed in December, yet closure in July; landing deep water species kills/ wastes them; marina development lowers water quality; Ceiba fishers concerned about sedimentation; knowledge of grass beds & reefs extensive among divers; conch shift territory by lunar cycles (closer to shore under full moon); competing theories about conch cemetery; fishers used to pierce bladders of small deepwater species after landing them; locating conch requires experience/ knowledge of substrates; studies conducted elsewhere don't apply to Vieques; Culebra fishers believe their mangroves are threatened.	Fajardo fishers appreciate Coast Guard safety training; problems with DRN enforcement; folk management: shift from place to place to allow resource to recover; license requirements are burdensome & Peñalize/ humiliate older, experienced fishers; Vieques fishing associations compete for state funds; inexperienced fishers in Vieques keep lobster with eggs, but experienced fishers don't.	Fishing centers are important family gathering places; fishing is important to the reproduction of the family; opposition to DRN promotes fisher solidarity; fishing landscapes lend ambiance to the coast; women and children more active in associations with seafood retail outlets (markets & restaurants); fishing as heritage; fishers give away species they cannot sell; wasting dead fish is immoral; inexperienced fishers give experienced fishers a bad name; Vieques fishers say they "sacrifice" to fish; Fishing and tourist sector are tightly integrated in Culebra through seafood sales and water taxi services; Culebra fishers promote marine protective measures in schools, among youth.	Fajardo fishers provide water taxis to tourists; seasonal fluctuations in earnings need consideration; Vieques unemployment leads to increased numbers of fishers; part-time fishers sell below market prices; island municipality fisheries have higher costs due to imports; indicates greater commitment to fishing; gentrification is raising housing prices in island municipalities beyond the means of fishers and other working people; there is a dynamic link between fishing and the construction industry in the island municipalities.	Fajardo marina development & expansion source of conflict; Ceiba fishers believe dredging permits given out unfairly; in Vieques conflicts among fishing associations stem from competition for state funds; experienced/ full-time fishers in Vieques oppose many inexperienced/ part-timers behaviors.

Region	MPA Issues	Coral Reef & Habitat Issues	Fisher Knowledge	Management Issues	Social & Cultural Issues	Livelihood/ Economic Issues	Conflicts
Western Metropolitan Municipalities: ***Mayagüez Añasco Rincon***	Conch closure narrows habitat of juvenile fish that use shells for protection; Mayagüez fishers fish Bajo de Sico, Abrir la Sierra, and Tourmaline; Añasco fishers report fishing Tourmaline; Rincón fishers support Tres Palmas MPA; Rincón commercial fishers desire increased bag limits for recreational fishers.	Mayagüez fishers fish the western coral reefs; Añasco fishers movement to providing tours may increase human interaction with coral reefs; some Rincón fishers believe reefs should be protected for tourists, and advocate using less fuel-burning motors.	Water quality varies with distance from shore, from *agua sucia* (dirty water) to *agua verde* (green water) to *agua azul* (blue water); juvenile fish use abandoned conch shells for protection; decline in sugar cane production led to changing near shore ecosystems, due to lack of canal maintenance; flushing of fresh water from the hotels damages near-shore ecosystems; boating traffic noise pollution damages fish.	Regulations enacted without sufficient justification (communication problem); fishers are "frightened of panels and statistics; Rincón fishers attempting to professionalize the fishery through record keeping.	Mayagüez Virgen del Carmen celebration engages entire community while emphasizing family basis of fishing; fishing as therapy from occupational stress; Rincón fishers highly cooperative, assisting each other in times of crisis; commercial fishers train by apprenticeship in Rincón.	Virgin del Carmen celebration stimulates economic activity; "Market destruction is just as bad as habitat destruction"; Rincón fishers depend on repeat restaurant business, give consistent quality.	Mining of sand for construction in Rincón has destabilized shoreline; gentrification, far advanced in Rincón, has pushed some fishers from coastal *parcelas*; recreational fishers depress market by selling fish on west coast.

Region	MPA Issues	Coral Reef & Habitat Issues	Fisher Knowledge	Management Issues	Social & Cultural Issues	Livelihood/ Economic Issues	Conflicts
Northwest: ***Aguada*** ***Aguadilla***	Aguada fish dealers finance fishers who must cross Tourmaline to fish;	Aguadilla fishers report aquarium fishing uses chemicals that stun fish and damage reefs.	Aguadilla fishers blame contamination on resource decline.	Fishers suggest managers should pay attention to long-lining in the area, as well as the aquarium fish trade.	Aguadilla artisanal boat builder supplies vessels all along the west coast;	Declines in garment manufacturing in this region have increased importance of fishing; fishing's role in local economy more noticeable on weekends than during week.	Aguada fishers oppose plans to open a Club Nautico based on its potential to disturb manatee populations and crab breeding grounds; Aguadilla fishers object to long-line fishers from U.S. mainland fishing their waters.

Region	MPA Issues	Coral Reef & Habitat Issues	Fisher Knowledge	Management Issues	Social & Cultural Issues	Livelihood/ Economic Issues	Conflicts
Southern Metro: ***Ponce*** **Juana Díaz**	Caja de Muerto Island (PR MPA) is a favorite fishing location of recreational and commercial fishers; some divers in this region continue diving for conch during closure.	Thermal and idustriral pollution from energy development highly destructive in this region; shipping and anchoring behaviors seen as destructive to coral reefs; Cabo Rojo mangrove habitats produce ballyhoo for bait for Ponce marine suppliers; Hilton's destruction of mangroves destroyed land crab habitats; Juana Díaz fishers specialize in lobster because of proximity of productive reefs near Caja de Muertos.	Recreational fishers who target Caja de Muerto Island find it productive; agricultural practices destroy mangroves and reefs, yet they are discouraged from complaining about this because they are part of the PR DOA; sea grass, sand flats, and patches of reef between Ponce shore and Caja de Muertos are highly productive areas; conch shells provide habitat for octopus; Salinas water treatment plant is contaminating inshore habitat (5-6 miles from shore).	La Guancha fishers demonstrate ways that network-based fishing communities still maintain fishing identity while embracing other economic sectors; DRNA enforcement personnel need to work on people skills; La Playa fishers object to being lumped with farmers after CODREMAR; La Playa fishers object to size limits because of wasteful deaths of deep water species; La Play fishers find licensing requirements burdensome; La Playa fishers advocate participatory co-management; Juana Díaz fishers praise DRNA's turtle protective measures.	La Guancha is a favorite site of celebration on Puerto Rican independence day (July 25th); stone statues and murals at La Playa, Ponce, and in Juana Díaz, celebrate fishing heritage; fishers at La Playa share labor and pool resources for improving facilities; La Playa marketing strategies change during Lent;	Tourist and commercial fishing fully integrated at La Guancha; La Guancha focuses commercial & recreational fishing with tourism, as premier example of vertically integrating fishing with tourism; most charter boat activity in Ponce associated with hotels, foreigners.	La Playa object to being over regulated for minor infractions while Ponce Hilton destroys acres and acres of mangroves and Club Nautico destroyed habitat in building their facilities; shipping traffic interferes with fishing (e.g. tearing lines).

Region	MPA Issues	Coral Reef & Habitat Issues	Fisher Knowledge	Management Issues	Social & Cultural Issues	Livelihood/ Economic Issues	Conflicts
Southeast: ***Naguabo*** ***Humacao*** ***Yabucoa*** ***Maunabo***	Conch closure causes derby fishing in Naguabo; Naguabo fishers opposed to seasonal closures; fishers believe they should be compensated for income lost to MPAs;	Naguabo divers excellent candidates for coral reef monitoring; construction is damaging mangroves; clearing of mangroves has hastened sedimentation and suffocating coral reefs; mangrove & coral reef declines go hand in hand;	Housing construction responsible for sedimentation, contamination; fishers dispose conch shells on reef to offer protection for juvenile species; size limits too strict, do not protect resource; fishers contrast "field" or experiential knowledge with knowledge based on landings data.	Coastal managers could look to Naguabo to see early tensions/ relationships with incipient tourist development; fishers participating in fish stock study believe information was used against them; Yabucoa fishers networked into island-wide fishery politics; Yabucoa fishers experimenting with new trap designs; Yabucoa fishers attempting to get law 278 changed; fishers believe that NOAA wishes to make a marine sanctuary of the entire Caribbean; fishers see contradictions between federal and local regulations; licensing seen as problem.	Shortages of fresh water due to cement mixing for construction; Naguabo fishers descend from boat-building and gear-making traditions, which they are attempting to teach youth; social network ties between Yabucoa and Humacao fishers directed toward the revision of fishing regulations; Maunabo has a land crabbing tradition (*jueyeros)*.	Popularity of area increasing housing costs beyond working people's means; despite high state level investment, fishing infrastructure is underutilized in Naguabo; restricted fish are imported and sold locally; declines in fishing pushing some younger fishers into drug smuggling; tourist traffic & marina maintenance at Palmas del Mar benefit fishing association; abandoned shipping infrastructure used by recreational fishers; imports and sportsfisher sales are undermining fish markets;	Coastal construction seen as problem by fishers in region; ships from the oil refineries cut trap lines and contaminate the sea with oil; trap fishers suspect divers of stealing from their traps.

Region	MPA Issues	Coral Reef & Habitat Issues	Fisher Knowledge	Management Issues	Social & Cultural Issues	Livelihood/ Economic Issues	Conflicts
Southern Region I: ***Guayama***		Petrochemical development destroyed land crab populations and mangroves; lack of fish near petrochemical plant have caused a decline in the use of beach seines;	Pozuelo fishers have been engaging in lobster preservation methods since before regulations, leaving lobsters with eggs in traps to protect them from predators;	Indiscriminant licensing of fishers allows some who don't fish to apply for assistance after a storm, claiming they lost equipment; abandoned vessels in Pozuelo attest to failed state investment in fisheries; fishers believe they have been excluded from management; management meetings are too long, take time from fishing; fishers promote reporting landings data as a pathway toward tax exemptions	Long tradition of fathers teaching sons in Pozuelo	Private fish marketing is common in Guayama fishing communities;	Problems between local trap fishers and divers from neighboring municipalities; petrochemical industry has displaced fishers and contaminated nearshore environments;

Region	MPA Issues	Coral Reef & Habitat Issues	Fisher Knowledge	Management Issues	Social & Cultural Issues	Livelihood/ Economic Issues	Conflicts
Southern Region II: ***Guánica*** ***Yauco*** ***Guayanilla*** ***Peñuelas***	Conch closure has negatively affected divers from this region; Guaypao fishers support closures, but believe the times need to be revised based on fishers' observations; Peñuelas fishers listed red hind as among their most important species.	Local fishers complain of outside fishers destroying reefs with *filetitos* (little gill nets); Guayanilla fishers fish the coral reefs and sandy cays along southern coast;	Fishers question the timing of the conch closuer; jet ski traffic has led to decline in baitfish; fishers know of mutton snapper aggregation locations; lobster are plentiful, but everything now preying on them: octopus, fish, fishers;	Fishers believe area and seasonal closures should be rotated, as fish change habits from year to year; fishers advocate for being allowed to fish one-third of the time during spawning aggregations;	*Sierra* among the most highly desired fish among fishers, though brings lower price at market; gray triggerfish and jacks important for household consumption; fishers in Guayanilla discouraging their children from fishing for a livelihood;	Tourism in an incipient state of development, with much potential; fishers compete with imports by focusing on freshness, quality; seafood sales brisk during Lent and summer months; most successful fishers in Guayanilla are divers; Peñuelas association members promoting cooperative membership.	Within Guánica fishing association, dispute over divers selling highly prized species to restaurants instead of association; municipality wants to move association to less desirable location; local fishers confronted beach seiners destroying near shore environments; petrochemical development has altered/ destroyed near-shore marine environments

Region	MPA Issues	Coral Reef & Habitat Issues	Fisher Knowledge	Management Issues	Social & Cultural Issues	Livelihood/ Economic Issues	Conflicts
Northern Metro Region: ***San Juan*** ***Cataño*** ***Toa Baja***	Condado Lagoon seen as the least effective MPA because of continued pollution from shipping and industry; conch closure and declining conch populations have forced changes in San Juan fisher behaviors; fewer divers today than previously.	Fishers perceive contamination as primary problem with habitat in this region; dredging has suffocated reefs in this region; Cataño fishers who tried to remove sediment from coral reefs suffered skin disorders.	Both king mackerel and conch populations down from 25 years ago; disapprove of size limits as wasteful.	La Hoare fishers point to several sources of bay/lagoon contamination.	Fishing remains a family enterprise in the midst of the city; Cataño fishers are educating youth in public schools about importance of marine resources; Northern metro fishers perceived as older, with less recruitment of youth to the fishery.	Unemployment lowest in Puerto Rico, offering fishers alternatives to fishing full-time; urban traffic important to fish marketing, encouraging street vending; Cataño fishers well supported by municipality; gas prices have restricted fishing territories.	Fishing associations compete with space with cruise ships, tourism infrastructure;

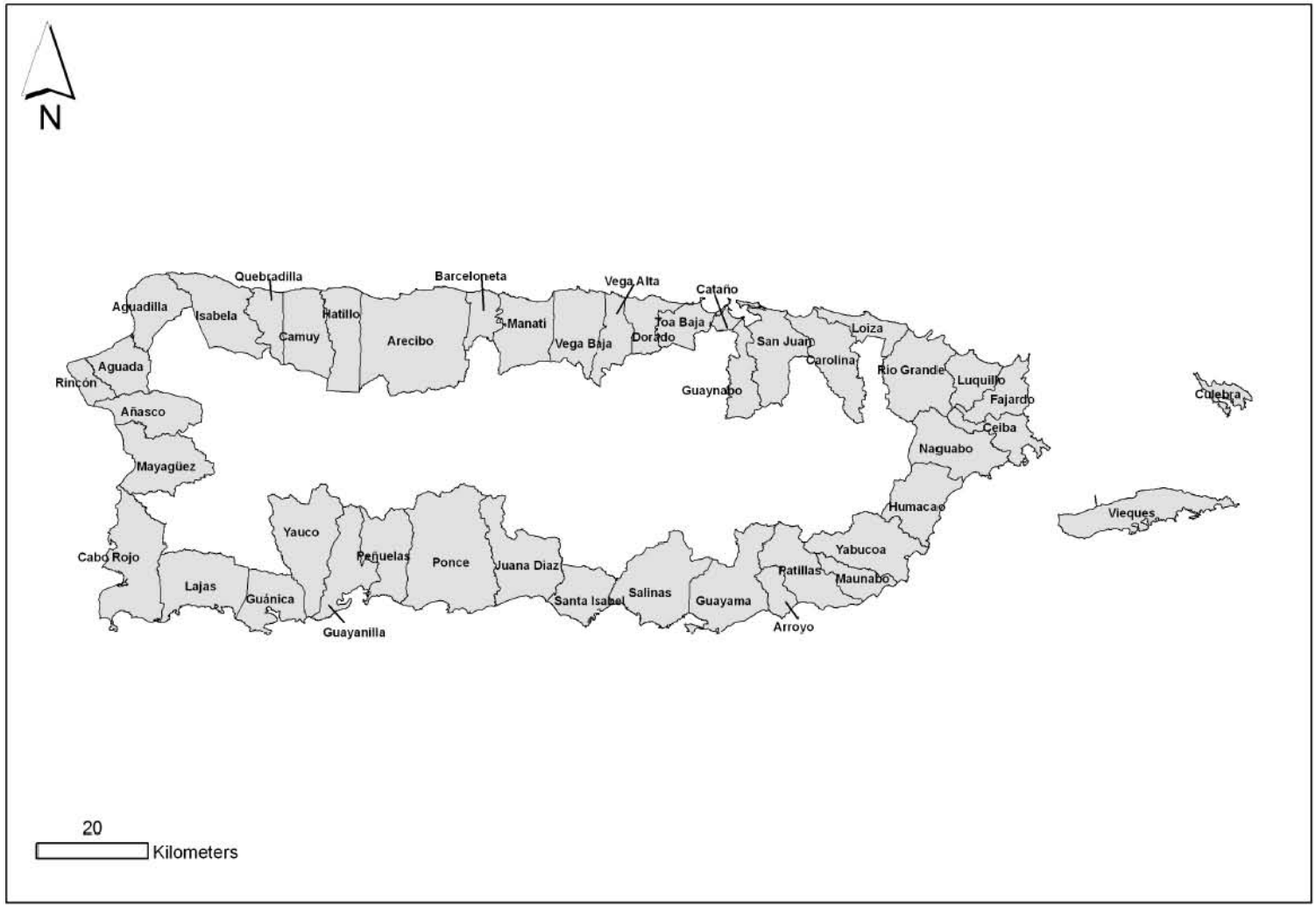
Region	MPA Issues	Coral Reef & Habitat Issues	Fisher Knowledge	Management Issues	Social & Cultural Issues	Livelihood/ Economic Issues	Conflicts
Southern Region III: ***Santa Isabel Salinas***	Fishers note rise in illegal fishing activities by youth in area, including poaching, taking small lobster, and flushing out octopus with bleach.	Decline of sugar industry has altered near-shore marine environments; region blessed with several sheltered mangrove bays, yet currently threatened by various activities; thermonuclear plant responsible for algal blooms and anoxic conditions (dead zones).	Fishers know well the migration habits of pelagics; some younger fishers mistakenly believe juvenile lobster are a different species than their adult counterparts; fishers here interpret DRNA data differently than DRNA.	Fishing centers are centers of resistance to fishing regulations/ DRNA needs to improve relations with local fishers; DRNA does not address pollution problems from coastal development or recreation; fishers object to imported seafood.	Boat building and social activity accompany political organization at Santa Isabel association, important place of occupational identity; fishers here have strong working class identity; lack of unity among fishers perceived as problem.	Close relations between tourism and fishing developing in this region; important land crab sales area; more than 40 restaurants specialize in seafood in La Playa, Salinas.	Space around association somewhat contested by both work and leisure interests; recent increase in divers has caused fear among trap fishers about theft from traps.

Region	MPA Issues	Coral Reef & Habitat Issues	Fisher Knowledge	Management Issues	Social & Cultural Issues	Livelihood/ Economic Issues	Conflicts
Southern Region IV: ***Arroyo Patillas***	Arroyo fishers claim to respect the closures.	As divers and highly conservation minded fishers, Arroyo fishers good sources of information on substrates.	Patillas fishers knowledgeable about wide territories to the east and west of Patillas; marine ecosystems are more complex than the laws give them credit.	Fishers in Arroyo active politically, in part to get permits to dredge out the marina downtown; Arroyo fishers willing to take DRNA officials out on the water; Patillas fishers view size limits as wasteful.	Virgen del Carmen festival in Arroyo annually attracts thousands; Arroyo fishers teach youth fishing as vocation; native sailboat regatta takes place in Patillas.	Much subsistence fishing in Patillas, along with nascent charter boat industry; Patillas and Arroyo fishers cooperate with one another economically.	State provided vessels at Arroyo association the cause of much envy and misunderstanding.

Region	MPA Issues	Coral Reef & Habitat Issues	Fisher Knowledge	Management Issues	Social & Cultural Issues	Livelihood/ Economic Issues	Conflicts
Western North Coast Municipalities: ***Carolina*** ***Loíza*** ***Rio Grande*** ***Luquillo***	Fishers consider their practices "artisanal" and not damaging to stocks; MPAs don't work because fish move out of closed areas; favor rotating closed areas from season to season.	Resort development is destroying wetlands and mangroves.	Cape Miquillo, site of new resort development, is an important bait area and area for shelter during bad weather.	Loíza fishers claim that "if they are going to arrest us for fishing, they better build larger jails;" fishers object to public hearings held in luxury hotels; fishers consider size limits wasteful.	Region's African past celebrated and used as source of solidarity; "in Loíza, fishing and folk art go together;" Luquillo woman fisher teaching gear construction to youth.	Lent in Loíza is a time of robust fish sales, leading to fish rationing among customers; supermarkets allowed to sell undersized fish; Rio Grande association provides sheltered location for recreational and other commercial fishers.	Resort development locus of fisher protest, particularly Hotel Paradisus & Isla Verde Hotels.

Region	MPA Issues	Coral Reef & Habitat Issues	Fisher Knowledge	Management Issues	Social & Cultural Issues	Livelihood/ Economic Issues	Conflicts
Eastern North Coast Municipalities: ***Arecibo to Dorado***	Dorado association members fish near Culebra MPA	Rivers along north coast often sources of contamination from industry.	Divers from Dorado exploit extensive territories as subsistence/ recreational fishers			Weekend recreational fishing traffic between Arecibo Club Nautico and Jarielito brisk; families sell fish larvae tamales;	Conflicts over limited access points into rough seas.

Map A. Puerto Rican Coastal Municipalities



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INTRODUCTION

"If you're going to write about fishermen, write with one hand over your heart."

—North coast Puerto Rican fisher, June, 2005

Out of context, uttered by itself, the above quote begs many interpretations. Is it a plea for truth? For pity? For understanding? Does it imply that most representations of fishers are untrue or unkind, and that by writing with your hand over your heart you are more likely to offer more accurate representations? Or could it be a challenge to the right-handed majority, asking them to write more slowly and carefully with their left hands while raising their right hands to their hearts? Could it be asking to consider how the left-handed minority lives?

Commercial fishing families in Puerto Rico certainly constitute an occupational minority. Between 1898 and the present, the population of full-time commercial fishers in Puerto Rico has fluctuated between 1,500 and 2,500, yet unnumbered thousands of recreational and subsistence fishers depend on the marine resources on and near the islands of Puerto Rico and similarly unnumbered hundreds of thousands of Puerto Ricans and others enjoy the fruits of the Caribbean sea as a significant component of tourist experiences. Further, fishing in Puerto Rico may be understood as a *moral economy*, rooted in households and families, rather than a capitalist enterprise, even in cases where fishers have modernized their fisheries and made significant attempts to professionalize fishing through more accurate record keeping, participatory co-management, improvements in marketing, and other measures. We expand on this in the section of this report on fishing communities, in which we argue that fishing communities are becoming increasingly non-place-based in Puerto Rico, instead being based on networks that interact regularly at significant coastal locations, on shared interests in coastal developments (often struggling against specific developments), and on knowledge of marine resources and environments.

It is important here to distinguish early in this report between types of fishing and their relationship to what we refer to as fishing communities—whether place-based, network-based, or knowledge-based. Here we address coastal fishing (as opposed to inland, freshwater fishing) in all its forms: from fishing as one's primary occupation and identity to fishing to supplement household food supplies to fishing recreationally. The bulk of the information in this report deals with commercial fishers and their communities—or those to whom fishing is important to their own and their families' livelihoods—primarily because these are the families and communities that MPAs, fishery regulations, licensing requirements, and other marine protective measures most directly impact. Yet we also describe here a vast and complex recreational fishing community in Puerto Rico, comprised of charter boat fishers, sport fishers from the U.S. mainland, and residents who fish primarily for recreation, most of whom consume at least some portion of their catch.

Recreational fishers appear here and there in the municipality profiles, but less frequently because they utilize marine resources less regularly than commercial fishers, usually on weekends, and our research took place through the entire week. Part of this, too, is due to confidentiality: that is, charter boat fishing operations are fairly thinly spread over Puerto Rico's coast. If we were to discuss them in detail in the municipality reports, they could be too easily identified. We devote a special section of this report to charter boat captains, however, because they are part of the much larger recreational fishing community. Most published accounts suggest that recreational fishers are growing in number and their communities

becoming more complex, particularly as they take on specific causes vis-à-vis new regulations, other users of marine resources, and so forth, becoming more politically organized and astute (Ditton and Clark 1994; Griffith, et al. 1998; Griffith and Valdés Pizzini 2002; Valdés Pizzini, et al. 1998). As such, they are adding to the number and elaboration of non-place based communities in Puerto Rico; in so far as they are involved in the gentrification of the coastal zone through their contributions to the demand for marinas and marina development, they are also involved in the complex processes by which place-based communities are becoming less and less common.

I.a. Objectives and Goals of the Current Work

This work emerges from the need, since the Magnuson-Stevens Act, to estimate the social impacts of proposed regulations, in this case primarily MPAs, on the fishing communities of Puerto Rico—a legal requirement that has been bolstered by the National Environmental Policy Act and Executive Order 12898 (*Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations)*. In this report, our first objective has been to conduct community profiles of fishing communities in all coastal municipalities that have fishing communities, including the extent to which communities are fishery engaged or fishery dependent, as defined in the executive summary above. The specific factors that make a community fishery dependent are outlined in the section below entitled Puerto Rican Fishing Communities. The second objective has been to estimate the impacts on Puerto Rican fishers and their families of the 11 federal MPAs of Puerto Rico and the U.S. Virgin Islands. The overall goal of this study has been to combine these two objectives into a comprehensive synthesis of Puerto Rican fishing, including its contemporary composition, its history, cultural significance, the changing nature of fishing communities, and its relation to fisheries policy.

Briefly, to satisfy these objectives, we spent more than two and a half years, from November 2003 to July 2006, compiling information on Puerto Rican fishing and fishing communities. We have organized the work by first presenting an overview of contemporary fishing practices in Puerto Rico and subsequently focusing on its various specific dimensions, including its history, cultural significance, a discussion of Puerto Rican fishing communities, a statistical overview based on survey work conducted in 2004 and 2005, a discussion of the performance of MPAs, and a policy discussion. These general discussions are followed, in Volumes II and III, with regional profiles that give more detailed information at the local level, describing fishing practices and fishing families' concerns on a community-by-community basis.

This work then constitutes an initial step in a long relationship between NOAA Fisheries and the fishers of Puerto Rico. The report is designed to be a living document, one that can and must be revised and added to as new developments emerge. Its attempt to understand the internal dynamics of Puerto Rico's multifaceted fishers is also an early attempt at establishing effective communication and more democratic participation in the regulatory process.

I.b. Brief Overview of Puerto Rico

The islands of Puerto Rico—including the main island, Vieques, Culebra, La Mona and Monito, and Desecheo, and a number of smaller keys—lie in the Caribbean archipelago between the large island that comprises the Dominican Republic and Haiti, and the southeasterly curving chain of islands known as the Lesser Antilles, which extend from the small island municipalities of Vieques and Culebra, Puerto Rico, and the U.S. and British Virgin Islands to the cluster of islands known as Trinidad and Tobago. They cover a land area of nearly 9,000 square kilometers and have just over 500 kilometers of shoreline. The

largest or main island of Puerto Rico is considered one of the Greater Antilles with the Dominican Republic/ Haiti, Cuba, and Jamaica, but its small outer islands to the east have more in common, geologically, with the Lesser Antilles.

Situated well within the tropics, the islands enjoy a warm climate, with temperatures averaging 82º between November and May and higher in the summer; although summer trade winds moderate coastal temperatures and mountain temperatures can dip as much as twenty degrees lower than along the coast. They have in common with other Greater Antilles wet, lush northern environments and drier, more desert-like southern environments; the prevailing winds arrive from the northeast and whatever clouds they drive drop most of their moisture prior to crossing the central mountains. As with island societies generally, the islands of the Caribbean have been defined in part by highly transient populations, with substantial proportions of their residents involved in international migration streams and many of their coastal and mountain locations common destinations for tourists and temporary or seasonal residents. Jorge Duany views this phenomenon as so pervasive that he entitled his recent book, Puerto Rican Nation on the Move (2002), and Griffith and Valdés Pizzini, in their book on Puerto Rican fishing, focused on the movement between fishing and wage work that often involved migration to the U.S. mainland.

As a commonwealth, Puerto Rico has been part of the territories of the United States since 1898—a political relationship that many Puerto Ricans often either forget or choose to downplay when they identify themselves. As a former Spanish colony, Spanish is the first language of most Puerto Ricans, although the knowledge and use of English is widespread as well. Puerto Ricans tend to consider themselves Puerto Ricans first and U.S. citizens second, an identity that derives from cultural rather than political nationalism. There are around 3.5 million inhabitants of Puerto Rico, with 1.4 million living in the San Juan metropolitan area; another perhaps two million live on the U.S. mainland, with New York, Chicago, and Miami having particularly large populations of Puerto Ricans. Families typically have ties to one or more regions across the United States through migration.

Puerto Rico's economy has changed from one dependent primarily on tropical agricultural crops like sugar, coffee, and tobacco to a more mixed economy of shipping, military spending, tourism, financial and insurance services, manufacturing, construction, and *chiripas* (temporary, informal jobs). Special tax exemptions made Puerto Rico attractive to many U.S. manufacturers from the 1970s through the 1990s, attracting in particular pharmaceutical and medical supply manufacturers as well as petrochemicals. The tax exemptions were replaced in 1993 with tax credits tied to wages that companies paid their employees, as well as additional incentives to pharmaceutical and hi-tech industries. On the heels of the phasing out of tax exemptions came the signing of the North American Free Trade Agreement, after which Mexico became a major competitor with Puerto Rico in the low-skill, labor-intensive manufacturing sector. Thus while many pharmaceutical and hi-tech (e.g. medical instruments such as pacemakers) manufactures remain in Puerto Rico, others, such as garment manufactures and tuna processors, closed their factories as these lower-labor cost overseas opportunities emerged.

Despite these economic developments, the 1990s were robust years for Puerto Rico's economy, paralleling growth in the United States as a whole—growth fueled in large part by the development and expansion of computer technologies. This growth slowed in the second half of 2000 and was dealt a severe blow after the terrorist attacks of 2001. Tourism—a particularly important economic sector for Puerto Rican fishing families—was particularly disrupted by the terrorist attacks, with many mainland U.S. citizens refusing to travel by air. Today, Puerto Rico's Gross Domestic Product is $72.37 billion and its per capita income $18,500. Nearly half, 44.6 percent, continue to live below the poverty level, however, with average hourly wages of $8.08 well below those in the rest of the United States. An

average of 29.5 percent of household income derives from transfer payments. The employed labor force concentrates in manufacturing (42.1%), finance, insurance, and real estate (17.1%), trade (11.6%), services (9.9%), government (9.6%), transportation and public utilities (6.9%), construction and mining (2.4%). Agriculture and fisheries currently employ less than 1% of the people of Puerto Rico (www.topuertorico.org/economy.shtml).

Puerto Rico's economy is also relatively heavily dependent on the United States government for transfer payments. Recent estimates suggest that transfer payments constitute 22% of personal income in Puerto Rico (Enchautegui and Freeman 2005). Correspondingly, unemployment is high, with slightly less than a third (31%) of its population employed. Unemployment increased through the last half of the 20th century and into the 21st, although in most cases this was accompanied by rising per capita incomes and reductions in percentages of people below the poverty line—likely due to transfer payments. Government funding of lifestyles in Puerto Rico is not restricted to transfer payments, but permeates Puerto Rican life, a phenomenon that has created a highly politicized society. Political party affiliation determines many disbursements of state funding, including financing fishing infrastructure, and any management alternatives proposed in Puerto Rico must take into account not only the political will that developed them, but also the likelihood that a change in political leadership may influence enforcement efforts or the extent to which the government continues to recognize existing management efforts as legitimate. Currently, there are two principal political parties in Puerto Rico—the People's National Party (PNP) and the People's Democratic Party (PDP)—and a third, smaller political party, the People's Independence Party (PIP). The primary issue differentiating these parties from one another is the question of the status of Puerto Rico vis-à-vis the rest of the United States: the PNP favors statehood; the PDP favors its current Commonwealth status; and the PIP favors independence.

Against this economic background, commercial fishing remains a viable economic and cultural niche in the islands, providing direct employment for around two thousand fishers and their families and generating or bolstering indirect employment in seafood markets, restaurants, fishing and diving stores, marinas, and other sectors. Fishing, too, is a critical component of Puerto Rico's tourist industry, supplying fresh fish to a variety of coastal restaurants. Finally, subsistence and recreational fishing provide households and communities with high quality seafood.

I.c. Brief Overview of Puerto Rican Fisheries

The commercial fisheries of Puerto Rico are considered primarily artisanal, or small scale, with vessels ranging in size from 18 to 20 feet but most around 20 to 25 feet in length, made of wood and fiberglass. Numbers of commercial fishers range from around 1,500 to 2,500, with many not listed in official statistical sources such as the fishery census or licensing data. Actual numbers of commercial fishers may be much higher, however, as many who fish commercially are unlicensed. During workshops held in July of 2006, most fishers attending the workshops disputed the 1,500 to 2,500 figure, claiming it was higher.

Of the 1,133 interviewed at 69 landing centers in the most recent, 2002 census, 63.5% reported fishing fewer than 40 hours per week. This includes about one quarter who reported fishing fewer than 20 hours per week. Around one quarter (27.2%) reported fishing 40 hours per week, or full time, and around 10% fished over 40 hours per week.

Nearly all of the 43 coastal municipalities have *Villa Pesqueras*, or fishing associations, and some have more than one, although the number of officially recognized associations and landing centers has changed over time. In 1985, for example, Gutiérrez Sánchez, McCay, and Valdés Pizzini reported that there were

88 landing centers but only 34 *Villas Pesqueras*. Of the 88 landing centers, however, only 40 had facilities for storing fishing gear, and, they indicated that, "some of these facilities are modern but others are deteriorating or abandoned" (1985: 2). Ten years later, Matos (1997) showed a map with 100 fishing centers. Of those interviewed in 2002, under half (44.5%) belonged to fishing associations. The observation that Gutiérrez Sánchez, McCay, and Valdés Pizzini made about fishing locations remains relevant today, with some centers thriving and others either abandoned or in the process of being abandoned.

As these comments suggest, fishing effort is unevenly distributed geographically, with little activity taking place along the north coast and the west and southwest coast witnessing the highest fishing activity. Cabo Rojo and Lajas continue to be significant fishing centers, but Rincón has been increasing its significance by modernizing its fleet. Fishers in Aguadilla tend to be highly politically active, occupying leadership roles for Puerto Rico as a whole. Other important fishing communities include Fajardo and Vieques in the east and Ponce and Peñuelas in the south. The importance of these communities varies through time, however, with changes in fishing association administration, trends in alternative employment, marine resource declines, and other factors. These changes recommend continued monitoring of the islands' fisheries.

Despite the apparent flux of landing centers, one remarkable fact about Puerto Rican commercial fishing is its evident stability over time. We know from several sources that fishers come and go from fisheries throughout their lives, that fishing on the one hand absorbs the unemployed and poor during difficult economic times and on the other subsidizes individuals working part-time or full-time in the formal economy, yet the *official* number of commercial fishers has fluctuated little over the past century (Jarvis 1932; Matos 1997: 12; Matos and Torres Rosado 1989: 2; Pérez 2005: 12-13; Wilcox 1904). As just noted, however, local fishers contest official figures as being too low.

Based on recent landings data, important gear types in Puerto Rico are bottom lines, fish pots, gill nets, and SCUBA gear, with SCUBA increasing every year, largely at the expense of fish pots. Hook and line rigs account for slightly over a third (35.4%) of all gear used from 1999 to 2003. Fish and lobster pots account for 27.8% during the same period, SCUBA 16.7%, and gill and trammel nets 16%. The most important species are several deep-water snapper species (red, yellowtail, mutton, lane, etc.), accounting for 27.9% of 1999-2003 landings, and lobster (10.6%). Matos-Caraballo (2005: 4) reports that the most important commercial species is yellowtail snapper. Other important species, culturally and in terms of landings, are king mackerel (3.0%), boxfishes (3.9%), triggerfish (3.1%), and red hind (2.6%).

Fish are marketed through a variety of channels, including *Villa Pesqueras,* private dealers, out of fishers' homes, through mobile street vending, and at roadside stands. Fishers and their families also add value to fish through the production of seafood products that are sold from a variety of restaurant types, stands, and other venues. Annually fishers sell between 3.0 million and 4.3 million pounds of fish, generating revenues of over $7,000,000 (Matos-Caraballo 2005: 4). Matos-Caraballo reports, however, that after the implementation of new fishing regulations in 2004, commercial fishers across Puerto Rico, at the urging of their fellow fishers, stopped reporting landings. He estimates that "approximately 50% of the fishers stopped [submitting] their trip tickets" (2005: 6).

In addition to the commercial fishery, Puerto Rico's recreational fisheries have been increasing over the past two decades. Currently, there are around 167,000 recreational fishers in Puerto Rico, around 30,000 of whom come from other parts of the world. This figure has more than doubled since the late 1980s.

Marinas, yacht clubs, and Club Nauticos currently hold between 20 and 25 fishing tournaments per year, most of which target Blue Marlin and other billfish.

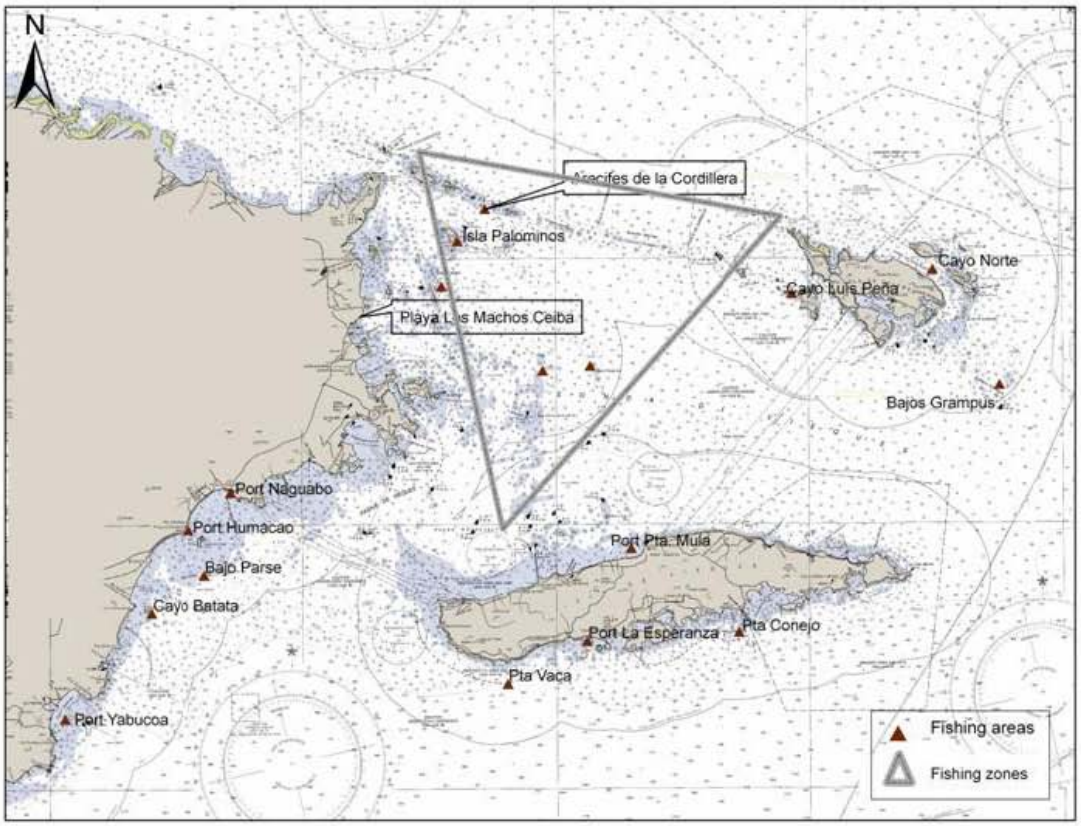
I.d. Important Fishing Territories in Puerto Rico

In the maps presented on the next few pages, we show some of the most productive and popular fishing territories in Puerto Rico. Briefly, Map I.1 shows one of the most productive areas that is frequented by fishers from Fajardo, Ceiba, Culebra, and Vieques primarily, but also by fishers from the southern half of the east coast (Naguabo to Yabucoa) and by fishers from Patillas and Arroyo. Dorado fishers, east of San Juan, also mentioned that they fished in this region.

This is a rich, triangular-shaped area that extends from the coastlines of Fajardo and Ceiba to the channels between Vieques and Culebra. It has a variety of substrates, including coral reefs, and it is home to several deepwater snapper-grouper species as well as a region of pelagic species. Lobster and conch also inhabit these waters.

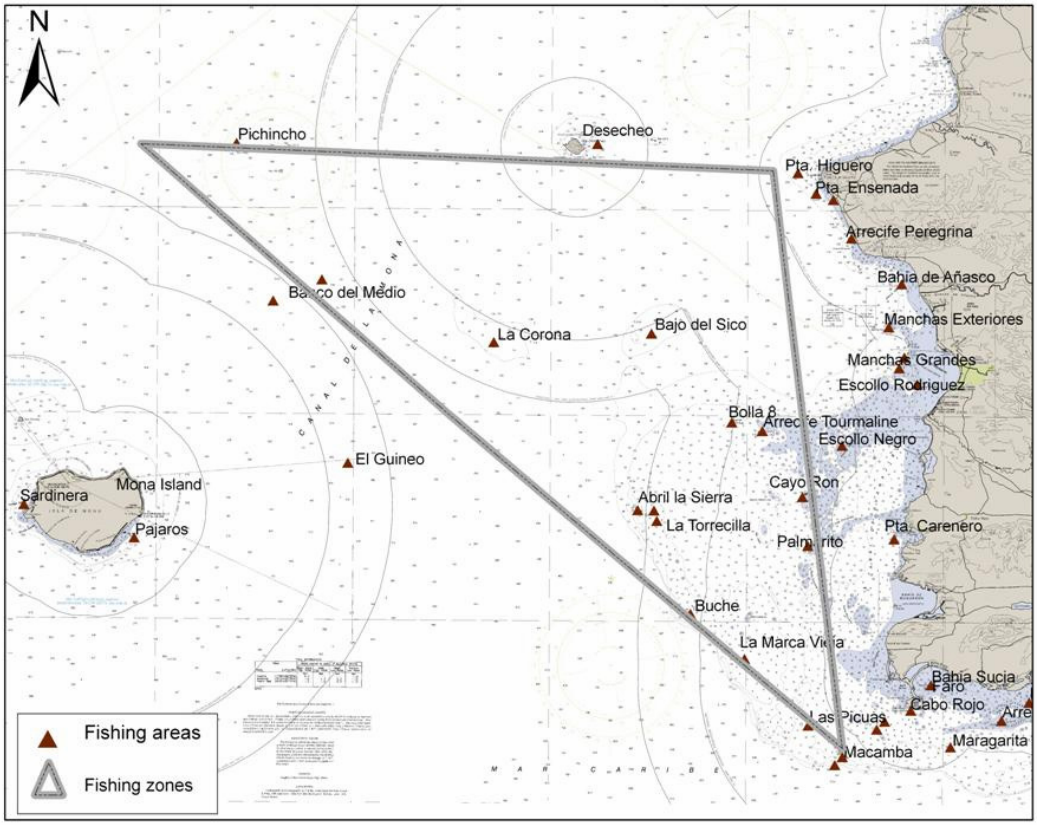
Equally important, these waters are subject to crowding from recreational boating traffic as well as international shipping, ferry traffic, and fishing, with several pleasure crafts coming and going from eastern Puerto Rican ports like Fajardo and Humacao and from the Lesser Antilles. Several small islets off the coast of Fajardo are popular tourist locations for day trips, sunset cruises, and the like.

Map I.1. Popular Eastern Fishing Grounds



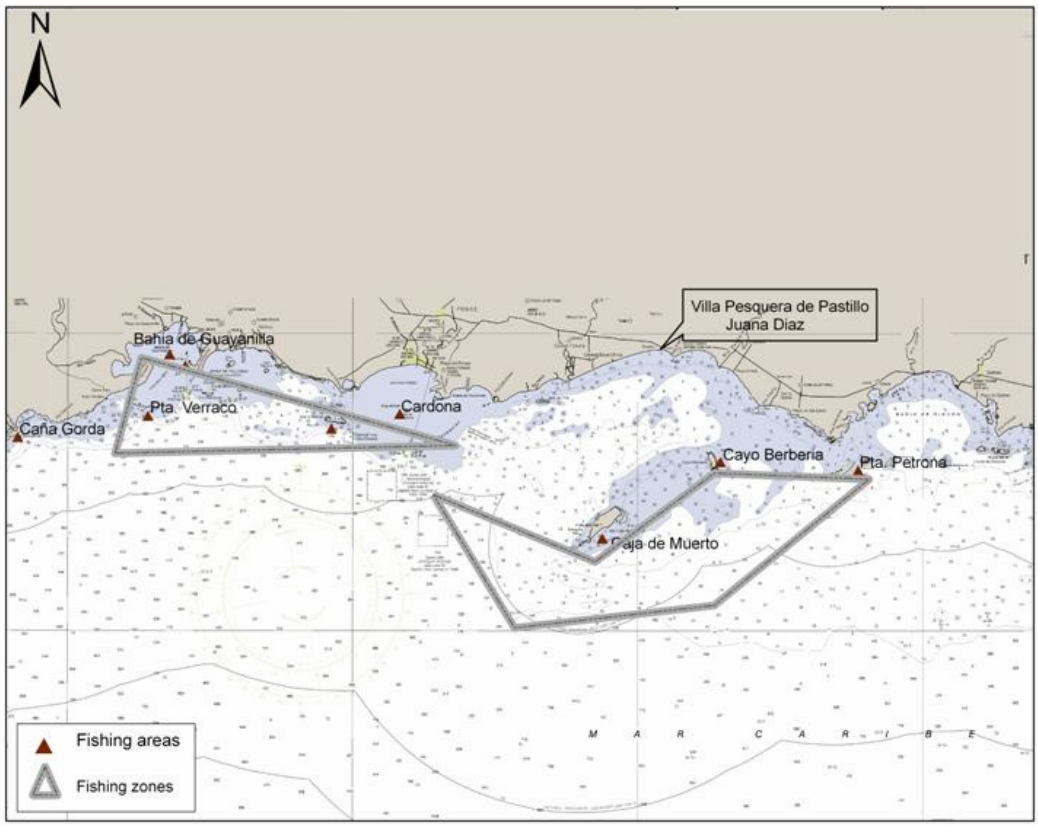
Map I.2 depicts the fishing grounds for Puerto Rico's most productive fisheries and some of its most innovative. Fishers from Cabo Rojo and Rincón historically, have fished the grounds between Desecheo and La Mona.

Map I.2. Western Fishing Territory



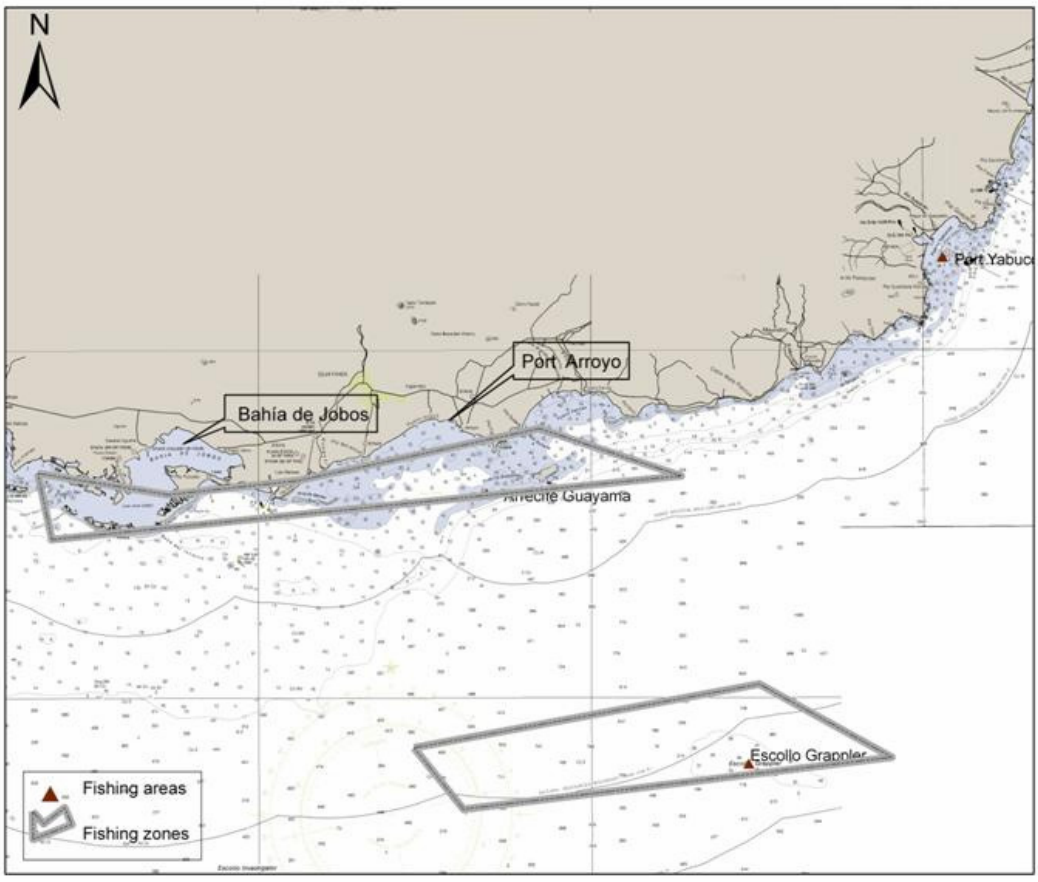
Map I.3 depicts a southern coast location that is particularly popular among fishers from Ponce and nearby municipalities. It includes the island called Caja de Muertos, which is a favorite among recreational as well as commercial fishers.

Map I.3. Southern Fishing Territory, Including Caja de Muertos



Finally, Map I.4 depicts an important fishing territory for the fisheries of southeastern Puerto Rico, which include the trap fisheries of Pozuelo, Guayama.

Map I.4. Southeastern Fishing Territory



I.e. Current Gear and Species: the Landings and Fisher Census Data

The following tables present data on Puerto Rico's fisheries (e.g. landings, gear types, species landed), showing how they vary by municipality. In Table I.1 we have grouped the municipalities into the regions discussed above. Table I.2 shows gear and species for all of Puerto Rico. In Table I.3 we rank the municipalities according to pounds landed and revenue the fisheries generated.

First, the following table shows the major gear types and species landed in each municipality[4]; in most cases these groupings (which are separated by bold facing and distinctive fonts) reinforce our decisions to group municipalities as we have. In most cases, however, particularly with regard to species, Puerto Rican fishers use a wide variety of gear types and target multiple species; rarely, for example, did more than one or two species account for more than 10% of the landings, and in many cases the third most important species listed below accounted for less than 10% of the landings. These data suggest that Puerto Rican fishers engage in multispecies fisheries as a matter of course.

Table I.1. Three Most Important Gear and Species by Municipality (grouped by regions and showing percentages of use & landings), 1999-2003*

Municipality	1st Gear	2nd Gear	3rd Gear	1st Species	2nd Species	3rd Species
San Juan	Bottom Line 66.2	Gill net 13.7	Cast net 6.7	Yellowtail Snapper 15.0	Jacks 8.0	Lane Snapper 6.4
Cataño	Gill net 51.2	Bottom Line 34.5	SCUBA gear 5.7	Jacks 7.9	Mojarras 6.9	White Grunt 5.5
Toa Baja	Gill net 57.6	Fish pot 14.7	Bottom Line 12.6	Jacks 7.9	Mojarras 6.9	White Grunt 5.5
Mayagüez	***Bottom Line 56.9***	***Fish pot 20.5***	***SCUBA gear 6.2***	***Yellowtail Snapper 12.6***	***Lane Snapper 11.1***	***King Mackerel 7.5***
Añasco	***Bottom line 57.5***	***Fish pot 29.0***	***Beach seine 4.5***	***Silk snapper 41.0***	***Lane Snapper 9.6***	***Lobster 6.0***
Rincón	***Bottom line 50.9***	***Troll line 16.6***	***Fish pot 14.5***	***Queen Snapper 28.6***	***Silk Snapper 25.1***	***Dolphin 5.1***
Ponce	Bottom Line 73.4	Troll line 8.2	Long line 8.9	Yellowtail Snapper 18.1	Lane Snapper 13.5	Snappers (generic) 9.1
Juana Diaz	Fish pot 64.2	Lobster pot 18.2	SCUBA gear 11.8	Lobster 32.2	Lane Snapper 17.5	Other fishes 7.5
Santa Isabel	***Gill net 22.8***	***Fish pot 21.7***	***Long line/ SCUBA gear 20.6***	***Lane Snapper 22.2***	***Lobster 9.3***	***Yellowtail and Mutton Snappers 8.7***
Salinas	***Fish pot 32.1***	***Gill net 25.0***	***Bottom line 16.3***	***Lane Snapper 15.7***	***Yellowtail and Mutton Snappers 9.5***	***White Grunt/ Lobster 9.0***
Guayama	Fish pot 76.4	Gill net 15.1	Bottom Line 6.2	Lobster 9.0	White Grunt 8.4	Lane Snapper 8.3
Patillas	***Fish pot 39.9***	***SCUBA 27.5***	***Bottom Line 21.6***	***Lobster 11.8***	***Lane Snapper 6.8***	***Parrotfish 6.0***
Arroyo	***Gill net 39.3***	***Fish pot 22.3***	***SCUBA gear 17.3***	***Parrotfish 15.1***	***Lobster 10.4***	***Ballyhoo 7.0***

[4] The table provides data on 41 of the 43 coastal municipalities; Yauco fisher data is included in the data for Peñuelas, as Yauco's coastline is short and there is no landing center there, and Quebradillas did not report landings for 1999-2003.

Municipality	1st Gear	2nd Gear	3rd Gear	1st Species	2nd Species	3rd Species
Peñuelas	SCUBA gear 73.7	Skin diving 13.3	Bottom Line 6.4	Lobster 26.0	Hogfish 16.3	Octopus 11.8
Guayanilla	Gill net 77.5	Bottom Line 11.7	Fish pot 5.9	White Grunt 12.1	Mutton Snapper 8.6	Lane Snapper 8.4
Guanica	SCUBA gear 37.7	Bottom Line 37.3	Gill net 11.6	Lobster 14.0	Yellowtail Snapper 12.0	Hogfish 9.0
Isabela	***SCUBA diving 36.7***	***Bottom Line 34.7***	***Fish pot 15.2***	***Lobster 20.7***	***Nasau Grouper 14.1***	***Silk Snapper 12.1***
Camuy	***Bottom Line 78.2***	***Troll Line 9.2***	***Cast net 5.3***	***Yellowtail Snapper 18.1***	***Mutton Snapper 10.5***	***King Mackerel 9.2***
Arecibo	***Bottom Line 43.8***	***Fish pot 35.1***	***Troll Line 6.1***	***Silk Snapper 32.9***	***King Mackerel 8.7***	***Lobster 8.0***
Barceloneta	***Fish Pot 37.8***	***Bottom Line 21.3***	***Troll Line 10.7***	***Silk Snapper 14.3***	***Triggerfish 8.8***	***Lane Snapper 7.1***
Manatí	***Bottom Line 55.3***	***Gill net 35.8***	***Cast net 4.9***	***Herrings 5.7***	***White Mullet 5.6***	***Jacks 4.9***
Vega Baja	***Bottom Line 41.7***	***Fish pot 19.2***	***Gill net 14.6***	***Silk Snapper 10.2***	***Red Hind 7.4***	***Bar Jack 5.7***
Vega Alta	***Bottom Line 40.0***	***Gill net 26.0***	***Fish pot 13.6***	***Silk Snapper 10.3***	***Bar Jack 6.4***	***Red Hind 6.2***
Dorado	***Gill net 26.9***	***Bottom Line 26.9***	***Fish pot 20.6***	***Silk Snapper 10.0***	***Triggerfish 6.8***	***Schoolmaster 6.4***
Carolina	Bottom Line 61.6	Gill net 25.9	Troll line 6.1	Jacks 8.0	White Mullet 7.6	Yellowtail Snapper 7.6
Loíza	Bottom Line 63.0	Gill net 18.4	Beach Seine 10.5	Silk Snapper 10.5	Vermillion Snapper 8.5	Yellowtail Snapper 6.6
Rio Grande	Bottom Line 71.6	Gill net 18.1	Cast net 3.3	Yellowtail Snapper 11.1	Vermillion Snapper 9.9	White Grunt 9.3
Luquillo	Gill Net 42.0	Bottom Line 23.9	Fish pot 11.5	White Grunt 10.3	Lane Snapper 7.2	King Mackerel 6.2
Fajardo	***Bottom Line 49.6***	***Fish Pot 31.1***	***SCUBA gear 12.3***	***Yellowtail Snapper 17.9***	***Lobster 7.7***	***King Mackerel 5.4***
Ceiba	***Fish Pot 64.9***	***SCUBA gear 17.3***	***Bottom Line 10.9***	***White Grunt 12.5***	***Lobster 7.7***	***Boxfishes 5.4***
Vieques	***Fish Pot 38.0***	***SCUBA gear 28.9***	***Bottom Line 24.5***	***Lobster 15.4***	***Yellowtail Snapper 8.7***	***Triggerfish 6.5***
Culebra	***SCUBA gear 73.2***	***Fish Pot 13.1***	***Bottom Line 13.0***	***Nasau Grouper 17.2***	***Lobster 15.4***	***Triggerfish 15.1***
Naguabo	Fish Pot 45.9	SCUBA gear 28.6	Bottom Line 12.6	Lobster 18.7	1st class fish 16.1	3rd class fish 13.7
Humacao	Fish pot 47.5	Bottom Line 36.0	SCUBA gear 13.2	Lobster 13.7	Yellowtail Snapper 9.3	White Grunt 7.8
Yabucoa	Bottom Line 63.5	Fish pot 25.0	n.a.	Yellowtail Snapper 12.7	Lane Snapper 10.8	White Grunt 10.8
Maunabo	Gill net 29.3	Fish pot 22.4	Bottom line 12.6	Lane Snapper 12.3	White Grunt 11.9	Lobster 9.3
Lajas	***Gill net 32.3***	***Fish pot 24.1***	***Bottom line 17.8***	***Lobster 8.2***	***White Grunt 7.8***	***Lane Snapper 6.5***
Cabo Rojo	***SCUBA gear 32.7***	***Fish pot 24.1***	***Bottom line 17.8***	***Lobster 17.8***	***Boxfishes 9.8***	***Lane Snapper 6.7***
Aguada	Bottom Line 32.9	Troll Line 32.8	Fish pot 21.1	Silk Snapper 13.0	Skipjack Tuna 8.5	King Mackerel 7.6
Aguadilla	Bottom Line 48.0	Troll Line 45.5	n.a.	Silk Snapper 12.9	Skipjack Tuna 10.0	King Mackerel 9.9

Source: Puerto Rican Landings Data, 1999-2003;

**In cases where there is more than one gear or species in a cell, it indicates a tie or nearly a tie.*

These data, though helpful in determining the most important gear and species used on a regional basis, should not mask the fact that, through the year and from year to year, Puerto Rican fishers use a variety of gear and land hundreds of different species. Landings data from 1999 to 2003 for the entire island list 20 different gear varieties and 243 different species. However, only five gear types account for over 90% of the landings and 11 species account for over half the species landed; most species landed account for under 1% of the landings. The top few are listed in the table below.

Table I.2. Important Gear and Species for All Puerto Rican Landing Centers, 1999-2003

Gear	Percent Reporting
Bottom Line	29.2
Fish pot	26.8
SCUBA Diving	16.7
Gill net	13.9
Troll line	5.1
Trammel net	2.1
Skin diving	1.7
Long line	1.2
Beach seine	1.1
Lobster pot	1.0
Cast net	.9
Rod & reel	.2
Land crab trap	.1
Species	
Lobster	10.6
Yellowtail Snapper	7.1
Lane Snapper	6.6
White Grunt	5.4
Silk Snapper	4.4
Mutton Snapper	4.2
Boxfishes	3.9
Snappers (generic)	3.3
Hogfish	3.3
Triggerfish	3.1
King Mackerel	3.0

In addition to important gear and species, we have ranked the 41 of the 43 coastal municipalities by the last five years of the landings data (1999-2003), indicating as well the coast (south, north, east, or west) of

each municipality.[5] The information on coastal location (north, south, east, or west) is important because fishing effort is unevenly distributed over the island. In addition, these rankings need to be considered in light of the number of landing centers reporting landings in each municipality, as well as ethnographic information about the coastal regions of the municipalities. Some landing centers have reported landing zero pounds for many years, while others have reported a disproportionate amount of the catch in one municipality. In Loíza, for example, three of its four landings centers accounted for less than 2% of its total landings. We include in our table only those landing centers that have reported landings at least once from 1999 to 2003. The municipalities are divided into quartiles (with one extra in the final quartile), differentiated by bold or non-bold print.

Table I.3. Rankings of Municipalities by 1999-2003 Total Landings

Municipality	Pounds	Av. Price Per Pound	Revenue**	N. Centers	Coast
1. Cabo Rojo	2,224,608	$2.346	$5,218,930	7	West
2. Lajas	992,900	$1.991	$1,976,863	3	South
3. Vieques	806,070	$2.392	$1,928,119	2	East
4. Aguadilla	720,229	$1.480	$1,065,939	4	West
5. Guánica	686,113	$2.338	$1,604,179	3-4*	South
6. Fajardo	646,146	$2.264	$1,462,874	3-4*	East
7. Naguabo	634,526	$2.539	$1,611,061	2	East
8. Rincón	588,329	$2.491	$1,465,527	2	West
9. Juana Díaz	545,830	$2.458	$1,341,650	2	South
10. Ponce	486,517	$2.164	$1,052,823	1-2*	South
11. Guayama	**464,378**	**$2.283**	**$1,060,175**	**3**	**South**
12. San Juan	**460,159**	**$2.129**	**$979,678**	**3**	**North**
13. Mayagüez	**439,678**	**$2.138**	**$940,032**	**3**	**West**
14. Humacao	**410,334**	**$2.625**	**$1,077,127**	**3**	**East**
15. Aguada	**405,182**	**$1.64**	**$664,498**	**2**	**West**
16. Ceiba	**352,671**	**$2.374**	**$837,241**	**2**	**East**
17. Salinas	**319,765**	**$2.408**	**$769,994**	**3**	**South**
18. Guayanilla	**275,080**	**$1.443**	**$396,940**	**1-2***	**South**
19. Peñuelas	**261,975**	**$3.174**	**$828,889**	**1**	**South**
20. Santa Isabel	**220,437**	**$2.776**	**$611,933**	**3**	**South**
21. Arroyo	219,462	$2.233	$490,059	1	South
22. Arecibo	210,453	$2.501	$526,343	1	North

[5] Neither Quebradillas nor Yauco reported any landings from 1999-2003.

Municipality	Pounds	Av. Price Per Pound	Revenue**	N. Centers	Coast
23. Loíza	187,722	$1.894	$355,545	1-4*	North
24. Vega Baja	180,571	$2.479	$447,635	1	North
25. Yabucoa	173,852	$2.155	$374,651	1-2*	East
26. Añasco	171,520	$2.748	$471,337	1	West
27. Patillas	132,164	$3.092	$408,651	1-2*	South
28. Cataño	150,760	$2.378	$358,507	1	North
29. Rio Grande	132,164	$2.114	$279,395	1-2*	North
30. Carolina	125,321	$2.224	$278,713	1	North
31. Maunabo	**124,104**	**$2.245**	**$278,613**	**1**	**South**
32. Culebra	**106,612**	**$2.345**	**$250,005**	**1**	**East**
33. Barceloneta	**94,935**	**$2.226**	**$211,325**	**2-3***	**North**
34. Vega Alta	**85,384**	**$2.167**	**$185,027**	**1**	**North**
35. Dorado	**85,001**	**$2.797**	**$237,748**	**1**	**North**
36. Manatí	**54,378**	**$2.054**	**$111,692**	**1**	**North**
37. Isabela	**48,016**	**$2.686**	**$128,971**	**1-2**	**North**
38. Luquillo	**43,988**	**$2.212**	**$97,302**	**1**	**North**
39. Camuy	**22,548**	**$2.123**	**$47,869**	**1**	**North**
40. Hatillo	**13,536**	**$2.603**	**$35,234**	**1**	**North**
41. Toa Baja	**9,731**	**$2.070**	**$20,143**	**1**	**North**

Source: Puerto Rican Landings, 1999-2003.

**=indicates one or more landing centers reported 0 landings in one or more years.*

*** =determined as average price x total landings*

A quick examination of table I.3 illustrates that most of the municipalities reporting low levels of landings are on the north coast, while western and southern municipalities dominate the upper quartiles. That landings constitute only one dimension of fishery dependence, however, will become evident from the ethnographic data. For example, although Cataño is in the third quartile, its single *Villa Pesquera* is one of the most modern and developed, in part because of its proximity to the seat of Puerto Rican government. The same could be said of Toa Baja. The San Juan, Cataño, and Toa Baja associations, combined, reported the highest landings on the entire north coast.

I.f. Tourism and Fishing in Puerto Rico

Tourism accounts for between five and ten percent of Puerto Rico's GDP, with an estimated 60,000 to 65,000 employees catering to nearly 4,000,000 tourists annually. Tourists spend around 2.5 billion dollars each year in Puerto Rico. It is unknown what percentage of those tourists visit the islands specifically for its fishery resources—either to enjoy the seafood that Puerto Rican fishers provide or to experience fishing as sport or recreational fishers themselves, chartering fishing boats or participating in tournaments. Official accounts of Puerto Rican tourism, however, note that direct tourist expenditures tell only part of the story of tourism's impact on the economy:

> "The current [2003] 5.5% share of the GDP suggests that tourism activity has a relatively small impact on general economic activity. However, its importance is much greater, in terms of employment and income multipliers, than what this figure would suggest. Nonresident as well as resident expenditures in tourism provide links, directly and indirectly, to such economic activities as transportation, communications, trade, service, restaurants, entertainment, and many others" (Government Development Bank 2003: 20)

In addition, historical data suggest that tourism is a growth sector, with direct tourism expenditures up from 1.9 billion dollars in 1996 to over 2.5 billion dollars today. Its annual growth rate has averaged 1.6% (Government Development Bank 2003: 20). In anticipation of this growth, from 2003 to 2005, hotels around Puerto Rico added 1,646 new rooms at a cost of approximately 1.2 billion dollars.

In many parts of this work, we describe ways in which fishers across Puerto Rico have taken advantage of tourism. Tourism is one of Puerto Rico's most important industries: annually, between 3,000,000 and 4,000,000 tourists visit the islands from the U.S. mainland and elsewhere, but internal tourism is important (though less well tracked) as well (Garcia-Moliner, et al 2002). Most notably, tourism benefits Puerto Rican commercial fishers through seafood restaurants and other retail outlets. However, all tourist traffic in Puerto Rico is not alike, and much of the tourism in Puerto Rico is extremely detrimental to fishing and marine resources, creating problems with crowding on the water, destroying mangrove forests, privatizing coast lines, and leading to problems of access to marine resources. Given the legal mandates described in the opening paragraphs of this report, it is incumbent upon fishery managers to delineate among different types of tourist development, recognizing which are helpful to fishing communities and which infringe upon fish stocks, habitats, and fishing ways of life.

I.f.1. Seafood restaurants as a link between the fisheries of Puerto Rico and the tourist sector

Enjoying seafood is one of the most valuable parts of visiting Puerto Rico's coast and central to the tourist experience. It is also one of the most important ways in which commercial fishing is dynamically linked to the tourist sector, a point perhaps most eloquently expressed in the comment, heard again and again among commercial fishers across the island, "We defend ourselves with fresh fish." That seafood is important to Puerto Rican tourism is clear from promotional materials about the island as well as from observations, particularly on weekends, of the seafood restaurants across the island. One of Puerto Rico's major tourist magazines, *Places to Go*, reads, for example:

> "No visit to eastern Puerto Rico is complete without a stop at the rustic kiosks on Route 3 in front of Luquillo Beach. Here you can sample the entire gamut of Puerto Rican cooking, from such Creole snacks as cod fritters (*bacalaítos)* or sweet plantain wrapped around seasoned meat *(piononos)* to complete fish dinners…"

We view seafood restaurants as so critical to the fisheries of Puerto Rico that we include them in the index of dependence we created to compare fishing communities across Puerto Rico in terms of dependence and engagement. All major coastal waterfronts have seafood restaurants, and our dependency index adds to a community's dependence score for possessing one or more of the following four types:

1. The enclosed, air-conditioned, and usually fairly fancy and expensive places in permanent structures of concrete or wood.
2. The open-air, smaller places, generally run with family members, that have a handful of tables, a bar, and are usually built of wood. These places usually have menu items as well as items, such as seafood empanadillas and pieces of fish, that are kept warm in glass boxes fitted with lightbulbs.
3. Kiosks, or small stationary stands that usually specialize in a few food items.
4. The ambulatory or mobile places that line the roads or are set up at the beaches on weekends, some specializing in such things as *pinchos de tiburón y marlin* (Shark and Marlin Shishkababs).

As important as seafood sales are to the fisheries of Puerto Rico, they become more important when considered in light of the family basis of Puerto Rican commercial fishing. When *Villas Pesqueras* add seafood restaurants to their facilities, it not only signals their reaching out to the local community and to visitors in a way that can add value to their catch and create increased dependence of the community on fresh fish and fishing: adding a seafood restaurant is usually a step toward more direct involvement of non-fishing family members of fishers in fishing operations. Generally, wives and children of fishers manage and work in these restaurants, sharing the same space with fishers, listening to and taking part in their conversations, and in the process becoming more familiar with all the issues facing fishing in Puerto Rico. This deepens the commitment of family to the fishery while expanding the ties to the resident and visiting community, and at the same time reinforces the idea of fishing as a moral enterprise, a moral economy whose commerce brings family and community together to provide high quality protein in a pleasing, seaside environment.

Equally important, incorporating seafood wholesale, retail, and restaurant sales into fishing enterprises is the principal way in which fishers can add value to their products. In several places across the island, we have documented the success that fishers have had with their seafood markets and restaurants, particularly in high tourist areas such as La Guancha, Ponce, where literally thousands of tourists visit every weekend. However, fishing families need not invest in elaborate restaurant facilities as some have, but can further process their seafood by making seafood pastries for sale from roadside stands, kiosks, or other less elaborate venues.

I.f.2. Puerto Rico's Recreational Fisheries

Detailed information on the recreational fishing sector of Puerto Rico, like information on recreational fishing across the United States, has a much shallower history than information collected on commercial fisheries. Early observers of fishing in Puerto Rico, such as Norman Jarvis, mentioned the existence of recreational fishing, but systematic data collection has been conducted only for the past few years, since Puerto Rico was added to the Marine Recreational Fishing Statistics Survey (MRFSS) in 1999. In the late 1980s, however, the National Marine Fisheries Service sponsored comprehensive research on the recreational fisheries of the U.S. Caribbean territories, funding studies that surveyed recreational fishers

and inventoried recreational fishing infrastructure in Puerto Rico and the U.S. Virgin Islands (Griffith, et al. 1988; Valdés Pizzini, et al. 1988).

Based on these data bases, as well as our current research, there is no doubt that recreational fishing constitutes an important social, economic, and cultural activity in Puerto Rico's coastal areas. We include this discussion of recreational fishing in Puerto Rico in our general discussion of the links between fishing and tourism because it constitutes an important leisure activity that attracts, annually, around 30,000 fishers from outside Puerto Rico and occupies the leisure time of around five times that many local anglers. Marinas and Club Nauticos around Puerto Rico host between 20 and 25 fishing tournaments annually, up from under 15 only a decade and a half ago, attracting hundreds of anglers from across the island and from abroad (Clark, Ditton, and Chaparro 1994). Tournaments tend to be important tourist attractions as well as fishing competitions, often including supplemental excursions for golfing, boating, sightseeing, or other common tourist activities. Our information here draws primarily on the ethnographic work and focuses on the general contours of recreational fishing for coastal Puerto Rico as a whole. In the following chapter we offer some information on the history of recreational fishing and later, in Chapter V, we present more detailed data on recreational fishers from a survey of Puerto Rican fishers.

I.f.2.a. Recreational Fishing Effort in Puerto Rico

According to the MRFSS, sport or recreational[6] fishers in Puerto Rico outnumber commercial fishers by over 100 to one, yet they land around the same number of pounds as the commercial catch (see table I.4). Their level of effort is far lower than commercial fishers, each recreational fisher taking, on average, around 7 to 8 trips per year, or less than one per month. Their presence may seem greater, however, in that recreational fishing and recreational boating share the same spaces—marinas and Club Nauticos—and recreational boating is among the coast's most visible activities. In addition, the DRNA registers all recreational vessels in Puerto Rico, but our information suggests that relatively few of these are used for recreational fishing. Nevertheless, the number and rates of increase in recreational vessels in Puerto Rico suggests that recreational activities directed toward the sea—boating, diving, fishing, etc.—are increasing as well. From 1995 to 1996, for example, recreational vessels increased from 35,931 to 44040, or an increase of 8,118 vessels (>20%).

Yet only a small percentage of recreational boaters are also recreational fishers. Interviews at marinas and Club Nauticos revealed that generally less than 10% of people who use marinas and Club Nauticos around the island engage in recreational fishing on a regular basis. In some cases this was considerably less: the operations manager at Puerto Del Rey, one of the largest marinas on the east coast, estimated that, at the most, 50 of the 1,200 boaters who use their marina fished recreationally, or less than 5%. In their study of recreational boaters who trailer their vessels, Appeldoorn and Valdés Pizzini (1996) found that 41 (13%) of the 312 boaters they intercepted reported fishing recreationally.

[6] The line between recreational and sport fishing is not well-defined, but the term recreational refers to fishers who fish primarily as a leisure or casual activity, catching a little food as well, while sport fishers tend to target game (hard-fighting) fish, participate in tournaments, and often belong to associations or clubs that advocate on behalf of sport fishers. Whether Puerto Rican fishers make similar distinctions is a question we cannot answer here, but the term *pescador deportiva* (sport fisher) is more common in Puerto Rico than the term *pescador recreativa* (recreational fisher).

Nevertheless, the linkages that exist between recreational boating and recreational fishing that occur at marinas and Club Nauticos, particularly in the context of tournaments (discussed in more detail below), create the sense that recreational fishing is an upper class activity and that, further, the culture of recreational fishing is substantially distinct from that commercial fishing. While this is clearly not the case with casual, shore-based fishers, marinas and Club Nauticos are the spaces of the wealthy, generally gated and guarded, where services and slip fees tend to be high-priced. At the Club Nautico de Oeste, too, golfing and tennis facilities supplement the marina, and their offices are air conditioned, with state-of-the-art communications, computing, and other equipment. The Club Nautico de San Juan has similar administrative offices, as do the other marinas we visited.

Commercial fishers, by contrast, usually work out of working waterfronts that are cluttered with gear, engine parts, and other signs of economic activity. Commercial fishers, too, often affiliate themselves with the working class in Puerto Rico (Griffith and Valdés Pizzini 2002). Further, they often object to marina development as a source of contamination and as a force in raising slip fees and reducing coastal access. These attitudes and differences make it difficult for alliances to develop between recreational and commercial fishers, though both groups tend to favor the conservation of marine resources and the two groups share many of the same attitudes toward regulatory personnel.

Despite the fact that recreational boaters outnumber recreational fishers, the numbers of recreational fishers are large. The Marine Recreational Fishing Statistical Survey reported over 200,000 (combining local and visiting fishers) in 2003 and 167,000 in 2004, who together landed between 2.2 million and 3.8 million pounds of fish (see table I.4). These figures represent substantial increases over the past decade and a half. In 1989, for example, Schmied estimated that there were only 81,000 resident recreational fishers in Puerto Rico, fishing from around 23,000 vessels (CFMC 2002). Recreational fishers tend to land between two and three million pounds annually, taking primarily food fish from the grouper-snapper complex as well as dolphinfishes, tuna, and other pelagic species. Near shore, they also land shellfish. Shore fishing is most active during August, June, and October and least during active in January and March. In its recent assessment, the Caribbean Fishery Management Council estimated that, in 2000 and 2001, recreational fishers landed between 125,000 and 150,000 pounds per year of spiny lobster and around the same number of pounds of queen conch (CFMC 2002: 220). Dolphinfish and tuna dominate the catch outside of Puerto Rican waters, in the EEZ.

Table I.4. Puerto Rican Recreational Fishing Statistics, 2003 and 2004

Variable	2003	2004
Number of Puerto Rican Fishers	185,000	141,000
Number of fishers from outside Puerto Rico	35,000	26,000
Pounds Harvested	3,768,000	2,214,000
Number Harvested	1,527,000	887,000
Number Released	150,000	249,000
Number of trips	1,111,000	1,055,000

Source: Marine Recreational Fishing Statistics Survey, 2004

Recreational fishing effort has not increased steadily over time, however, but varies from year to year. In 2001, an estimated over a quarter of a million recreational fishers fished in Puerto Rican and surrounding waters, nearly 90% of whom were resident fishers. These fishers landed fewer pounds than in 2003, however, only 2.8 million pounds as opposed to nearly 3.8 million in 2003. During these years, the recreational finfish catch was only slightly more than 40% of the commercial catch in the islands. Today

(at least in terms of official numbers) they are more in line with one another, which is due principally to recent declines in commercial landings.

In addition to fluctuating through time, recreational fishing effort is unevenly distributed across the islands of Puerto Rico, although recreational fishers commonly use public, *Villa Pesquera*, and other infrastructure, as well as natural shore sites, to fish recreationally. During our ethnographic work, we also found that recreational fishers commonly used shipping infrastructure formerly used by the sugar industry to fish. Again, however, not all bridges, piers, or other such locations attract fishers. Bridges over river mouths along the north and west coasts, in Arecibo, Dorado, Carolina, and Mayagüez, for example, regularly attract recreational fishers, but similar bridges along the east coast do not; instead east coast fishers tend to fish from public piers, as those in Punta Santiago, Ceiba, and the Downtown harbor of Fajardo.

Fishers we interviewed during the ethnographic phase of our study ranged from families fishing casually during a weekend picnic to fathers and sons fishing together to fishers who regularly participate in tournaments. A handful of fishers we interviewed said that they fished primarily for relaxation or therapy, caring little about whether or not they actually caught fish and throwing back much of what they catch. Two brief profiles follow:

Recreational fisher # 1:

One of the recreational fishers we interviewed, José, we intercepted at the Club Náutico of San Juan. He is a scuba diver first and a rod & reel fisher second, but when asked what species he caught most they seemed mostly rod & reel fish: sierra, marlin, shark… He is a young man, perhaps in his early thirties, single, and he maintains recreational vessels for a living—hence his presence at the marina, where he was working.

He said that he lives for fishing, and his work schedule and proximity to the water at the marina allows him to fish more often than most recreational fishers, ten to fifteen days every month, mostly directly off the north coast. He hasn't had any problems with the MPAs, in that he never fished in areas that are currently closed, and he doesn't fish for those species that are prohibited or for which there are seasonal closures.

He owns a small vessel, a Boston Whaler with a 40 hp motor, which he purchased in San Juan. He maintains it himself. He also purchases baitfish from local commercial fishers. He wasn't aware of any new licensing system coming into effect for Puerto Rican recreational fishers.

One of the more interesting comments he made was that he believed that both the coral reefs and mangroves were recovering from earlier times, although the fish resources have yet to catch up to the improvement in the other marine resources. Mangroves were nearly completely decimated, he said, so they had nowhere to go but up, and growth in coral he has noted from his diving.

Recreational fisher # 2:

This man, middleaged, is married with two children, and primarily a sport fisherman, fishing for tarpon and barracuda for the joy of the catch. He works for the government, he said, but didn't say exactly in what capacity. He usually doesn't fish during the week, and in fact usually only fishes two to four days per month, but when we spoke with him he was on vacation.

Because he fishes mostly for sport, he releases much of what he catches. When he catches food fish he gives most of it to friends or neighbors; his family consumes some, but they aren't great fans of seafood.

He hasn't experienced problems with the MPAs, although he believes that overfishing has been occurring and that fishing resources, which are in poor shape, need to be protected. He sites nets and improved fishing technologies as the most important causes of declines in fishery resources. He did acknowledge the role of contamination (particularly industrial pollution) and construction in the destruction of habitat.

His reasons for not having any problems with MPAs are due to his lack of experience with them. He never fishes in the Laguna Condado or around Culebra, but fishes mostly along the shelf on the north coast, trolling for game fish.

Just as recreational fishers come from a variety of walks of life and fish for different motives, recreational fishing in Puerto Rico is not concentrated in any one region or represented by any one dominant type. In their late 1980s report, Griffith, et al. (1988: 19) reported high recreational activity in Fajardo, the San Juan/Carolina/Loíza area, Cabo Rojo, Lajas, and Ponce; they listed as medium areas Salinas, Humacao, and Arecibo; municipalities with low recreational fishing activity included all others. It should come as no surprise that the high and medium municipalities are also home to some of the largest and most elaborate marina facilities on the island, again attesting to the strong link between recreational boating and recreational fishing.

Because of the overwhelming importance of recreational boating at marinas and Club Nauticos, it is difficult to estimate the amount of employment recreational fishing generates in Puerto Rico. Clark, Ditton, and Chaparro (1994) report that tournament fishing provides around 200 part-time jobs in Puerto Rico annually. These are some of the only jobs, along with people who own and staff charter boats, discussed below, that can be attributed directly to recreational fishing. Normally, Club Nauticos and marinas provide full-time employment for only a handful of year-round workers, including harbormasters, security guards, marina managers, clerks, secretaries, and maintenance personnel. Marinas and Club Nauticos we visited typically operate with only between 4 and 6 full-time staff, supplementing their full time staff with a few part-time employees. Of course, the extent to which these individuals owe their jobs to recreational fishing, as opposed to recreational boating, is open to question. Clubs and marinas do, however, also provide settings for restaurants, bars, marine supply stores, dive shops, and so forth, whose business depends, in part, on recreational fishers.

I.f.2.b. Tournament Fishing in Puerto Rico

Central to sport fishing in Puerto Rico has been tournament fishing, particularly at prominent marinas and Club Nauticos. Table I.5 lists sportfishing tournaments held in 2005, showing that the majority target marlin. Of all recreational fishing activity, tournament fishing has been studied in some depth. Clark, Ditton, and Chapparo (1994), for example, conducted a survey of Puerto Rican billfish tournament fishers to estimate their real and potential economic contribution to the Puerto Rican economy. They estimated that billfish tournament fishing generated over $40,000,000 in economic value; however, $18,000,000 of this figure derived from their estimate of "consumer surplus," or the amount that tournament fishers reported they would have been willing to spend to participate in billfish tournament fishing.[7] The actual

[7] Consumer's surplus was calculated based on responses to the question, "If the price of goods and services were to increase so a billfish fishing trip cost $[Bid Value] more than usual, would you pay the higher price rather than stop

value, derived from expenditures, was $21,320,579 for non-resident tournament participants and $4,459,270 for resident participants, for a total of $25,779,849. As is obvious from these figures, non-resident tournament participants spend considerably more than resident participants in billfish tournaments, in part reflecting their status as tourists as well as participants. In addition to point of origin of tournament participants (resident vs. non-resident), Clark, Ditton, and Chapparo found that three other factors influenced the amount of expenditures per tournament: a) number of fishers; b) number of non-participants; and c) length of stay.

As noted earlier, many tournament organizers add tourist activities such as golf or sightseeing to tournament fishing, which may serve to increase both the number of non-participants and their length of stay. Some tournament organizers seem to have arranged their tournaments with this in mind more than others. For example, while the blue marlin tournament in La Parguera lasts only three days, focusing primarily on fishing, the billfish tournament sponsored by the Club Náutico of San Juan lasts eight days and includes two days of preliminary activities (a boat parade and commodore's party), one day off for golf, and four days of fishing. They advertise "Ladies activities for your significant Other!" and spice up the tournament with daily meals, cocktails, and other amenities (see www.sanjuaninternational.com).

From interviews at Club Náuticos and marinas, it is clear that tournament activity represents the height of recreational fishing annually at these locations. The marina manager at the Club Nautico of San Juan, which has around 400 members, reported that they take great pride in the fact that they sponsor the oldest blue marlin tournament in the world. Begun in 1953, posters on the walls of the club chronicle the history of the tournament. They surround a stairway that winds up from a statue of a blue marlin and passes one of the largest blue marlin ever caught—an approximately 480-pound stuffed fish mounted on the wall. In addition to the marlin tournament the club sponsors a dorado tournament. During the blue marlin tournament they practice catch and release, something that is necessary to get permits from NOAA and other agencies. Many who fish in these tournaments, however, believe this practice results in waste.

Despite the fact that the Club Nautico of San Juan sponsors only two tournaments, these occupy the heart of recreational fishing at the club. Every year, they have around 100 boats per tournament, with 4 persons per boat. The club provides most of the fishing boats and, as just noted, they offer a package of other activities.

The tournament has many sponsors, including influential local businesses such as local distilleries and news organizations, and is done in conjunction with the International Game Fish Association and the Billfish Foundation. It has an entrance fee of $500 for boat owners, $750 for a local angler, and $1,750 for an international visiting angler. It gives away upwards of $250,000 in prizes; last year the winning vessel took $48,000 of that.

Several things are notable about this tournament. First, it—like recreational fishing generally—is clearly a powerful male event. Second, it is expensive, especially because the $1,750 for the international angler (which would include U.S. citizens from the mainland) would have to have plane fare and hotels attached—a package of around another $1,500—for a total of over $3,000 for a little more than a week. This is clearly beyond the reach of most of the people of Puerto Rico and even most of the population of the United States.

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fishing for billfish?" Bid values were given in $75 increments over a range from $75 to $750. We believe that it is important to point out that, rather than a true accounting of value, consumer's surplus is a measure based on responses to a hypothetical situation, and thus should be viewed with caution.

The tournament also bills itself as a conservation event—a way of raising money for conservation causes: in this case, specifically, for the conservation programs of the International Game Fish Association and the Billfish Foundation. When questioned about whether or not the tournament personnel had problems with the *relgas*, those interviewed said that they had "Almost no problems," adding that they were careful to apply for all the permits they required and that they always received them. In addition, as mentioned above, they practice catch and release, which is "good," at least symbolically, in the eyes of regulators.

Table I.5. Tournament Fishing In Puerto Rico, 2005

Site/ Sponsor/ Location	Time of Year	Type of Tournament
1. Ponce Yacht Club	May	Multispecies
2. Club Nautico de Parguera	May	Blue Marlin
3. Arecibo Outboard Motor Club	June	Blue Marlin
4. Association Pesca Deportiva Dorado	June	Blue Marlin
5. Club Nautico de Vega Baja	July	Blue Marlin
6. Club Nautico de Arecibo	August	Blue Marlin
7. Cangrejos Yacht Club	August	Blue Marlin
8. Club Nautico de Rincón	August	Blue Marlin
9. Club Nautico de San Juan	August	Blue Marlin/ multispecies
10. Caribbean Game Fish Marina	September	Rodeo
11. Club Nautico de Boquerón	September	Blue Marlin
12. Marina Boquerón	September	Blue Marlin
13. Club Deportivo de Oeste	September	Blue Marlin
14. Club Nautico de Mayagüez	September	Blue Marlin
15. Arecibo Outboard Motor Club	October	Sailfish
16. Club Nautico de Arecibo	November	Blue Marlion
17. Congrejos Yacht Club	November	Sail fish
18. Congrejos Yacht Club	January	Dorado
19. Club Nautico de Arecibo	January	Dorado
20. Congrejos Yacht Club	April	Tarpon
21. Club Nautico de Boquerón	March	Dorado
22. Ponce Yacht & Fishing Club	March/ April	Light tackle
23. La Guancha, Ponce	April	Dorado
24. Club Nautico de Parguera	April	Dorado

Source: www.associaciondepescadeportiva.com and interviews with sport fishers in Boquerón.

Tournaments are also important recreational fishing events in the communities where they are held. In La Parguera, where the Club Náutico has been sponsoring tournaments for over three decades, tournament fishing attracts sponsors from predictable businesses, such as boat sale companies and marine supply stores, but also from local banks, kitchen supply companies, plumbers, insurance agencies, pharmacies, lawyers, grocers, restaurants, and others. In addition, well-known national and international companies also sponsor and buy ad space in the tournament booklet, which features records from past tournaments, scenes of winning crews, and a welcoming letter from the mayor of La Parguera.

The 2006 La Parguera tournament booklet is interesting for another reason as well: the tournament is dedicated to a major local tournament fisher, and two full pages in the 32-page booklet picture and

describe him. The description emphasizes his long history of recreational and tournament fishing, his active work as a force behind the Club Náutico's continued vitality, and, perhaps most importantly, his introducing young people to fishing as a way of steering them clear of negative influences such as drugs. We find this important in its attempt to establish tradition in recreational fishing by linking it to important local figures, to the passage of generations, and portraying it as a positive influence in Puerto Rican society. Anthropologists have long argued that the conscious invention of tradition is important in enhancing the cultural value and significance of sites, activities, events, and so forth.

Interviews with two full-time employees at the Club Nautico of Parguera again confirmed that, despite the tournament's importance, the club is primarily a recreational boating club. Of its 220 members, they estimated that only between 15 and 20 fish recreationally, although more than that may participate in tournaments. The two tournaments they organize, a dorado tournament in April and a marlin tournament in May, have become important to the club and the community. Smaller than the tournaments in San Juan, they are also less likely to attract international or non-resident fishers, generating less income for La Parguera. The dorado tournament attracts around 40 vessels, with 4 to 5 fishers per vessel, and the marlin tournament only 30 vessels. Last year's Blue Marlin tournament attracted only one non-resident fisher, from Santo Domingo, Dominican Republic.

By contrast, the Blue Marlin tournament at the Club Nautico de Oeste, which has 650 members, attracts slightly more participants than the San Juan tournament. The marina manager there reported that last year (2005) they had 104 vessels, with between 4 and 5 people per vessel. They supplement this large tournament, which occurs in September, with two smaller tournaments, one for wahoo and one for dorado, each of which attracts only around 25 vessels. In some years these are combined into a single tournament. Last year's blue marlin tournament attracted vessels from as far away as Africa, and was filmed by ESPN. The activities director of the club also arranges an annual golf tournament and, like San Juan, they supplement the tournament activities with golf and tennis.

While the principal species that recreational fishers target during tournaments is blue marlin and other billfish, the species most commonly landed is dolphinfish (Rodrigues-Ferrer, Rodrigues-Ferrer, and Lilyestrom, 2003). In the four years from 1999 to 2002, tournament landings of dolphinfish totaled 26,291.88 kg, while tournament landings of blue marlin totaled 16,590.36 over the same time period. Other important species were wahoo, king mackerel, and barracuda (Rodrigues-Ferrer, Rodrigues-Ferrer, and Lilyestrom, 2003: 616).

I.f.2.c. Sport Fishers' Attitudes toward Regulations

In terms of regulations, portrayals such as the one in the La Parguera tournament booklet help support or legitimate management decisions such as the 1988 Fishery Management Plan (FMP) for Atlantic Billfish, which closed billfishing to commercial fishing: "The FMP sought to prevent the development of a domestic commercial market for Atlantic billfish, other than swordfish, by including a 'no sale' provision. The result of the FMP was to reserve the entire fishery for recreational anglers *because of the tradition of use by recreational anglers*, their practice of releasing a large percentage of their catch, and the economic value of the recreational fishery" (Clark, Ditton, and Chaparro 1994: 48, emphasis added).

In general, sport fishers we interviewed reported few problems with MPAs, although the emphasis on tournament fishing among Club Members have led some to criticize state intervention in tournaments.

Specifically, as noted above, some fishers were critical of the catch-and-release program for blue marlin (the key tournament fish), considering it a foolish regulation on much the same grounds as commercial fishers view the prohibitions against keeping deep water species foolish: because it results in waste. After fighting billfish for sometimes many hours, the fish will usually die. Sometimes its sail or fins have been damaged beyond repair or it is beyond resuscitating, although some fishers reported that they routinely make attempts to resuscitate the fish by dragging them along the boat after successfully reeling them in. Nevertheless, often these measures are fruitless, many believe, summing it up in the statement that, after being caught, billfish in tournaments become *carnada de tiburones* (shark bait).

Other regulations are too recent to evaluate their impact. Although Puerto Rican recreational fishers over the age of 12 have had to have a license for some years, the DRNA began implementing a recreational fishing license for sale in July 2006, selling them directly from around 60 sites around the island as well as through Internet sales. They will sell them for $20.00/ year, $7.00/ week, and $3.00/ day. The latter may generate between $90,000 and $210,000 per year in revenues, assuming each of the 30,000 or so visiting recreational fishers (see table below) buys a temporary license. For locals, the licenses may generate around $3,260,000 for the state. DRNA officials hope that the license will serve primarily as a sampling tool, making the tracking of recreational fishing behavior a much simpler process (right now they make around 100 phone calls to find one recreational fisher).

I.f.3. Charter Boat Fishing in Puerto Rico

Another tourist-related, fishing-supported business in Puerto Rico is charter boat fishing, which has been slowly growing since the late 1980s. In the 1930s, Norman Jarvis lamented its underdevelopment (1932). In their report on recreational fishing in Puerto Rico, Griffith, et al. (1988) note that charter boat fishing was confined largely to the San Juan metropolitan area, with some limited charter boat fishing conducted from the western municipalities as well. Since that time, charter boat fishing has spread to several municipalities, although it still is relatively undeveloped compared to other tropical and temperate areas such as Florida, Texas, Georgia, and the Carolinas.

In their study of charter boat fishing in Puerto Rico and the U.S. Virgin Islands, Garcia-Moliner, et al (2002) documented 28 charter boats operated by 19 captains in Puerto Rico, with seven of the operations having more than one boat. During the peak summer season for charter boat fishing, additional boats operate in and around Puerto Rico and the U.S. Virgin Islands, although this seems to be most common in St. Thomas. Unfortunately for this study, most of the data about charters (e.g. average number of trips per vessel, lines fished, etc.) that Garcia-Moliner, et al (2002) include in their report does not differentiate between U.S. Virgin Island and Puerto Rican charters.

The charter boat industry is the economic sector where tourism and commercial fishing are most closely aligned. Most charter boat captains advertise in hotels and other tourist venues (both physical and virtual), using brochures and websites, and they also maintain links with recreational fishing and tourism through their participation in sportfishing tournaments (usually as captains) and through close personal connections with owners of marine supply stores. In Ponce, for example, the owner of one of the most popular marine supply stores routinely points tourists and residents to charter boat captains he knows, as well as carries packages of ballyhoo that are packaged specifically with charter boat captains in mind.

In some cases, charter boat captains come from commercial fishing families and the charter boat captains we interviewed all got along well with resident commercial fishers. Those we interviewed were all

Puerto Rican. The CFMC (2002) suggests that most charter boat captains from the mainland United States operate out of the U.S. Virgin Islands. Griffith, et al. (1988) also found this to be the case.

Charter boat captains we interviewed learned their craft from friends or relatives that were commercial fishers. Most said that they purchased bait from commercial fishers. Their principal problems with commercial fishers were with foreign long-lining fleets, who had cut into their business by taking pelagic species from Caribbean and nearby waters. One reported that, "In the late 70s to 80s an American guy went to the states to get five long-lining fishing vessels to come down [to Puerto Rico]. These vessels had over 35 miles of line and they stayed out for a week at a time. Each vessel would come in with enough fish to fill 15 refrigerated trailer vans to ship to the states. They were filling 75 vans per week."

Another commented to one of his clients, "Wahoo were everywhere out there but now it's hard to find," and the client said, "Well, let me give you a clue. I was at Aruba and I bought 50,000 pounds of Wahoo filet and I was only one buyer. There was a ship there loaded with nothing but Wahoo."

Yet another said, "The drop in yellowfin tuna is due to the fishing done by Japanese and Taiwanese during the 1980s. Today there is pressure from the *palangreros* (long-liners)."

We interviewed a total of 9 charter boat fishers across the island. We discuss them as a group here, as opposed to including them in the municipality studies, because they are so thinly distributed across the island that to discuss them in the municipality studies would be to identify them, violating confidentiality. Table I.4 presents the results of these interviews.

From this table, it is obvious that this industry targets primarily pelagic species and tend to seek their clients among people staying at the hotels and resorts, taking advantage of the busy winter tourist season. Most reported that their business during the summer months dropped to around half of what it is during the winter months. Summer is the principal time that resident Puerto Ricans tour the coasts, and all but one reported that very few of their clients are Puerto Ricans.

All of those we interviewed were licensed captains and most had their "Six-Pack for Hire" licenses as well, which enables them to use their vessels as water taxis. This is in line with their tendency to offer a range of services, including taking divers out to coral reefs or for night dives, taking tourists to phosphorescent bays, and offering recreational sunset cruises and other boat rides. In this sense, the charter boat industry overlaps with those commercial fishers (as in Fajardo) who use their vessels for similar purposes, as well as with the recreational boating industry.

Regarding fishery regulations, a few complained of the costs of licensing, one complained that the regulations on cast net sizes (from 12' to 8') made it harder to get bait, and others complained of what they perceived as the poor performance of the Department of Natural Resources, but others viewed the current regulations as important to preserving fish stocks. Most believe that there are problems with the fishery resources they target, citing primarily overfishing of key species, such as Marlin and Wahoo, for commercial sale outside of Puerto Rico. Others, however, pointed to water quality problems, sedimentation, lack of food fish close to the coast, and global warming.

The following table shows the characteristics of those charter boat fishers we interviewed. They share several characteristics with those included in the Garcia-Moliner, et al (2002) study, including the species they target, average numbers of trips per year, and seasonal factors.

Table I.6. Characteristics of Charter Boat Fishing in Puerto Rico (n=9)

Variable	Responses
Years of Experience	15 to 49 years (average = 24.75)
Busy Season	October or December to May (resort high season)
Fishing Territories	1. Southeast (off coasts of Yabucoa, Humacao) 2. 20 miles off west coast/ La Mona 3. North of Fajardo, Luquillo 4. *Bola de Fuche* (Culebra) 5. In shore Cabo Rojo 6. Desecheo/ Mona-Monito 7. South of South-Southwest coast (Ponce to Cabo Rojo)
Species targeted	1. *Dorado* (Dolphin—*Coryphaena hippurus*) 2. *Aguja azul* (Blue Marlin—*Makaira nigricans)* 3. *Peto* (Wahoo—*Acanthocybium solanderi*) 4. *Atún* (Yellowfin Tuna—*Thunnus albacares)* 5. *Sierra* (King Mackerel—*Scromberomorus cavalla)* 6. *Sábalo* (Tarpon-*Megalops atlantica)* 7. *Picua* (Barracuda—*Sphyraenidae)*
Trips Per Year	20 to 500/ year (average = 190/ year; 15-20/month)*
½ Day Cost **Full Day Cost**	$275 - $750 (average = $526) $400 - $1,500 (average = $960)
Home Location of Clientele, in order of importance	U.S. Mainland Europe South America Puerto Rico
Locations of Advertisements	Internet Travel and Port Magazine Compañia de Turismo *Que Pasa* (local tourist magazine) Resort Hotels Marine Supply Stores Flyers & Brochures

*High figures are those that charter with multiple boats

I.g. Methods

This work is based on a combination of ethnographic, survey, economic, and GIS mapping methodologies that were accomplished by a multidisciplinary team from December 2003 to July 2006. We discuss these methods here not only as background to the report, but also as guides to coastal managers as means to improve methods of communication with fishing populations. Team members visited the 41 coastal municipalities listed in table I.1. and I.3. as well as Quebradillas and Yauco (the two municipalities that do not report landings data), using several different data collection protocols at different phases of the research (see Appendix A). In general, initial site visits were oriented toward cultural mapping, taking photographs, and brief interviews and later site visits involved more in-depth interviewing and, in some cases, administering standardized surveys. Secondary source data were collected from Puerto Rican

libraries and bookstores, government agencies and websites, and university connections and collections, including the University of Puerto Rico Sea Grant College Program.

The survey work began later than the ethnographic work, in the spring of 2004, and lasted into the fall of 2005. The later start was due to a lengthy process of survey development, pretesting, obtaining OMB clearance, and developing a list of intercept sites. The survey instrument, shown in Appendix A, was developed by the research team in conjunction with NOAA Fisheries scientists and a separate research team conducing a parallel study in the U.S. Virgin Islands. We discuss the survey methodology in more detail in part VI, but here point out that it was based on two sampling methods: random sampling from the commercial fisher census and intercept sampling. The latter was necessary because recreational fishers are not listed in any directory that was available to us. Thus, we developed a list of intercept sites based on early ethnographic observations and lists of Club Nauticos.

I.g.1. Research Design and Approach to Fieldwork

The early phases of this project were designed to identify fishing communities and collect general data on the current state of Puerto Rican fishers and these communities. As in former studies of fishing communities, we moved from less structured to more structured methods as the project progressed, beginning with open-ended ethnographic work before narrowing our inquiry with the use of cultural mapping inventories, survey instruments, cognitive tests, and so forth. In addition to using the OMB-approved survey reproduced in Appendix A, which our field team helped to design, here we describe in somewhat more detail the methods employed to produce this work:

Cultural mapping. Oriented specifically toward identifying fishing communities, cultural mapping consists of structured observations similar to the marine infrastructure inventories we produced during the late 1980s (Griffith, et al. 1988; Valdés, et al. 1988). In those studies, we traveled along the coasts of Puerto Rico and the US Virgin Islands, noting the infrastructure (e.g. launching ramps, boat slips, etc.) that existed, how it was used, its condition, and other features on forms that assured we collect the same set of information at each location. Griffith performed similar work in North Carolina (1999) and, with Dyer, in New England (Griffith and Dyer 1996). In this study, working in municipalities, we noted the distribution of fishing associations (*Villas Pesqueras*), lockers, docking, and launching facilities, sportfishing clubs (*Clubs Nauticos*), marine suppliers, seafood markets, and so forth. Through brief interviews with 2 - 3 individuals at each site, we noted, for example, the numbers of fishers who use the site, the times of day the site is active, principal gear utilized and species caught, existence of markets and seafood restaurants, and so forth. The cultural mapping data served multiple purposes: in addition to enabling us to update our information about the distribution of fishing communities and their linkages to non-fishing sectors of Puerto Rican economy and society, this work was also useful for sampling purposes. Moving from place to place across Eastern Puerto Rico, the cultural mapping will assure that we conduct our open-ended interviews (discussed below) in several communities of the region. For the cultural mapping, we anticipate spending, on average, one day in each of the 26 municipalities; time will vary because some municipalities, such as Guayama, have several complex fisheries while some of the municipalities along the northern coast have relatively little fishing activity, in part due to a lack of sheltered shoreline.

Transect walks. These are walks with fishers through areas that possess special significance to fishers and their family members. They are designed to enhance interviews and point out linkages between various fisheries and other sectors of Puerto Rican society and economy as fishers explain their significance. For example, we had presidents of associations and seafood dealers “walk” us through

their freezers, a process which has led to descriptions of networks among fishers, seafood dealers, street vendors, and other marketing outlets. We performed these in conjunction with the cultural mapping phase of the research.

Open-ended interviewing. We conducted open-ended interviews with different stakeholders, initiating this phase of the project concurrently with the cultural mapping. The types of stakeholders interviewed are included in table I.7; the numbers of interviews varied by the internal complexity of the populations, with more interviews being conducted among those groups that are more complex. Some of the subject areas we were interested in during these interviews were:

- Seasons that the community members are most involved in fishing.
- Gear and species targeted.
- Approximate numbers of fishing households in the community.
- Distribution of fishing households across the municipality.
- Movement between fishing and non-fishing sectors of the economy among fishers.
- Common occupations (e.g. welding) or industry sectors (e.g. tourism) that fishers engage in, in addition to household-based fisheries.
- Linkages between fishers and suppliers of fishing equipment, ice, vessels, etc.
- Celebrations involving fishers (e.g. blessings of the fleet, sportfishing tournaments, etc.)

Table I.7. Work Accomplished by Municipality

Municipios	CulturalMapping/ Transect Walks	Stakeholder Interviews	Background Literature	Photos
Arecibo	Club Nautico, recreational fishing areas near harbor & river mouth Jarealito	Isabela association President	Toro Sugrañes	+
Hatillo	Observed/ Photos	Isabela president	Toro Sugrañes	+
Camuy	Observed/ Photos	Isabela president	Griffith & Valdés Toro Sugrañes	+
Quebradillas	Observed/ Photos	Isabela president	Toro Sugrañes	+
Isabela	Villa Pesquera Jobos	Villa President, local handywoman for Corporate group, restaurant owner & wife.	Griffith & Valdés Toro Sugrañes	+
Aguadilla	Crash Boat Barrio Higuey El Tamarindo	Crash Boat	Griffith & Valdés Toro Sugrañes	+
Aguada	Barrio Espinal Independent Association/ Guanquilla	Barrio Espinal/ pescaderia/ commercial fishers	Griffith & Valdés Toro Sugrañes	+
Rincon	Villa Pesquera Club Nautico Parcela Estela	Colmado owner; 6 fishers who sell in Aguada based here Pescador & CFMC member	Griffith & Valdés Toro Sugrañes	+
Añasco	**Tres Hermanos** La Puerte Barrio La Playa	Tres Hermanos. La Puente. DRNA person. Sister of Villa Administrator.	Toro Sugrañes	+
Mayagüez	Mayaguez front, small landing areas (Joyuda)/ Virgen del Carmen festivities El Dockey El Maní El Seco	El Dockey (administrator) El Maní . Local shell artisan. Fishery scientist.	Toro Sugrañes	+
Cabo Rojo	Puerto Real La Mela Otro Associacion (near casetas) Combate Boquerón	Puerto Real (5 pescadores), restaurant owner. Combate Villa Administrator Dive boat captain	Griffith & Valdés Valdés	+
Lajas	3 Associations Seafood dealers Papayo Parguera	Pescaderia, commercial fisher. Restaurant owner. Association fishers.	R. Brusi dissertation. Valdés Griffith & Valdés	+

Municipios	CulturalMapping/ Transect Walks	Stakeholder Interviews	Background Literature	Photos
Guánica	Guánica Assn. Jacinto/ Gulligans Playa Santa Ensenada	Restaurant owner, pescadors (3). Association fisher/ diver. Boat repairs.	Griffith & Valdés	+
Yauco*	n.a.	Peñuelas fisher	n.a.	n.a
Guayanilla	El Faro, Ensenada	Pescador, dealer Boat repairer, El Faro	R. Pérez dissertation.	+
Peñuelas	El Boquete/ Tallaboa	Pescador, Assn president, Yauco fisher	R. Pérez (2005)	+
Ponce	Punta Las Cucharas La Guancha La Playa	Pescador (P. Cucharas) Pescadores/ administrator (3) La Guancha Marine supply DRNA Recreational fisher.	Toro Sugrañes	+
Juana Díaz	Patillas	Pescadores Trap manufacturer Wife of fisher	Toro Sugrañes	+
Santa Isabel	Playa/ Malecon Club Nautico	Association members (2)	Toro Sugrañes	+
Salinas	Playa/ Playita Aguirre Las Mareas	Pescadores (4)	Toro Sugrañes	+
Guayama	Barrancas Pozuelo	Pescadores (4)	Toro Sugrañes	+
Arroyo	Arroyo Downtown (Marina & Association)	Pescadores (3)	Toro Sugrañes	-
Patillas	Patillas Bajo Guardarraya	Pescadores (2)	Toro Sugrañes	-
Maunabo	Punta Tuna	Recreational fishers (2) Fisher Association member	Toro Sugrañes	+
Yabucoa	La Puntita Lucia Shell Refinery Canal (recreational fishing site)	Focus group (2) with fishers from Yabucoa & Humacao	Toro Sugrañes	+
Humacao	Punta Santiago Palmas del Mar	Recreational fishers (2) Pescadores (3) Restaurant owner (1)	Toro Sugrañes	+
Naguabo	Húcares Playa Naguabo	Association Divers (2)	Toro Sugrañes	+
Ceiba	Los Machos	Focus group with 5 fishers 2 fishers	Toro Sugrañes	+
Vieques	Isabel Segundo Esperanza	Association presidents Pescadores DOA extension agents		+
Culebra	Fishing Association	Association officials	Iranzo	+

Municipios	CulturalMapping/ Transect Walks	Stakeholder Interviews	Background Literature	Photos
Fajardo	Maternillo Mansion del Sapo Sardinera Las Croabas/ Atlantic Caribe Marina Puerto Chico	Pescadores (8) Recreational fishers (2) Marina	Toro Sugrañes	+
Luquillo	Luquillo waterfront	Association official (1)	Giusti-Cordero Toro Sugrañes	+
Río Grande	Espiritu Santos Villa Pesquera	Association official (1)	Giusti-Cordero Toro Sugrañes	+
Loíza	Vieques	Association officials & pescadores (3)	Giusti-Cordero Toro Sugrañes	+
Carolina	Piñones		Giusti-Cordero Toro Sugrañes	-
San Juan	La Princesa La Hoare	Association officials (2)	Toro Sugrañes	+
Cataño	Centro Agropequario	Association officials (2)	Toro Sugrañes	+
Toa Baja	Villa Pesquera Arroyo Boat yard	Boat yard employee	Toro Sugrañes	+
Dorado	Downtown recreational fishing Rio de la Pla Villa Pesquera Recreational Tournament site Mameyal	5 recreational fishers Association officials/ members (3)	Toro Sugrañes	+
Manatí	Observed		Toro Sugrañes	-
Vega Baja	Villa Pesquera Club Nautico	Association members (2)	Toro Sugrañes	+
Vega Alta	Cerro Gordo Marine Supply Store	Association members (2)	Toro Sugrañes	+
Barceloneta	Palmas Las Altas La Boca	Recreational fishers (2)	Toro Sugrañes	+
Overall Region		DRNA (Mayaguez lab) Unemployed/ displaced factory workers	Census/ reports, Landings data. Nonplace-based community literature. 6 websites NMFS Rec. Fish Inventory. Artisanal Boat-making study.	
Totals	**93 locations**	**135 (+/-) Ethnographic Interviews**	**20-30 sources****	**>300**

*Yauco has very little coastline, which is why many of these fields are not applicable.
**estimate of sources that deal with Puerto Rico directly.

Other methods we utilized included group interviews/ focus groups, the use of visual cues (e.g. maps, photos), collection of background data from local repositories, and the recruitment and training of local research assistants.

I.h. Organization and Content of this Report

As noted earlier, this report has three parts: 1) this introductory section, which includes: (a) an executive summary; (b) introduction; (c) a brief history of Puerto Rican fishing; (d) the cultural significance of fishing; (e) our understanding of Puerto Rican fishing communities and their relation to the notions of dependence and engagement; (f) a presentation and analysis of the survey data; (g) a chapter on the performance of MPAs; and h) a policy discussion that addresses impacts of regulations on Puerto Rican fishing communities and the relationships between Puerto Rican fishers and coral reefs; 2) the regional profiles, which describe fishing centers and communities, present capsule histories (for which we are particularly indebted to Toro Sugrañes's 1995 Historia de Los Pueblos de Puerto Rico), profile fishing practices and concerns, and discuss current problems and opportunities facing fishers in each region; and 3) the appendices and references.

In the regional profiles, we have attempted to standardize the information with the presentation of landings, census, fishing census data, and information from the ethnographic interviews, but the narratives in each municipality occasionally wander off in new directions. This is due, primarily, to the fact that fishers often guided the investigators toward some areas of investigation to the exclusion of others, reflecting salient issues in those municipalities at the time the fieldwork was performed. Yet it is also due to the interests of the principal investigators and their research assistants who, despite being provided data collection instruments, were given the freedom normally granted ethnographic researchers and, as such, focused on some issues but gave scant or no attention to others. An additional source of variation comes from the attempt to alter the narrative structure slightly, experimenting with different styles of presentation in order to keep the reading as interesting as possible.

HISTORICAL OVERVIEW OF PUERTO RICAN FISHING

II.a. Fishing, Smuggling, and Caribbean Coastal Adaptations

Puerto Rico endures and enjoys a relationship with the rest of the United States that has incorporated Puerto Ricans into U.S. society and economy unevenly. Following the Spanish-American War, during which the United States invaded Puerto Rico and acquired its territory from Spain, Puerto Rico became an ethnographic curiosity in the United States while continuing to serve as a strategic location in the sea lanes of the New World and as a source of tropical agricultural products and relatively inexpensive labor (Duany 2002; Buitrago Ortíz 1973; Picó 1986). Yet U.S. interest in Puerto Rico and other Spanish territories in the Caribbean predate the Spanish American War by nearly a century. According to Picó, both Thomas Jefferson (president from 1801-1809) and James Monroe (president from 1817-1825) expressed an interest in acquiring Puerto Rico early in the 19th century, and in 1852 the United States expressed an interest in purchasing the Dominican Republic's Samaná Bay, across the Mona Passage from Puerto Rico's western shore (1986: 223).

U.S. interest in Puerto Rico and the Greater Antilles ultimately stems from their proximity to the Continental United States and, as just noted, their strategic positions for the military and for international shipping. "The sea," Griffith and Valdés Pizzini wrote, "has always been more valuable to the Puerto Rican economy as a link to the rest of the world. Fishing is of small significance compared to defense, shipping, tourism, and other commercial and strategic uses of surrounding waters." (2002: 40). Despite this, fishing has been a part of Puerto Rico's coastal landscape for as long as humans have occupied its islands, usually deeply intertwined with other economic pursuits.

Early Arawak and Taino peoples used coastal and marine resources to round out their diets and produce ceremonial and utilitarian objects. Archaeological investigations in Ponce in 1975, after Hurricane Eloise unearthed several antiquities, determined that pre-Columbian peoples inhabiting Puerto Rico's southern coast possessed advanced astronomical knowledge, indicating a sophisticated seagoing tradition combined with an advanced calendar, the former critical to long-distance fishing and the latter to a developed agricultural system (Vidal Armstrong 1986). Archaeological and ethnohistorical accounts describe complex Arawak and Taino cropping systems both contemporaneous with early European settlement and predating that settlement by two millennia. At the same time, marine resources, including fish and crustaceans of the sea and mangroves, provided critical protein to supplement diets otherwise rich in maize and a variety of fruits, root crops, and vegetables. Of the Taino, Picó (1986: 24) writes: *"No hay duda alguna de que los sembrados de yucca y de maíz podían alimentar grandes poblaciones, pero sabemos también que podían cazar roedores, reptiles y pájaros que, junto con la pesca, proveían el complemento necesario de proteínas para su dieta"* ("Without a doubt, from yucca and maize fields they could feed large populations, but we know as well that they could hunt rodents, reptiles, and birds that, together with fishing, provided the necessary complement of proteins for their diet"—authors' translation, emphasis added).

Picó also suggests that, among the Taino, fishing, like hunting, was primarily a male activity. If so, it was probably highly valued, given that most male activities among most people prior to the 20th century were more highly valued, socially, than tasks performed by women. More importantly, in the absence of large game animals in the Caribbean, as in insular societies generally, sources of protein have been particularly prized, reducing the physiological stress associated with protein deficiency.

Price (1966) reports that slave fishers in the Caribbean were given freedoms not accorded other slaves for similar reasons: fisher slaves provided high quality protein to their owners' and overseers' households. Such freedom allowed them to participate in the underground economy, where they engaged in contraband trade, assisted fugitive slaves, and spread information from plantation to plantation along the coast, including information about slave rebellions (Cecelski 2000). Nearly all histories of coastal Puerto Rico point out that smuggling has always played a role in Caribbean coastal economies. This shouldn't surprise us, as the coastlines of many insular societies are also international or territorial boundaries, where contraband trade flourishes.

Such activities were responsible for lingering views of coastal communities as sites of lawlessness and danger, views that were enhanced by Puerto Rican historians' tendencies to contrast the coastal lowlands with the mountainous interior: one the site of plantation agriculture, slavery, smuggling, the miasmas of mangroves, and associated with people of African descent; the other home to hardworking *jíbaros* who descended from Spanish colonial stock to produce for the subsistence security of their families (Duany 2002).[8] These distinctions continue to influence local perceptions of coastal peoples when they feel threatened by forces larger than themselves. In Loíza, for example, long portrayed as one of the most African of coastal municipalities in Puerto Rico, during a dispute involving the destruction of wetlands by a large resort compex, one local fisher said, *"Nos quieren sacar de la pesca porque somos negros y pobres!"* ("They want to force us out of fishing because we are black and poor!").

Portrayals of Puerto Rico's coastline as locations of danger and lawlessness dramatize and misrepresent lifestyles that are in reality complex and as much oriented toward feeding their families and securing a decent living as are the proverbial *jíbaros* of the highlands. Guitsi's dissertation on the history of Loíza points out that historians, anthropologists, and others writing about Puerto Rican history often portray "dead time" in sugar cane production—the season between harvests—as a time of poverty and relative idleness (1994). Yet it was during this period every year that fishing, along with several other economic pursuits, rose to the surface of coastal economic activities. Combined with making charcoal in the mangrove forests, hunting, gathering, and peasant farming, fishing enabled families to survive the season that sugar workers routinely referred to as *la bruja*—the witch. Fishing's status as one of multiple livelihoods mirrored the complexity within the fisheries themselves—of gear, species, fishing territories, catch sharing and marketing arrangements, patterns of consumption, and, perhaps most importantly, the extent to which households and communities inserted themselves into fishing lifestyles, appropriating the symbols and festivals surrounding fishing as their cultural heritage (Valdés Pizzini 1987).

Norman Jarvis, in his 1932 overview of Puerto Rico's fisheries, lists sixty species of "principal varieties of Puerto Rican food fish" harvested by five primary gears: fish pots, trolling lines, hand and trawl lines, gill nets, and haul seines. Even while capturing large numbers of species with a variety of gears, Puerto Rican fishers still engaged in alternative pursuits. Jarvis reports that:

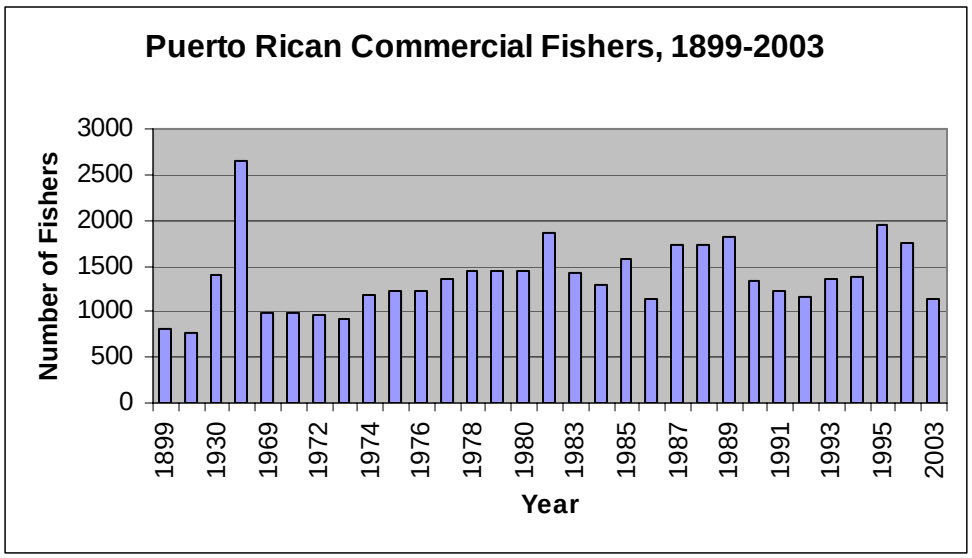
> "The great majority of fishermen in Puerto Rico depend on plantation work, employment in the sugar centrals, or stevedoring at the docks and landings as much or more than they do on fishing. Fishing is followed as a sole occupation only where other work can not be obtained or the demand for fish is fairly extensive. Regular fishermen are found in considerable numbers only at Culebra Island, Las Cabezas (near Fajardo), Puerto Real, Cataño, Palo Seco, Guanica, Aguadilla,

[8] *Jíbaros* are rural working people that have been reified in Puerto Rican cultural history as the hard-working, self-sufficient peasants of the highlands; a statue honoring the *jíbaro* stands next to the principal interstate connecting Ponce and San Juan.

Vieques Island, Mayagüez, and Guayama. The majority of the regular fishermen in the San Juan district are blacks from the British West Indies or the Virgin Isles. There are numbers of men who state that they fish all year, but in several instances the writer has found that this was done in the intervals between loading ships, or to supplement other irregular employment" (1932: 14).

Jarvis claims to have interviewed 80% of the island's 1,403 fishermen in 34 coastal communities. Graph II.1 suggests that this number would prove to be relatively stable over time. In the communities Jarvis studies, comparing his observations to scant few previous accounts, he came to believe that fishing practices hadn't changed significantly since the U.S. occupation of 1898. Operating under this assumption, despite his own reservations about the quality of previous data on the fisheries, Jarvis devoted much of his report to recommending methods of either modernizing fishing and fish handling practices or making more efficient use of marine resources. He lamented that few crustaceans besides land crabs and lobsters were used, and he was particularly critical of fish handling.

Figure II.1. Numbers of Puerto Rican Commercial Fishers*



Source: Cummings and Matos-Caraballo (2003): Table 1

At the time of his survey in 1931, Puerto Rican fishers used sail and rowboats primarily, although the occasional motorboat caught his attention as well, which he said were "not especially adapted for fishing, but they can cover a greater fishing area and are not affected by the weather to the same extent as other craft in use" (1932:5). Half of the catch, he reports, was taken with fish pots, 30% with hooks and lines, and the remainder with haul seines (*chinchorros,* or beach seines), gill and other nets, forks (harpoons), and fish weirs (ibid.). He gave three reasons for the popularity of fish pots:

"1. The fish can not easily be robbed from the traps by predatory fish.
2. It can be used without bait, or if bait is used the amount required is much less than that needed for hand-line and trawl-line fishing.
3. Pots require less attention than other types of gear" (1932:6-7).

Jarvis praised many of the fishing vessels he observed and much of the gear, deeming them "well constructed" and in line with what he had observed in other parts of the Caribbean. He focused the bulk

of his criticism on fish handling practices, commenting that repeated sales of rotten or stale fish undermined consumer confidence in seafood and served to limit demand. This, in turn, limited fishing. Eight of his twelve final recommendations involved improving fish handling methods. His descriptions of fish markets and fish vendors in San Juan were particularly scathing, referring to the fish market displays as unappetizing and the market stalls themselves as in poor condition. The markets in Ponce and Mayagüez fare little better, and the interior he believed to be poorly supplied by itinerant peddlers riding horses and mules. Jarvis placed a high value on ice and refrigeration, praising its use whenever he came upon it and condemning fish handling practices in its absence.

Some of the cooling facilities and practices he encountered were associated with imported fish. In the 1930s, imported fish was treated with more care than fresh local catch, which may have been due to the privileging of North American products. Though Fajardo, Mayagüez, and Puerto Real fishers used ice regularly, neither Culebra nor Vieques fishers had access to ice (unless landing fish in Fajardo) and across much of the main island ice was too expensive for fishers to use. As a result, Jarvis argued, Puerto Ricans considered the consumption of local fish risky, with a high probability of food poisoning. Evidently much of the island's population agreed. Based on official statistics (which doubtlessly underreported consumption of local fish), imported cured, canned, and frozen fish were consumed at a per capita rate of about six times that of locally caught fish, though total per capita fish consumption still fell short of that found in the U.S. Virgin Islands, a fact Jarvis attributes to fish poisoning episodes. His explanation is one of mutually negative reinforcement:

> "Blame for the consumption of fish in such condition that it is liable to cause food poisoning must be apportioned among fisherman, dealer, and consumer. The fisherman will not clean his fish or give it a proper handling in the boats. The dealer does not maintain a sanitary establishment or pay attention to the keeping fish in good condition. His is often unwilling to throw out fish known to be stale and will sell such products, if possible, without regard to the effect it may have on future sales. The customer refuses to accept gutted fish, believing that this is a method of concealing inferiority. Another popular concept held by the consumer is that ice is used for the same reason, to hold fish already stale from further decomposition" (Jarvis 1932: 25).

Jarvis's attention to fish handling practices included conducting his own fish curing experiments. He salted, dried, and smoked hogfish, capitán, barracuda, red snapper, king mackerel, and other species. Although his cured products were of as high a quality as cured imports, he was uncertain about the extent to which his methods would catch on and persist. If today's preservation methods are any indication, Jarvis's observations regarding cooling and ice were more acceptable to local fishers than his experiments with curing: across the island, at nearly every Villa Pesquera and private seafood dealer, freezers have become a more than a mere tool of preservation, occupying a critical position in relations among fishers and fish dealers as well (Valdés Pizzini 1985).

Towards the end of his report, Jarvis raised the subjects of freshwater fishing and sportfishing. While he saw little hope of developing many inland fisheries, he viewed sportfishing as an untapped opportunity, suggesting an early association between the developing tourist trade and the island's marine resources. Particularly troubling to him was the contrast between the rich sportfishing resources in the waters between Fajardo and the two outer islands of Vieques and Culebra, and the relative lack of "comfortable accommodations" in the east (1932: 38). As such, the little sportfishing there was, was based in San Juan, and that remained poorly developed—little more, he noted, "than a line in an advertising folder" (1932: 37). With little optimism, he opens his conclusion with the following negative statement:

> "It is believed that there has been little if any development of the fishing industry of Puerto Rico during the past 30 years. While considerable progress has been made in fish handling in the last 30 years elsewhere, conditions in Puerto Rico are essentially those prevalent before the introduction of ice or refrigeration; that is, local methods are 100 years behind the times" (1932:38).

Other historical accounts of fishing aren't nearly so negative. In his detailed examination of the Piñones region of Loíza, on the north coast, Guitsi (1994) describes fishing and other coastal livelihoods to challenge the idea that rural sugar cane workers were wholly dependent upon, and shaped by, sugar production.[9] Combined with the high seasonal fluctuations of work in the cane, the proximity of many sugar plantations to coastal and marine environments such as mangrove forests, river mouths, lagoons, and near shore substrates made possible the development of fishing, cottage manufacturing, and gathering activities tied to the sea. His work is important because he focuses on the 1920 to 1950 period of peak sugar production, when presumably the working class culture formed around the industry was absorbing and transforming other coastal plain livelihoods. Yet the seasonal and sporadic nature of work in the cane, tapering off in mid-summer and by September and October falling to two to three days per week for only a select portion of the work force, forced most sugar cane workers and their families to seek alternative incomes, many peasant in nature, for periods of up to six months (July through December): "The Puerto Rico Minimum Wage Board (1942) estimated that the sugar centrals; demand for labor declined as much as 60% during *tiempo muerto* (dead time). During the last weeks of the *zafra* (harvest), after both *primavera* (spring or early) and *gran cultura* (full-grown) cane had been cut, the work shaded off into *tiempo muerto* as laborers worked only 2-3 days per week" (1996: 764).

The seasonal, peasant-like dead time activities that Guitsi describes include charcoal production, small-scale animal husbandry, the gathering of *jueyes* (land crabs) and oysters, and fishing. Though census figures do not report large numbers of fishers, Guitsi argues that fishing was neveretheless important:

> "The census collector's identification of a 'primary' occupation also created important difficulties: for instance, an absense, or near-absence of certain vital categories from the 1910, 1920, and 1936 census; in particular, "fishermen". Only 3 fishermen were identified in any of the three census years, in 1936. This reflects the fact that few *piñoneros* lived primarily from fishing, but at the same time obfuscates the important point that fishing (and *jueyes*) were a major form of subsistence; indeed, fish were often sold to passing merchants. This is a striking absence, in a locale with important fishing and marine-gathering resources. The seasonal character of fishing is similarly obscured" (1994: 772).

Perhaps the lack of fishermen showing up in the census was partly responsible for stalling state investment in Puerto Rican fishing. Despite the fact that among Jarvis's 1932 recommendations to improve fishing vessels, gear, and fish buying and distribution (all prescriptions for investment in fisheries), the insular and federal governments did not invest in fishing in a concerted way until several years later, and then usually in conjunction with other state-funded projects, such as building the military bases in Vieques and Ceiba.

Pérez's dissertation on the fisheries of Guayanilla, on Puerto Rico's south coast, includes an important and critical overview of state investment in fisheries. These initially came in the form of critical

[9] Griffith and Valdés Pizzini (2002) note that it is difficult to consider fishing historically without reference to sugar production. Sugar took up much of the coastal plain from early colonial days to the mid-20th century, and sugar production was carried on by not only large plantations but also small, household, peasant operations.

descriptions of the islands' fisheries, such as Jarvis's, but eventually led to stock assessments, the collection of landings data, licensing, and a census of fishers—all oriented toward more sophisticated surveillance methods to track fishing activity and marine resource health. Pérez refers to this as a "knowledge apparatus that involved the creation of several public agencies to deal with the fisheries' problems and the approval of various laws to regulate fishing practices" (2003: 77). He lists twelve agencies that developed between 1934 and 1990 to play a role in the islands' fisheries:

Table II.1. Programs, Agencies, and Government Levels Associated with Puerto Rican Fisheries Development, by Year

Agency or Program	Government Level	Year Founded
1. Division of Fish & Wildlife	Puerto Rico Department of Agriculture and Commerce	1934
2. Laboratory for Fisheries Research	U.S. Department of Interior	1941
3. Agricultural Company	Puerto Rico Department of Agriculture and Commerce	1945
4. Fishermen's Credit Agency	Puerto Rico Department of Agriculture and Commerce	1958
5. Program of Minimum Facilities in Fishing Village	Puerto Rico Department of Agriculture and Commerce	1963
6. Commerical Fisheries and Development Act	U.S. Department of Commerce	1966
7. Agency for Community Action	Puerto Rico Department of Agriculture	Early 1970s
8. Caribbean Fishery Management Council	U.S. Department of Commerce	1976
9. CODREMAR*	Puerto Rico Department of Natural and Environmental Resources	1979
10. Puerto Rico Sea Grant Program	U.S. Department of Commerce	1989
11. Program for Fisheries Promotion, Development, and Administration	Puerto Rico Department of Agriculture	1990

*Source: Pérez, 2003, pp. 64-65 and 2005: 54 (slightly adapted).*Corporation for the Development & Administration of Marine, Lacustrine, and Fluvial Resources of Puerto Rico/ Corporación para el Desarrollo y Administración de los Recursos Marinos, Lacustreas y Fluviales de Puerto Rico*

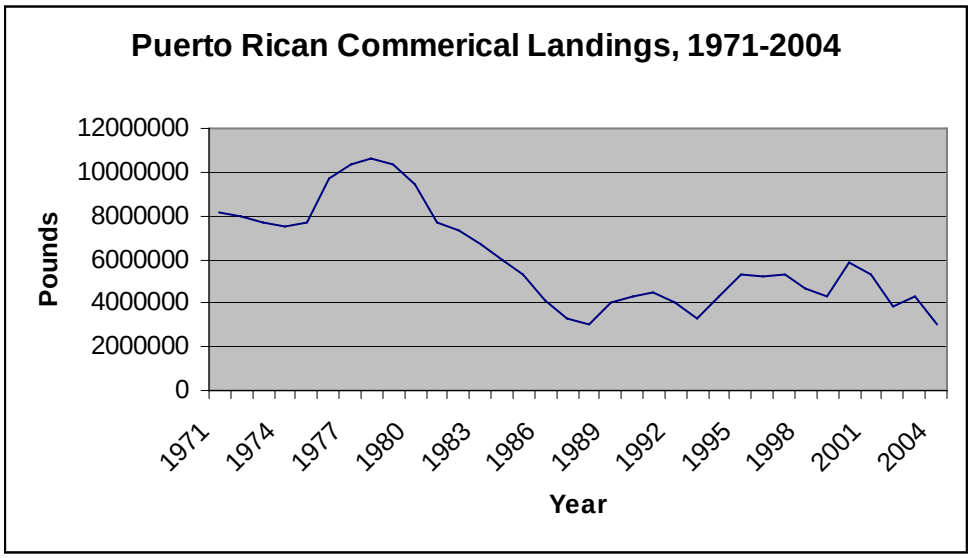
At least two dimensions of fisheries development are obvious from this table: first is the multiplicity of agencies, from federal and local governments, that have become involved in Puerto Rican fisheries; second is the continuing presence of the Department of Agriculture in the fisheries, creating an association between fishing and farming in Puerto Rico. Pérez argues that from the beginning of government involvement with fisheries, fisheries development was inextricably bound to agriculture, agrarian reform, and rural poverty. Yet fisheries development thus always played second fiddle to agricultural development. Fishers across the island today continue to lament the dominating force of agriculture in the research and funding agendas of the Department, arguing on the one hand that funds routinely get channeled away from fishing to agriculture but that, on the other, the same arguments that apply to agriculture in terms of subsidies and other forms of compensation for lost income, to compensate for imports, etc., do not apply to fisheries. In Naguabo, for example, fishers complained that when regulations cut into farming incomes, farmers are often compensated, but when regulations result in income losses to fishers, compensation rarely occurs.

After failed attempts to establish large scale, highly capitalized Puerto Rican fishing fleets during the years immediately following World War II, fisheries development, in the 1950s and 1960s, adopted the

path whose legacy is most apparent today: investment in the infrastructure that became *Villas Pesqueras*. "From 1958 to 1964," Pérez writes, "the Fishermen's Credit Agency distributed more than 900 loans worth over $500,000, a decent amount of money that provided motors to approximately 65% of the fishing boats registered in the island. In the fiscal year 1975-76, it approved some 249 loans at a value of more than $402,568" (2003: 89). Other funds were used to buy large (51-foot), technologically sophisticated vessels for some fishers. Again, however, the most far-reaching investment was in fishing centers: "By the 1970s, the three programs [Fishermen's Credit, the Agency for Community Action, and Minimum Facilities in Fishing Villages] helped the Puerto Rican government to construct the basic infrastructure in thirty-two fishing communities across the island and to disburse approximately $2,000,000 among the small-scale fishermen" (Pérez 2003: 89).

Despite these investments, fishing continues to be an occupation in Puerto Rico that is largely artisanal and must be, in most fishing households, supplemented by alternative sources of income. Graph II.2 shows that catches have declined since the late 1970s, fluctuating between 3,000,000 and 6,000,000 pounds per year during most of the past twenty years. The central theme of Griffith and Valdés Pizzini's work on Puerto Rican fishing, reflected in their title, Fishers at Work, Workers at Sea (2002) was that movement between fishing and wage work more common among Puerto Rican fishers than specializing in fishing as a full-time occupation. This does not mean that there are no full-time fishers in Puerto Rico, nor that fishing in Puerto Rico is secondary to other occupations or, equally important, secondary to other sources of identity. On the contrary, many fishers fish full-time for much of their lives and consider fishing the primary source of their identity even when they spend part of their productive years involved in other pursuits. Often, the income from these other pursuits is used to subsidize fishing.

Figure II.2. Puerto Rican Commercial Landings, 1971-2004*



Source: Adapted from Matos-Caraballo (2005)

Work in other sectors of the Puerto Rican economy may account for the relative stability of official numbers of commercial fishers over time, as seen in Graph II.1. The movement into and out of fishing may result in only active fishers being counted in any one year, although during workshops held with commercial fishers in June 2006, fishers nearly unanimously questioned official statistics, suggesting they were an undercount. In any case, if the number of fishers has remained relatively stable over time, those

who participate in commercial fishing are landing fewer and fewer fish (see Graph II.2), a factor that might discourage entry into the fishery and encourage those who remain to continue seeking occasional employment outside fishing.

The vast majority of Puerto Rican fishers have other occupational experience. Surveying fishers in the mid-1980s, Guittierez-Sanchez, et al. (1985) found that over 90% of fishers had had jobs outside of fishing at some time during their lives, and our survey work this past year found that between 40 and 45% of commercial fishers listed other occupations that supplemented fishing incomes. Most worked in the construction and repair industries, as carpenters, welders, mechanics, and the like, but the list of other jobs included over 60 different occupations ranging from professional work to manual labor. Fishers who participated in the June 2006 workshops also confirmed that most Puerto Rican fishers supplement fishing with wage work, a phenomenon that may increase during periods of rising expenses (e.g. increasing fuel costs beginning shortly after the second war with Iraq).

Thus far, this discussion applies principally to the islands' commercial fishing fleets, long considered small-scale or artisanal in nature. Yet they are not alone in their reliance on marine resources in Puerto Rico. Two additional parts of the development trajectory of Puerto Rican fisheries have been: 1) development and eventual decline of large-scale tuna processing in Mayagüez; and 2) the continued growth of marine recreational and subsistence fishing and Clubes Nauticos around the island. We mention them briefly here because the former once was an important part of the history of Western Puerto Rico and the latter is becoming an increasingly important part of profiles of fishing communities.

II.b. Tuna Processing in Mayagüez, Puerto Rico

The tuna canneries did not engage local fisheries as much as they provided processing facilities for U.S. tuna fishing fleets that roamed the high seas. Canning tuna for such household name brands as Bumble Bee and Star Kist, from 1962 to the end of the 20th century, they provided employment to thousands in the area, many of them in the neighborhood known as El Maní, on the north edge of the Mayagüez metropolitan area, also the site of a *Villa Pesquera*. At one time, for example, Star Kist provided employment for 5,000 people. With the changes in 936 tax laws and the development of processing centers with access to cheaper labor outside of the United States, principally in Mexico, Puerto Rico lost its competitive edge. They began phasing back operations in the 1990s, dropping employment levels by over half and finally closing the plants permanently.

Even when the canneries were employing large numbers of people, jobs were often insufficient to meet household expense needs. According to an ex-tuna worker, even after working for Star Kist for over 30 years, he still purchased a taxi to supplement his tuna plant income. Still working at the plant in 2000, making $5.90 per hour, he began feeling more and more certain that his job would be lost, sending him into unemployment and the ranks of those performing *chiripas* (odd jobs), working in construction, scavenging aluminum and other recyclable materials, and so forth. He mentioned that El Maní, with layoffs in tuna combined with similar downturns in the textile industry, had become a neighborhood where unemployment was high and where people mixed these activities with collecting welfare payments, drug dealing, and other methods of surviving.

II.c. Recreational, Sport, and Charter Boat Fishing in Puerto Rico

Section II.f. above described the contemporary recreational fishery in Puerto Rico, including its links to tourism and the growing importance of charter boat fishing. Here we place this in as much historical perspective as possible, keeping in mind that information on the history of Puerto Rican fishing has not received the same amount of attention as commercial fishing. This is partially due to the paucity of research funding for recreational fisheries until the late 1970s.

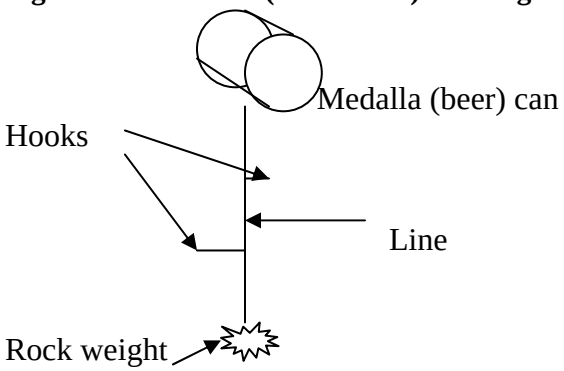
Historically, recreational fishing has occupied an interesting, intermediate kind of position in Puerto Rican fishing. On the one hand, many Puerto Rican recreational fishers interviewed over the years have stated that their principal motive for fishing has been to provide food for their families; on the other, many of the locations and activities of recreational fishing are the same locations and activities of the rich. Thus recreational fishing has long been intertwined with subsistence fishing, associated with the hungry and poor in Puerto Rico, as well as with the sailing, yachting, boating, marina crowds whose high levels of conspicuous consumption have been prominently displayed in ports throughout the Caribbean for many years.

This history of recreational fishing in Puerto Rico, however, has been poorly documented. Jarvis, we noted above, lamented the lack of a well developed charter boat industry, but seems to have paid little attention to casual recreational or subsistence fishing activities. In addition, as just noted, the National Marine Fisheries Service paid little attention to saltwater recreational fishing until the 1970s, in Puerto Rico and elsewhere. Yet in the late 1980s, NMFS funded two related studies on recreational fishing in Puerto Rico and the U.S. Virgin Islands: a survey of recreational fishers and an inventory of recreational fishing infrastructure (Griffith, et al. 1988; Valdes Pizzini, et al. 1988).

These studies found great regional variation in recreational fishing across the islands of Puerto Rico, with some areas (e.g. Fajardo) possessing virtually all kinds of recreational fishing services and types of recreational fishers (professional/ charter, boat, shore, fishing club members and non-members, etc.), others with medium levels of recreational fishing development (e.g. Salinas), and still others possessing few recreational sites and attracting few recreational fishers (e.g. Camuy). Other important findings were that marine recreational fishing facilities in Puerto Rico were inadequate to meet the demand for recreational fishing, that small-scale commercial fishers assisted 40% of recreational fishers (usually through bait sales), and that the charter boat industry outside of San Juan was poorly developed. In some cases, informal charter services had emerged, technically illegal, to meet the demand, but these generally operated irregularly.

The studies also found that a large proportion, around 45%, consume 100% of the fish they catch, while slightly more than a quarter of recreational fishers sell some of their catch and that the proportion of fishers who consume 100% of their catch decreases with age. This suggests that recreational fishing in the 1980s was an important source of income, both as a food for the family and as a source of cash through fish sales. It also suggests that as recreational fishers age, they are more likely to explore different methods of disposing of their catch: selling it and giving it away as well as consuming it themselves. The studies also found that the most popular fish pursued among recreational fishers were meat fish (e.g. snapper, grouper) rather than sport fish (e.g. tarpon, marlin), adding some weight to the connection between subsistence fishing and recreational fishing. That 71.6% fished with handlines (among other gear) also suggests that many recreational fishing used low-level technologies that required little financial investment. Such gear are still in use today, as the following illustration, seen in Barceloneta in the summer of 2005, shows:

Figure II.3. Medalla (Local Beer) Can Rig Used by Fisher at La Boca, Barceloneta



As with other studies of recreational and sport fishing, these studies found differences between club and non-club members in terms of their fishing activities and other characteristics. Members of *Clubes Nauticos* (about one-third of those surveyed) were more likely, for example, to participate in tournament fishing. We also know from other sources that club members are often involved in political disputes over access to marine resources, as in the case chronicled in Griffith and Valdés Pizzini (2002), when a recreational fishing club in Vega Baja becomes involved in a dispute over a ramp.

II.d. Recent History and Continuing Links between Fishing and Other Occupations

Since the decline of the sugar industry in Puerto Rico, fishing has undergone changes vis-à-vis its relationship to other sectors of the economy and has witnessed, as well, internal changes such as changing fishing styles, gear varieties, and so forth. Despite state investment in fishing, few fishers in Puerto Rico use fishing as their sole source of income throughout their lives. Building from the findings of Guitirrez, et al (1985) that over 90% of fishers have worked in other occupations at some point in their lives, Griffith and Valdés Pizzini examined the movement between fishing and other kinds of work in their recent work (2002). Their work shows that most fishers, through the course of their lives, supplement fishing incomes with work in other sectors of the Puerto Rican and mainland U.S. economies, including sugar cane production, migrating to the U.S. mainland for agricultural work, working in Puerto Rico's 936 companies or factories on the U.S. mainland, or taking part-time, seasonal jobs in construction and public works. At the same time, they are careful to point out that fishing is an area of the economy and of their lives that they return to again and again, finding it both a source of income and identity and a kind of therapy.

This is in line with Guitsi's work in Loíza mentioned earlier, where fishing was part of a complex of coastal occupations that became most important during dead time in the sugar industry. Since the demise of the sugar industry, beginning around the mid-20th century, the range of occupational alternatives facing Puerto Rican fishers has changed and has, we argue, contributed to changing fishing styles and gear types. One of the principal occupational alternatives that emerged during the last days of sugar was migrant agricultural work on the U.S. mainland, principally in the Northeastern United States. As early as 1946, a labor contracting organization, Glassboro Services, was founded specifically to recruit and place Puerto Rican labor in agriculture in New Jersey and other states in the Northeast (Griffith and Kissam, et al. 1995). Joining forces with the Puerto Rican Department of Labor, over the next twenty years Glassboro

and other labor contractors managed to recruit and place thousands of Puerto Rican workers throughout U.S. agriculture; by 1970, however, the numbers began to decline, from 18,884 in 1970 to around 2,500 twenty years later.

Fishers were part of this migration. Fishers interviewed in the Griffith and Valdés Pizzini study told of life histories that first combined sugar with fishing, later combined migration to the U.S. mainland for agricultural work with fishing, and still later, as manufacturing, construction, and public works spending increased in Puerto Rico, combined work in these sectors with fishing. During the latter part of the 20th century, as these broader economic changes were taking place, shifts in gear use were taking place within fisheries. Specifically, traps were becoming increasingly less and less common of a gear type, although it is difficult to link this specifically to broader economic changes. Declines in trap fishing have been due to a variety of sources, including problems with losing traps due to weather or other factors, having traps stolen, the time and monetary costs of trap construction as opposed to other gear, and problems with storing traps while leaving fishing to work in the wage labor sector. These last two problems with trap fishing may account for their declines in tandem with increasing migration to the U.S. mainland and with increasing participation in wage labor generally. That is, compared to other gear, the start-up time with trap fishing is longer than that of other gear, as traps often need to be constructed or cleaned prior to use and need to be stored during idle periods.

As traps have declined, two other gear varieties have risen in importance: nets (especially gill and trammel nets), and diving with SCUBA gear (Matos 1997; Valdés Pizzini, et al. 1992). Although cast nets and beach seines have been important since Puerto Rico was a Spanish colony, and perhaps even prehistorically (see Valdés 1987), gill and trammel nets did not become popular until after World War II. Prior to this time their use was irregular and often the source of user conflicts, in part because they were typically used in river mouths and near-shore environments, where crowding led to their interfering with hook-and-line rigs and other gear (Valdés Pizzini, et al. 1992). As the fishing fleet became motorized after the war, and more fishing territories were accessible, crowding became less of a problem and stationary nets increased. From 1930 to 1970, the number of nets in Puerto Rico doubled, but from 1970 to 1990, the number tripled, with government sources counting record highs of 708 gill nets and 507 trammel nets in 1990 (ibid.). Later that decade, Matos counted 1,385 gill nets and 861 trammel nets, showing yet more dramatic increases in the first five to six years of the 1990s. They remain important gear today.

Among the most noticeable changes that has taken place in the past two decades, however, has been the increase in the use of SCUBA equipment, a development that has been a source of particular dismay among trap fishers and that has contributed to the continuing decline of trap fishing. Matos found that, between 1988 and 1995-96, SCUBA divers increased from under 20% of commercial fishers to over one-third, or 36%, essentially doubling their numbers. While many fishers specialize in diving, it has become more common for fishers to sift diving equipment into their other gear varieties, in line with the mulitgear character of Puerto Rican fishing in general (Griffith and Valdés Pizzini 2002). It is possible, for example, to dive while soaking other gear such as nets, and diving allows more targeted catch as well as the catch of highly desired species—lobster and conch in particular.

CULTURAL SIGNIFICANCE OF FISHING IN PUERTO RICO

III.a. Identity and the Festivity of the Virgen del Carmen, Patron Saint of Fishers

Pfizer is one of the largest pharmaceutical companies in the world and the producer of the popular drug Viagra, the bread and butter of their plant in Barceloneta, on Puerto Rico's north coast. It is also the only pharmaceutical company in the top hundred spenders in advertisement for the Hispanic market in the United States. Despite its great run in Puerto Rico, Pfizer will leave the island soon, looking for a more profitable venue. Yet even now, on the eve of their departure, the company continues to pour television ads underscoring Pfizer's role in the health of the Puerto Ricans, highlighting the quality of life in the island. One of their ads begins with the archetypical image of the islands' fishers: two men with naked chests carrying a pole heavy with fish against the background of a beautiful sunset. They are not alone. The number of ads using a fisher or fishers as an essential leitmotif is countless. Medalla, the local light beer (whose cans are often used by hand line fishers in their rigs—see figure II.3), is one of the companies that appropriates the image of the fishermen to incorporate them into the visual lure of the good life, life in the context of nature.

The reasons for this are unknown, but we speculate that fishers are among the last users of the environment, those humans still making a living in full contact with nature. In the eyes of many people living in postindustrial societies, that is both virtuous and desirable. Despite government efforts to relocate them, a good number of fishermen (and their communities) still inhabit the marginal areas of the mangrove forests, close to the water and the cays used for their subsistence. That aspect of the poor life of the fishers was desired by the upper classes that started to move to the coastal areas or bought second homes in that area. La Parguera is a text book case of how fishers were removed from the water only to find their former space illegally occupied by upper and middle class individuals (Llanes 2000), eager to live the lives of fishers, in close contact with the sea.

After the demise of the sugar cane industry and the collapse of many local crops, the number of people with an employment linked to the earth and the environment dwindled. However, agriculture left a sour taste in the mouth of the Puerto Rican workers who found themselves bitterly exploited in the sugar cane industry (see Steward et al 1950, Giusti 1994) or quickly abandoning the poor working conditions of the coffee plantations. In fact, as we write this report, volunteers are urged to help in the harvest of coffee beans, since there is scarcity of workers, some of which were recruited in the past from the Dominican Republic (see Pascual Morán and Figueroa 2000). Fishers thus remain as a class of workers whose days are spent in contact with nature, jointly working and deriving pleasure through the notion of fishing and the sea as therapy (see Griffith and Valdés Pizzini 2002). Fishers are also among the few people without bosses, living the life that they want, and, apparently, the life that other people want. Some fishers we interviewed were in fact recreational fishers posing as the real thing. We suspect that a number of people we interviewed over the last 15 years were in fact recreational fishers, dressed as commercial fishers and occupying the space of the former: *Villas Pesqueras*, their lockers, their social clubs, their seafood markets and restaurants, their piers.

In Ponce's La Guancha, for example, most of the fishing association members are part-time fishers providing a range of services to the heavy recreational fishing, boating, sunbathing, and tourist traffic that visit its facilities every weekend. Fishers here have partially domesticated a school of *sabalo* (tarpon) that tourists can feed with fish that the association members provide. A second association in Ponce, La Playa, is also composed of a mix of full-time and part-time fishers, and they have memorialized the

fishing tradition with elaborate mosaic steps leading into the bay. Written in colorful tile, flanked by larger memorials of the Virgen del Carmen and tiled vessels made of concrete, these steps outline the history of La Playa, emphasizing its ties to the sea, and portray the faces and names of fishers from the community.

Through such activities and memorials, fishers have been a vehicle for the revival and revision of old traditions and festivities in the coastal zone. In the late seventies, a local real estate broker decided to develop the Fish Festival in the municipality of Puerto Real, Cabo Rojo. Together with local entrepreneurs and local people committed to the betterment of their community, they "created" the *Festival del Pescao* (Seafood Festival) as a major festivity during Lent, prior to the Holy Week. This is the period of the year when Puerto Ricans consume great quantities of fish to adhere to the long-standing Catholic tradition of fasting and the prohibitions of eating meat. Although the religious character of this tradition is no longer of primary importance, the custom of buying and eating fish remains a powerful force driving the market.

In Cabo Rojo, the original idea was to congregate a large number of people from the region and the island in a major festivity using as an attraction the best Puerto Rican artists and a myriad of craftsmen and kiosks with food and fish.[10] Fishers worked very hard to bring the rarest species including a plethora of sharks and rays to show to the visitors. The assemblage of dead sea fauna was the main attraction, as large crowds surrounded the large tables with the sea critters. Everyone asked the presenter, a member of one of the key fisher families, to state the name of the animal, to open its mouth, and show it again and again. At the end of the day, the creatures went back to the large freezer of the biggest fish-house that was one of the sponsors of the event.

With improved roads, travel from San Juan to Cabo Rojo had been reduced to two and a half hours. Local entrepreneurs believed that the festival could attract more visitors as well as potential buyers in an increasing second home market. The Festival del Pescao grew into a well-oiled machine and a very successful activity drawing thousands of people every year, disrupting the quiet life of the community for a full weekend in the month of March. Business for the sponsors boomed, and the number of people from the San Juan Metropolitan Area buying properties also increased. In 1986, Cabo Rojo's main realtor became realtor of the year for Puerto Rico, an amazing feat for anyone living in a coastal municipality 80 miles from San Juan. The festival fever swept through the region and the island, as other communities started their own festivals devoted to land crabs, or *jueyes* (*Cardisoma guanhumi*); *chirpe* (*Mercenaria mercenaria*); blue crabs, or *cocolías*; and mangrove oysters (*Crassostrea rhizophorae*), as was the case of Boquerón, also in Cabo Rojo, and home to the most important real-estate broker.

It was in the early 1980's when the coastal communities started to show the early signs of change in the configuration of the settlements, as middle and upper class families started to move in or buy houses from the local people to fix them as second or vacation homes. Condominiums also started to appear in a landscape painted with salt flats, salt works, abandoned cane fields, pastures with a handful of cattle, dilapidated houses, and poor *parcelas* (Valdés Pizzini et al 2006). Gentrification was indeed about to become a pervasive social and economic process in the coastal landscape of Puerto Rico (Valdés Pizzini 2001).

Coastal communities were rapidly changing, and the old way of life based on fishing, maritime occupations, and coastal activities was fading away. However, coastal communities remained active in

[10] Interview with Luis Acosta Doitteau, Cabo Rojo, 1983.

underscoring their own importance and fueling, revitalizing, and revising their traditions. Some of these traditions had a linkage with the long history of the community of maritime laborers in which fishing had an important role. During fieldwork for the fishing community profiles, our team members had the opportunity of attending the celebration of the Virgen del Carmen (Virgin of Mt. Carmelo), which is on the second Sunday of July. This is a traditional celebration of fishing communities, as this particular Virgin is the patron saint of fishers. It derives from the fishing and maritime tradition of Spain, and it was brought to the New World, incorporated into the local practices, and stimulated by the representatives of the Catholic Church. Marian cults devoted to the Virgin Mary have been popular in the Mediterranean for hundreds of years (Wallace 1963). The cults of the Virgen del Carmen, St. Peter, also a fishers' saint, and St. Telmo, patron saint of sailors and mariners, have been an essential component of maritime communities throughout that region.

A recent manifestation of the festivity in the community of Palamós in Catalonia, Spain, reveals some key aspects of the cult (Grassot and Martí 2001).[11] The commemoration of the Virgen del Carmen, the Mother of God, is an old tradition that was disseminated in the Mediterranean in the XIV century, after the arrival of the Carmelite order. It is called the Mother of God because the image is carrying the infant Jesus. In the 18th century the festival became an essential component of maritime communities, and was well entrenched in the local culture at the time that the Gremio de la Gente de Mar (the Seamen' Guild) was established by Phillip II. The Guild was the organization that structured maritime occupations and also gave rights to those workers to fish in the water using their vessels. The Guild provided the Spanish Navy with a substantial amount of technical support throughout the myriad of maritime occupations, without having to recruit and pay those involved in this collaboration. In exchange, they could fish freely in Spanish waters. Members of the Guild and the brotherhoods of fishers (in Catalonia they were called *confrarías*[12] followed the cult of the Virgen del Carmen as part of their religious belief of having a saint protect them from the perils and risks of facing the open sea.

The celebration has a secular and a religious component. The religious component is characterized by a mass followed by a procession that carries the image of the Virgin through the streets of the town and into the fishermen's area; afterwards, the statue is taken in the largest boat in a procession in the nearby waters. In the past the image was carried in a large fishing boat with sails, most likely a sloop used to trawl the net called the *bos*. Today, the image is carried in a large traditional sailboat instead of a working vessel devoted to the use of longlines, traps, or nets. The local priest leads the procession, along with members of the *confraría* and their families. The bearers of the image and the followers belonging to religious organizations and groups are dressed in the uniforms of their organization. Often the bearers are dressed as sailors in the Navy. During the dictatorship of Francisco Franco, the fascist leader encouraged these festivities, insisting that the participation of the military become a crucial component. This wasn't difficult: since the XVIII century, the celebration of the Virgen del Carmen has been associated with the Spanish Navy and the Gremio de la Gente de Mar.

The secular portion consists of music, dance, and songs after the procession, or in some cases through the days prior to the procession. In the case of Palamós, the fishers and their *confraría* occupy the center of the event—its protagonists. In fact, by opening the event to the public, the people at large participate in commemorating the working space of fishing. During the procession, fishers allow a large number of people to come to the building of the "*confraría*," walk in the esplanade and the landing area, and ride in

[11] Our Catalonian colleagues Joan Lluís Allegret and Miquel Martí were kind enough to provide the information discussed here about the commemoration of La Verge del Carme de Palamós.
[12] *Confrarias* or *cofradías* became the equivalent of fishermen cooperatives and associations in the Mediterranean.

their boats during the procession. Grassot and Martí (2001) cite a number of sources and descriptions of the activity in previous years that, jointly with the wealth of photographs, give the reader an idea of the magnitude of this event. The depictions emphasize the "extraordinary phenomenon" of the procession in the bay, marked with an "unchallenged beauty and elegance." The gallant and beautiful dresses of the people, the flowers used in the procession, the flags and ribbons, and the movement and rhythm of the vessels—all mark the movement and atmosphere of festivity. It is a day in which the space of labor is transformed into a space of feast (2001:25). The multitude, the crowded vessels in the bay, and the almost haphazard and hasty manner in which the procession moves out into the sea gives the observer the impression of a buzzing activity, filled with life, faith, and enthusiasm (2001:26).

Palamós is an important harbor and landing center in the Costa Brava of the Mediterranean Sea. Costa Brava is also an important tourist area, experiencing the common demographic trend of increased population in the coastal zone. Catalonia has a vibrant fishing sector employing more than 6,000 people. Although in the past fishers were considered a marginal group, they are not anymore due to their identity as an occupational group who work in constant contact with nature, and have a unique way of life, as heir of a tradition kept alive after many generations (Allegret and Martí 2001:20). All fishers are not devoted to that activity on a full-time basis, since most depend on other agricultural and service work to maintain a decent living. Catalonian fisheries, similar to our conceptualization of the Puerto Rican fisheries (see Griffith and Valdés Pizzini 2002), serve as a "labor refuge in times of crisis" (Allegret and Martí 2001:20). For Allegret and Martí, Catalonian fishermen are an essential component of the identity of that country, and carriers of important traditions. Fishing techniques, *confrarias*, festivities, and the language are part of that legacy. As in Puerto Rico, a relatively small number of workers are still fishers, and fishing remains a minority occupation in one of Spain's most advanced economies. [13] In some communities, fishing constitutes but a fraction of the economic activity. But in all coastal communities, the festivity of *La Verge del Carme* is the way in which fishers highlight the importance of their way of life and underscore the fact that they belong to a community of people with an identity of their own (Grassot and Martí 2001:18). In that sense, Grassot and Martí argue, the procession becomes a symbolic trajectory through "the village" and the festivity a collective endeavor, in which their own space of labor becomes a space filled with joy. The calendar marks an important date for the fishers, as well as for the rest of the community (2001:18).

In Puerto Rico, the festival was associated with brotherhoods and those related to maritime occupations since the XVIII century. Mulattoes were in charge of the festivity of the Virgen del Carmen, and it is possible that by 1796, the date when the new regulations of the Guild came into effect, the festival was well integrated into the liturgical calendar of this particular group. Unfortunately, little is known about the incorporation of the liturgical cycle of commemorations and festivities and the process of labor in Puerto Rico. However, Fernando Picó in his book Libertad y Servidumbre (1979), on the structure of agricultural labor in the highlands in the nineteenth century, reveals the well oiled machine of the Catholic Church and the many ways in which the liturgical calendar was synchronized with the production cycle in forests and small farms. Picó matches the key dates in the liturgical calendar with the cycle of coffee production and the subsistence plots. The cycle is thus divided into the Christological and the Saints. The former covers the period from Christmas (December) to Corpus Christi (June), while the latter starts with John the Baptist (June 23), who is the patron saint of the island of San Juan, the original name of the island of Puerto Rico. The difficult times of the heavy rains and the hurricanes are covered by the adoration of the saints and the festivities of the Marian cults. Some of the manifestations of the

[13] We are considering Spain as a country formed by other countries and "autonomous governments," such as Catalonia.

Virgin Mary that are the focus of these festivities are Carmen, Asunción, Monserrate, and Rosario (Picó 1979:135). Natural events, diseases, floods, and loss of income and savings characterize the period. In the coastal areas, it is also the times of hurricanes and floods in the wetlands, and the end of the sugar cane harvest, with the advent of "*la bruja*" ("the witch") or "death period" on the plantations. In Picó's view, the saints and the Virgin accompanied rural folk into the months of despair, filled with uncertainty, tragedy, and hunger. They were the arbiters between the poor and the weather, between the poor and the oppression of the landholders. Religious festivities associated with the cult of the Virgen María and the saints started after Corpus Christi and were prevalent throughout the rainy season. These *fiestas de devoción* (festivities of devotion) for the saints and the Virgin, carried by brotherhoods and guilds, as well as by other religious groups, were prominent during the period.

That is, as well, the spatial and temporal context of the festivity of La Virgen del Carmen. Statues of the Virgen are ubiquitous around Puerto Rico's coast. In many coastal communities, people repeat a similar tale: that the statue was beached in their community, or survived a shipwreck in other versions, and was carried ashore to be placed in an sanctuary in order to adore her and thank her for saving the lives of the mariners and fishers.

The work of religious historian Arturo Dávila provides some insight to the historical trajectory of the cult in Puerto Rico. According to Dávila, the local tradition is as old as the sixteen century and quickly found its expression in local brotherhoods (*cofradías*) engaged in a number of rites. An inventory of churches in the nineteenth century finds only a handful of churches that do not have an image of the Virgin. The expansion of new townships (municipios) in the coast also saw a dramatic expansion of the cult from 1850 to 1898, as documented for Naguabo (east coast), Arecibo, Barceloneta, Palo Seco and Cataño (north coast), Ponce Playa (south coast), among others (Dávila 1982). Most notably, in many coastal towns, the Virgen del Carmen replaced the patron saint in key local festivities, soon to become dominated by the procession along the coast and the other associated activities. For example, in Vieques, the saint Santiago and the Immaculate Conception gave way to the Virgen del Carmen in a celebration that lasted one full month. Other towns like Arroyo and Guayama experienced the same process. According to Dávila, Guayama has a small settlement named Carmen from which the dwellers engage in a procession with the image of the Virgen, in a pilgrimage to the main church in town.[14]

Dávila does not make the connection between the adoration of the Virgen del Carmen and the Seamen's Guild. However, the information he provides from his analysis of the documents suggest that members of the guild were indeed involved or at least related to the cult in more than one way. Dávila describes the participants of the cult as "artisans, bearers of small occupations, workers involved in the rough occupations of the sea, and the harbors" (Dávila 1987:12). That list covers those who might be involved in one way or another in the guild, and thus its connection with fishing in the nineteenth century. The "congregations" and brotherhoods were composed throughout the West Indies by "people of color" and, apparently, these brotherhoods had a similar composition in Puerto Rico. In 1860 a new *cofradía* was born: *los caleteros* (stevedores) in the city of San Juan, composed by mulattoes (*morenos*) following the cult of the Virgen del Carmen with an image brought from Barcelona, in Catalonia, that remains in the San Juan Cathedral (1987:15). Dávila does not describe the festivities but provides information that allows us to speculate on the magnitude of the event. Members of the working class, living in a poor quarter of the city (San Francisco), the brotherhood was nevertheless powerful enough to have its own

[14] Dávila also documents the pervasive character of the festivity in other areas of the island, including highland towns where the cult is strong and has produced a local iconography of wooden carvings and the importation of images from Catalonia.

chapel in the old San Francisco Church, with an image bought in Spain from one of the renowned artisans of Barcelona. Devotion must have been great, as well as the socioeconomic strength of the group. We don't have more information, except that their activities (presumably processions in the bay) were also similar to those of their counterparts in Cataño and Palo Seco, across the bay.

Two additional speculations are provided here before moving to other aspects of the cult, including the ethnographic descriptions of the procession during our fieldwork. First, stevedores became an important group around the turn of the 20th century and eventually became members of one of the most powerful labor unions in the island: Unión de Trabajadores de los Muelles, who played a critical role in labor disputes in the 1930's. Second, San Juan also had a rich maritime tradition in which mulattoes presumably had an important role. One of the key entrepreneurs in the maritime sector in the eighteenth century was Don Miguel Henríquez, who dominated the trade in the latter part of the century. This linkage between ethnicity, locality, and maritime occupation must have had an impact in the cultural manifestations of the cult and its members' identity.

Puerto Real, which is in the municipality of Cabo Rojo, was one of the sites visited by our team working in the profile of fishing communities. The trajectory of the cult of the Virgen del Carmen in that community has been documented elsewhere (Valdés Pizzini 1985, 2006 forthcoming). A handful of facts are important here. The community was embedded in the structure of the Seamen's Guild in the nineteenth century (see also Ramos Ramírez and Acosta 1984). The harbor was the hub of maritime activities in the region and then an important fishing center with members of the Guild. The festivity and cult were well structured from 1920 to 1950, as stated by various informants we interviewed in the 1980's. As in Catalonia, the festivity had both secular and religious components. During the secular phase, which lasted a week, dance, music, food, and drinks enlivened in the streets of Puerto Real. Houses were decorated with bright-colored ribbons and flowers. They tried to bring the best artists with the help of the fish dealers. Fishers and their families participated in the event in many ways, including the procession. On the Sunday of the celebration, the town's priest came into town to give mass, bless the image, and lead the procession to the harbor. From the harbor, the fleet engaged in a roundabout on the bay following the largest vessel, which carried the image, its bearers, and the flower offerings. The image was then returned ashore and taken back to the chapel. The secular festivity continued throughout the day, and in the evening all the activities ended.[15]

In the 1930's, when the community was engaged in an aggressive expansion of the fleet and there was an increased capitalization of the fleets and the proletarianization of the labor force, the fishermen remained aloof from the cult. The activity continued, nevertheless, with the devotion of the local women and members of the Catholic Church who kept the tradition alive. Puerto Real was also changing as Puerto Ricans became more detached from the Church in the 1960's and 1970's. Catholicism lost ground to other sects, such as Pentecostalism and Protestantism. Apathy, secular orientations, and other religious alternatives eroded the old traditions in Puerto Real.

However, in the 1980's, the cult remained active. Despite minor participation from the fishers, it was nevertheless an important component of their culture, as its followers claim that it was an important part of their identity as members of coastal communities. In fact, the activity started to be appropriated by non-fishers who were linked with fishing through kinship and affinity. It was those community members who revived the secular portion of the festivity, with the Festival del Pescao. In fact, by design, they

[15] We describe similar processions that we observed during the summer of 2004 in Mayagüez in the Western Metro regional profile below.

separated the sacred and the profane and moved the profane portion of the cult to yet another timeline in the liturgical cycle: Lent. It substituted the popular carnivals and festivities prior to the Holy Week, and provided a venue for the selling of fish and foodstuffs in the community. Both events remained separated, and no linkage between them was attempted by community members. In our view, fishing provided cultural substance to the identity of the rest of the community members, a membership that was underscored in the festivity of the Virgen del Carmen. The old fisher families continue to promote the cult, as evidenced every year.

It is possible to argue that fishers throughout the shoreline of Puerto Rico are conscious of the importance of the cult in reaffirming their identity and emphasizing the importance of coastal peoples and fishing as a unique way of life. Aguadilla, for example, has been an important landing center and a locale of members of the Seaman's Guild since early in the nineteenth century (see Torres 1967). Three photographs and a leaflet from the festivity of 1916 show a large amount of people in the harbor during the celebration. The Virgen del Carmen is dubbed as the patron saint of sailors, and one of the surviving photos has a caption that indicates that the priest (probably Basque) and the town policeman were heading the procession, accompanied by a crowd of followers.

Nestor Rodríguez Escudero, a writer from Aguadilla, wrote a brief account of the event in which the fishermen are not mentioned but sailors are. Apparently, the festivity in Aguadilla was embedded in the local maritime culture of stevedores and workers serving the busy harbor, which handled the goods for the local companies as well as the vast amount of sugar exported from the Coloso sugar central mill in Aguada. The landscape and seascape he depicts is filled with steam boats, workers, and sailboats carrying salt, coconuts and cargo from other harbors in the island. The shore was buzzing with economic activity and filled with dark, barefoot, muscled men. These same men took the image of the Virgen del Carmen and carried it from the church to one of the warehouses in the harbor in a procession followed by devotees and people from town on the Saturday afternoon. Devotees remained singing and praying until the morning where the image was transported to a *barcaza* (barge) used for cargo but adorned with wild flowers, palm leaves, and bloomed branches of *flamboyán* (royal poinciana). The *barcaza* was tugged by a motorboat that led the seaborne procession of small boats.

We give credit to Rodríguez Escudero's description, as he was a well versed writer in the life and times of the local fishermen. He knew them well, and had direct contact with their livelihood. He also knew the customs and whereabouts of the fishers in the region, as presented in his collection of short stories Litoral y otros cuentos (1962), one of few Puerto Rican literary narratives devoted to fishers and people of maritime occupations. While Rodríguez Escudero described that particular festivity, it may be that other fishermen locations in the town of Aguadilla had their own festivity, as it is evident in other towns of the island, such as Mayagüez. In his stories he described the importance of la Virgen del Carmen in the lore of the fishermen, and thus knew well the importance of the cult among them.

A recent description in an English newspaper on the history of the Aguadilla celebration reveals many of the well structured patterns of narratives, processes, and origins of the celebration, as documented here. The timing of the resurgence of these traditions is specific to the localities; however, they appear to have been gaining in popularity over the last 30 years. This may be related to an interest in revitalizing traditions in the face of change in the coastal zone. A few newspaper quotes speak to the endurance of the tradition:

> "She is a dainty figure with a serene expression. But boy, can she ride the rouge seas. The fishermen of Aguadilla will hail their protector this weekend in the patron saint

> celebration of Virgen del Carmen, the woman who guides them safely to and from the high seas after a night of fishing.
>
> And unlike the usual drunken Saturnalia that patron saint celebrations have turned into, this three-day fete has little, if any, party-hardy purpose.
>
> There is only one artistic act –Los Pleneros de Ponce—and that takes place Saturday afternoon in Aguadilla's Barrio Higuey.
>
> Other than that, fishermen, their families and the overall townsfolk take great seriousness in honoring la Virgen del Carmen. The celebration dates back to 1886, according to Professor Alba Martínez of the University of Puerto Rico's Aguadilla campus.
>
> The boat of seaman Jorge el Griego capsized while trying to enter Aguadilla Bay and he desperately invoked la Virgen del Carmen for protection. He was spared.
>
> In gratitude he raised money among his fellow sailors in Aguadilla's Barrio Tamarindo and donated the money before an altar with the image of the virgin.
>
> Fervent followers took great care in keeping with the religious ceremony during the July celebration and held many masses and processions with statues of the virgin.
>
> According to Martínez, it was Elisa Carracosa de Amel, a devout follower of the virgin and the wife of a wealthy Aguadilla merchant who brought an image of the virgin from Barcelona and donated it to the Aguadilla Church, where it still stands.
>
> By 1917, the celebration included a trek into the Aguadilla Bay. A statue of the virgin was placed on a boat and headed a procession out to sea.
>
> The image was then returned to church. The celebration waned after the 1940s Aguadilla's maritime commerce became important.
>
> Yet there has been a resurgence lately, now the celebration takes place not only in heart of Aguadilla but in its seaside bay Tamarindo, Playuela and Higuey. Member each community hold their own celebration join in the colorful procession out to sea, when dozens of fishing vessels accompany the ness of the virgin out and into the bay."[16]

Aguadilla fishermen, like many others, remember specific events in their lifetime in which they were in danger and had no other option than to invoke the Virgen del Carmen. Such is the history told by Felix Morales Blas to a journalist in the San Juan Star a few years ago. Morales is also one of the most important boat builders and artisans of the west coast (see López 2004) and one of the leaders of the fishermen in the west coast of Puerto Rico, and his crafts are emblematic of West Coast *yolas* (fishing skiffs)—as colorful as they are cultural, descending from a tradition as rich as the festival of the Virgen del Carmen.

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[16] Melba Ferrer, Aguadilla to hail Virgen del Carmen: Century-old festival regaining popularity. The San Juan Star, Thursday July 89, 2000.

III.b. The Cultural Significance of Fish in the Puerto Rican Diet

While the Virgen of Carmen celebrations collect together masses of people every year to honor the cultural significance of fishing, a less spectacular but perhaps more important role of fish in Puerto Rican and Caribbean cultural has to do with its place in the Puerto Rican diet. We have already noted that fish are particularly important among Catholics during Lent, and our interviews with fishers about their marketing practices confirm that this is one of their most brisk seasons for seafood sales, contrasting it in particular with the Christmas season, when the tradition of consuming large amounts of pork cuts into their sales. Outside of religious festivities and celebrations, however, fish have been important and culturally significant in Puerto Rican diets since the early days of European colonization.[17] We noted above that Price (1966) argued that fish and fishing were important components of diets of propertied classes, and that the indentured servants and slaves who provided fish to their tables were given freedoms unknown to most of their peers.

More importantly historically and today, however, was the trade in dried and salted fish that accompanied the growth of slavery across the Caribbean.[18] Salted cod from the large fisheries of New England and Canada was an important imported good during the plantation era, when cheap sources of protein were necessary to feed a growing enslaved population (Vickers 1994; Wolf 1982). One of the infamous triangles of trade during this period was a route that included Caribbean and southern products such as sugar, tobacco, and cotton traded through Caribbean and southern ports for salted cod from New England which had been traded for salt from the mines at either Cadiz, Spain or Liverpool, England (O'leary 1981). The involvement of the Spanish in this trade, as producers of salt as well as salted fish, inevitably drew Puerto Rico, a Spanish colony, into the trade. These traditions laid the groundwork for a cultural association of fish with work and the working classes of Puerto Rico, at the same time locally caught fresh fish was seen as both a luxury good among the upper classes and as an important source of income and food during dead seasons in coastal agriculture.

Fish in Puerto Rico today continue to invoke these cultural senses: on the one hand a high-priced, luxury food enjoyed by tourists and coastal visitors by the thousands, and on the other a fairly low-cost, high quality protein commonly sold to working people. The ubiquity of lamp-warmed glass cases around Puerto Rico's coast, out of which restaurants and stores sell reasonably priced seafood pastries (of boxfish, shrimp, conch, lobster, shark, etc.), along with fried king mackerel steaks and other fish, attests to the importance of seafood in the diets of working people. These glass cases are often an important component of mobile food stands that set up near factories and other working places where they are frequented by Puerto Ricans from all walks of life.

In these contexts, king mackerel—*sierra*—deserves special attention. Not only is *sierra* served in these settings routinely, generally at a low cost of under $2.00 per steak (4-5ounces), but many fishers we interviewed across Puerto Rico cited *sierra* as one of their most important species, reporting that they leave other fisheries in order to fish for *sierra*. Landings data, however, do not support the fact that it is as important a species as various kinds of snapper, yet the frequency with which fishers mention it as important to them underscores its cultural significance. We suspect that this derives from the role that

[17] Indeed, even prior to European colonization, the Taino who occupied the islands depended heavily on fishing and land crabs for protein, as the Caribbean tends not to have large mammals that might otherwise provide protein.
[18] In Jamaica, a dish known as akee-and-salt fish still uses dried salted cod as one of four ingredients; it is considered one of Jamaica's national dishes.

fishers play in their communities as sources of food for neighbors and others who are, like them, working class people; that they are very cognizant of their positions within the working classes of Puerto Rico has been documented again and again in the literature on Puerto Rico, as well as the fact that they express pride in feeding members of their communities (Benedetti 1995; Griffith and Valdés 2002; Pérez 2005; Volumes II & III, this work)

PUERTO RICAN FISHING COMMUNITIES: A TYPOLOGICAL DISCUSSION WITH REFERENCE TO DEPENDENCE AND ENGAGEMENT

IV.a. Deterritorialized Communities

Early in the 21st century, led primarily by social scientists, NOAA Fisheries funded several studies, including the present one, designed to profile fishing communities around the United States. These profiles have been directed toward two ends: 1) determining how much different coastal communities were dependent on or engaged in commercial, recreational, and subsistence fishing; and 2) predicting, based on measures of dependence and engagement, how new regulations, such as Marine Protected Areas and seasonal closures, would affect fishing livelihoods. Again, as we noted in the executive summary, according to the Magnuson-Stevens Act,

> "Substantially dependent implies that loss of access may lead to some change in the character of the community, perhaps a major change, or may even threaten its existence. Substantially engaged, on the other hand, implies a level of participation in commercial, recreational, or subsistence fisheries that includes social and economic networks that are directly and indirectly associated with these fisheries (such as the harvesting and/or processing sector)" (NOAA, 2004; see, 63 FR 24235, May 1, 1998).

In this work, we pay particular attention to the notion of *community* as it applies to the fishing populations of Puerto Rico. We define a community as a group of people living and working together, exchanging services and goods, who share some common interests while diverging at times according to different class backgrounds, where many also share a common cultural and linguistic background. Communities are social fields, comprised of overlapping networks of kin, neighbors, friends, co-workers, and others who interact with one another regularly. Communities may be place-based, network-based, knowledge-based, or may transcend specific geographic locations, although many community members usually share attachments to a specific place.

As with most social scientific research, addressing the issues surrounding community, dependence, and engagement has produced theoretical, methodological, and other insights that may also be useful to fishers and fishery managers. By-products of these profiles include, for example, describing the ways that fishing families interact with marine ecosystems such as coral reefs, discovering ways that fishing families protect marine environments, and understanding the knowledge base of fishing families and communities and its relationship to marine policy and science.

Paralleling regional fishery management bodies around the country, these profiles have been regional in nature, conforming more or less to the jurisdictions of the councils that develop fishery management plans and other recommendations to regulate fisheries. Beginning from state actions and structured around preexisting state-defined regions, the work of profiling fishing communities became, in several regions, exercises in imagining communities—characterizing and representing natural resource communities that the state assumed were more or less tied to specific geographical locations, places, or regions, as opposed to communities that transcend geographical place and are bound, instead, by common interests, common knowledge bases, occupational or ethnic identity, mobilization around specific crises, events, ceremonies, practices, or other factors.

In Puerto Rico, for example, we were asked to consider how fishing communities were dependent on or engaged with fishing and fishing communities. In reality, however, most coastal communities in Puerto Rico include many people who have little to no involvement in fishing beyond enjoying, at times, local seafood. This is even more the case with coastal municipalities. Municipalities in Puerto Rico, like counties in most of the continental United States, boroughs in Alaska, and parishes in Louisiana, are political units that, in a study such as this, are primarily useful in that many government agencies aggregate data at this level. Yet in all of Puerto Rico's coastal municipalities, the social, economic, and cultural contributions of fishing are entangled in masses of other occupations and activities—hence the title of this report.

NOAA Fisheries' effort to profile fishing communities occurs on the heels of several dislocating processes, social and natural, that have undermined fishing families' attempts to rely on fishing as a way of life. Demographic changes in coastal regions, most happening coincidentally with real estate development and other landscape altering projects (e.g. dredging, beach replenishment, inlet stabilization), which have compromised commercial, recreational, and subsistence fishers' access to marine resources. Gentrification has increased property values, taxes, and the cost of boat storage space while its protagonists often simultaneously press for aesthetic changes to working waterfronts (Griffith 2003). Yet gentrification is a complex process, not always spearheaded by the rich; in La Parguera, for example, Brusi (2003) outlines a process in which working class, fishing families colonized a coastal area as squatters to remain in their community. Seafood imports, particularly of inexpensive cultured shrimp through national supermarket and discount chains, have negatively affected domestic fish markets while sensitizing domestic palates to frozen instead of fresh fish. Destruction, pollution, and suffocation of wetlands, rivers, and oceans have damaged water quality in nursery areas with detrimental consequences to fish and shellfish populations. Finally, overfishing, real and perceived, has stimulated or fueled the efforts of managers and environmentalists to reduce fishing effort, alter gear, create marine protected areas, and redistribute fish stocks among competing fishing groups (most notably commercial and recreational fishermen).

Such processes result, nearly everywhere, in reorganizing communities that were formerly viewed, by residents and visitors, as fishing communities. Places like Gloucester, Massachusetts, home port for large numbers of groundfish fishermen, became destinations for artists, whale-watching companies, and others seeking access to the sea at the same time NOAA implemented measures to cut the number of days at sea in half (Doeringer, Moss, and Terkla 1986; Griffith and Dyer 1996). Across the South Atlantic and Gulf States, former fishing communities like Ocracoke, North Carolina, McClellansville, South Carolina, Brunswick, Georgia, and Cedar Key, Florida, have witnessed immigrations of wealthy seasonal residents and marinas changing from commercial to recreational uses.

Similar dislocating processes are occurring across Latin America and the Caribbean in peasant communities, whose members have been marginalized by neoliberal economic policies such as NAFTA and disrupted from within by emigration. From an anthropological perspective, this is historically relevant, in that the study of peasants, in the 1980s, helped to lift the anthropology of fishing folk out of a period of theoretical stagnation, primarily moving our analyses away from modernization theory and its tendency to embrace neoclassical economics and toward more accurate analyses of fishing families as embedded in household or domestic economies. Durrenberger's studies of shrimpers in Mississippi and Alabama, building on Pollnac's work with Doeringer, Moss, and Terkla (1986) in New England, were particularly notable in focusing on the domestic production of fishing families instead of abstract questions of economic rationality, entrepreneurship, or efficiency. Most importantly, these and other studies pointed to the importance of family in fishing and fishing-support activities (e.g. processing and

marketing) and in such factors as organizing crews, forming and running fishing associations, transmitting knowledge and experience, holding community events such as blessings of the fleet, and political activism. Even as fishing families find themselves surrounded by new, non-fishing residents, or pushed away from coastlines through gentrification and other such processes, ties of family continue to be primary forces in binding people together into communities based on fishing.

In many ways, recent fishery policy developments and social scientific theories about fishing have become more and more cognizant of the importance of placing fishing families and fishing communities into wider social, economic, and cultural fields. That NOAA Fisheries has created and filled several social scientific positions with anthropologists in just the past few years, along with its extensive attempts to define terms such as fishery *dependence* and *engagement*, suggest that policy makers understand the importance of the broader contexts in which fishing takes place. No longer is it possible to develop effective fishery regulations without the active, sustained, and meaningful participation of fishing families; those cases where regulations and enforcement strategies have been developed without significant fisher input, such as those released in March of 2004 in Puerto Rico, have generated opposition, suffered from a lack of legitimacy, and initiated new rounds of policy formulation. Indeed, the response to the new regulations in Puerto Rico were so vehement that DRNA officials agreed to establish an advisory council to evaluate and perhaps rewrite the regulations they developed.

Work on the impacts of fishery regulations has benefited from social scientific work on fishing families and fisheries around the country and the world that elucidate the ways fishers interact with the state,[19] respond to new laws governing access to marine resources, and deal with other developments taking place in coastal environments. Over the past two decades, fisheries social science has shifted from an emphasis on the tragedy of the commons and modernization to more detailed empirical work that has focused on: 1) the importance of fishing households within broader kinship/ ethnic units and fishing communities (including the seasonal or periodic movement between fishing and non-fishing occupations); 2) fishers' uses of locally-defined and managed or folk conservation methods; and 3) traditional or experiential knowledge that fishers possess to determine not only when and where to fish but also to aid in adapting to new developments in the marine or regulatory environments (Acheson 1987; Durrenberger 1995; Durrenberger and King 2000; Maril 1995; McCay 2000; Dyer and McGoodwin 1994; Griffith 1999; Johnson and Griffith 1995a). These interrelated fields of inquiry have influenced recent developments in marine resource management as well as affected our abilities to predict how fishers may respond to new regulations.

One of the underlying assumptions of both the tragedy of the commons and modernization approaches to fisheries was that fishing operations, like capitalist enterprises, were organized to maximize profits or returns on labor, time, and other economic inputs. While it is clear that many fishers desire to catch as much fish as they can, several factors constrain their abilities to maximize their catches and behave as predictably as capitalist firms. First and perhaps foremost is that most fishers do not operate as independent businesspeople, but instead usually as members of fishing households or families and occupational communities. Some of the earliest work that recognized this was done by a team of economists who relied extensively on the work of anthropologists (Doeringer, Moss, and Terkla 1987). Examining New England's groundfishing fleets, they found that many fishers failed to leave fishing even under conditions of declining yields. They concluded that the desire to keep family members employed was at least as important, and often more important, to these families than profit margins, adding that "the

[19] Throughout this report, we utilize the word "state" to refer to any government entity, rather than individual states like Iowa or Maine.

adjustment processes [to declining yields] proved more diverse than capitalist arrangements typical of larger scale enterprises" and that "the family and kinship arrangements in the labor market can motivate effort, loyalty, and flexibility among the work force that are hard to attain under more capitalistic employment relationships" (1987: 127-28).

Building on these observations, Durrenberger (1995) drew upon the literature on peasant farming in Asia and elsewhere, including Chayanov's Theory of Peasant Economy, to argue that the size, composition, and character of fishers' households influence fishing effort, target species, and other interactions with the marine environment.[20] Just as Durrenberger was able to apply peasant studies to the fishers of the U.S. Gulf coast, peasant studies provide a good deal of additional insight into other factors that motivate producers whose production is deeply embedded in family life and cultural tradition. For example, production accomplished under domestic economic relationships is often considered a moral enterprise, especially when conflated with the reproduction of the family's way of life and subsistence security (Scott 1976; Nash 2001; Striffler 2001). During our ethnographic work in Puerto Rico, two days after Puerto Rico's Department of Natural Resources announced its new regulations, in March of 2004, members of our field team visited a prominent fisherman and fish dealer on Puerto Rico's Southwest coast whom we call Miguel.[21] We happened upon him at a good time, while he was waiting for a man from the University of Puerto Rico's Sea Grant College Program to arrive and listen to his opinions about the new regulations. It was a lively time of day for him as well, around eleven in the morning, when fishers who had landed their catches during the night visited to sell him *dorado* (dolphin or mahi mahi), *colrubia* (yellowtail snapper), and *sama* (mutton snapper). His position as a fish dealer, as well as an active fisherman and head of a fishing family, made him especially well-connected to the local fishing associations, the community at large, and to other fishers from neighboring villages and municipalities. Thus his views on the new regulations were particularly interesting to us.

He began by simply saying that the regulations were not designed with fishers in mind, something that fishery scientists on the island later agreed with. Instead of following with a point-by-point critique of the regulations, he instead launched into an oral history of his time on the water and the importance of fishing to his family and his way of life. Miguel had been fishing commercially for 40 years, raising three children from the fruits of this work, training one to follow in his footsteps, and contributing to his broader family's welfare by using his nephews as *proeles* (crew) on his boats. He was, in short, making a moral argument for his claim to fishery resources and using this argument to justify his direct participation in the design and implementation of new regulations over marine resources. He saw commercial fishing as a crucial part of his family and his community, and he mentioned more than once that his interest in preserving the resource for future generations derived directly from the fact that his son and his nephews were taking over the operation from him. His opposition to the new regulations, he was arguing, needed to be considered in the light of the place of fishing in his life and the place of his life in fishing.

Peasant studies also point to the propensity for domestic producers to defend the resources upon which they depend through various means, including working through legal channels, peaceful protest, civil

[20] Working with detailed census data in early 20th century post-revolutionary Russia, Chayanov argued that peasants alter their labor investments in production based on the ratio of consumers to workers in the household. His "drudgery curve" showed that the subjective value that peasants attached to labor rose as the ratio of consumers to workers rose, reaching the equilibrium point when there was one consumer for each worker in the household.

[21] With the exception of public officials, authors, and others who are well-known, the names used throughout this report, for the purposes of confidentiality, are pseudonyms.

disobedience, and violence (Scott 1985; Wolf 1969). Certainly recent events in Vieques illustrate that Puerto Rican fishers are willing to engage in all of these forms of dispute to protect their resources (Griffith and Valdés Pizzini 2002; Benedetti 1997; Fabían Maldanado 2003). The actions of viequenses, however, were only the most noteworthy of instances of civil disobedience among Puerto Ricans protecting coastal and marine resources, and one that extended far beyond the fishing communities of Vieques, eventually drawing most Puerto Ricans into the protest. During our ethnographic research, we encountered many other instances of fishers using various means to protest or inhibit coastal development that threatened nursery areas and their livelihoods. Based on this, we argue here that participation in conflicts over coastal marine resources is a sign of willingness to sacrifice to protect such resources and a reflection of dependence on those resources.

Finally, like peasants, Puerto Rican fishers find themselves, with few exceptions, in subordinate class positions vis-à-vis the dominant and more powerful classes of Puerto Rico, whose capital resources have financed many of those coastal developments that threaten fish stocks and fishing livelihoods. Class relations in Puerto Rico, as elsewhere, however, are complex and rarely merely instrumentalist in nature, with state powers always backing wealthier classes. We noted earlier that Puerto Rico is a highly politicized society, and in this context politicians often take up constituents' causes whether or not constituents can contribute to their political campaigns. This has been a source of power within Puerto Rican fisheries and has at times hastened or altered processes of internal social differentiation or class formation within the fisheries. Nevertheless, fishing families have become differentiated within the fisheries by their relationship to the tourism and other leisure uses of the coast, by their access to the infrastructure of fish marketing (e.g. freezers, marketing structures, marketing relationships, etc.), by their relations with the state, and by their relations among one another.

Within fisheries social science, work paying attention to their domestic economic relations and other peasant-like attributes laid the foundation for expanding the context of fishing to include more than the vessel, gear, species targeted, etc. and consider, for example, relationships among harvesting and processing, non-fishing employment of household members, gear and territory conflicts, and other factors that link fishing families to wider social realms. Such an approach clearly influenced Griffith and Valdés Pizzini in their study of Puerto Rican fishing families (2002). Focusing explicitly on the movement between fishing and non-fishing employment by members of fishing families, they found that networks of interlinked fishing households, often spanning two generations with links through marriage (e.g. fathers-in-law fishing with sons-in-law), were effective in adapting to changes in the marine environment, responding to political and economic developments affecting their access to marine resources, and developing the human capital necessary to shift among different gears, fisheries, and territories.

Others have found that similar networks typically pool traditional and experiential ecological knowledge to develop folk theories about resource changes and, at times, develop folk conservation efforts (Dyer and McGoodwin 1994). The acknowledgement that fishers possess vast stores of knowledge about the marine environment, combined with local conservation efforts, have helped pave the way for fisheries co-management, in part because experiential local knowledge offers some hints about how fishers respond to environmental and other changes in the marine environment. Griffith and Johnson (2003) have found that fishers tend to place their traditional ecological knowledge into larger contexts that include not only natural phenomena such as lunar phases, salinity levels, and wind direction, but also aspects of the social environment, such as regulations on season and area closures. Because of this, learning about fishers' experiential knowledge and perceptions of the marine environment can assist in predicting how fishers are likely to respond to new regulations.

Additional insight into fishers' behaviors and their responses to new regulations comes from biographical work on fishers' lives, such Linda Greenlaw's The Hungry Ocean (1999) or Susan West's Fish House Opera (written with anthropologist Barbara Garritty-Blake—2003). These texts offer emic (insider) perspectives on fishing, as well as knowledge of the marine and social environments that fishers negotiate, that are difficult to glean from typical methods of observing and collecting data in fishing communities. In addition, recent popular texts on fishing and oceans can provide background regarding common ways that fishing and fishing communities are portrayed to the general reading public (Earle 1995; Kurlansky 1997; Safina 1997).

Together, the above observations point to several important methodological considerations, including collecting information on the experiential knowledge that directly influences marine resource use and paying attention to existing conservation methods (even those that fishers may not view explicitly as conservation, as in the case where shifting from one species to another, due primarily to market demands, reduces pressure on one of the species). Clearly, too, these aspects of fishing in Puerto Rico need to be placed within a broader temporal context in order to estimate, based on past experience, how fishers have responded and are likely to respond to MPAs, closures, and other regulations (see Valdés Pizzini 1990).

IV.b. Puerto Rican Fishing Communities

Fishing communities without discernable boundaries—otherwise known as non-place-based communities—are becoming more common in Puerto Rico. As we noted earlier, these can include network-based communities, or those comprised of a number of fishers who work together from specific locations but who live in different neighborhoods or different municipalities, or knowledge-based communities, or communities that consist of fishers and fishing families who possess knowledge about specific fish, fishing grounds, habitats, and other attributes of the marine environment, and who use that knowledge to form cooperative ties.[22]

Despite the presences of other types of fishing communities, the place-based communities that exist serve the entire population of fishers by underscoring the legitimacy of the fishing way of life. Equally important are those fishing associations and other fisher gathering locations, small and large, that provide locations where fishers can discuss issues and problems, share information about marine resources, develop and refine their knowledge bases, and devise strategies to address regulatory, marketing, and other problems. These locations are unevenly distributed across Puerto Rico, varying from region to region according to ecological conditions, government investment in fisheries, relationship to the tourist sector, and trajectories of coastal development (e.g. petrochemical ports, recreational marinas, private resort or condominium construction, etc.). Table II.5, in the introduction to this report, lists the communities and sites we visited during our ethnographic work, including information on those we interviewed as well.

Puerto Rican commercial fishing communities share a number of characteristics that can help us assess the extent to which they may be fishery-engaged or fishery-dependent and, by extension, their susceptibility to shifting regulatory and natural resource environments. Those fishing communities where families consider fishing a central part of their identity and their livelihood are likely to share all the

[22] These cooperative ties can be used for daily survival resulting from the sharing of information or the exchange of goods and services, or they can be used for alliances to challenge the state, other fishing groups, etc. In other words, the cooperation common in knowledge based communities can be either relatively benign or relatively active and heated.

characteristics we discuss below while those communities where fishing, though present, is more marginal to families' identities or livelihoods are likely to include fewer of the characteristics we discuss here. These characteristics are both material and symbolic and their number, density, and quality influence how deeply enmeshed fishing and fishers are with broader social, political, and economic settings. This discussion develops a typology of fishing communities in Puerto Rico while considering the notion of community in light of the concepts of dependence on and engagement with Caribbean marine resources. It draws on the social scientific literature on peasant communities and on more recent writing about non-place-based communities known as diasporas, transnational communities, or transnational social fields.

The literature on peasant communities is relevant for the reasons discussed earlier—their domestic economy, the moral nature of their production, their involvement in conflicts, etc.—but also because peasants depend directly on natural resources. These resources usually consist of land and water but in some cases open access resources such as grazing lands, communal farm lands (e.g. *ejidos* in Mexico) or marine fisheries—yet peasants often have to defend those resources, communally and individually, from encroachment from within and outside their communities. Peasant communities, too, have always been involved in larger social and economic processes that have challenged them to transcend, in a number of ways, whatever parochial tendencies their communities may instill.

Perhaps most important, peasants have been instrumental in social scientific understandings of community, particularly in anthropology but also in fields such as political science and economics, in part due to the importance of the peasant war in Vietnam (Wolf 1969). Anthropological work on closed and open peasant communities, combined with well-known long-term research projects and studies in Asia, Africa, and Latin America (e.g. the Harvard Chiapas project, the Cornell Peru/ Vicos project), enabled understandings of place-based communities with rich civil-religious traditions, distinct cultural identities, and economies that, though often marginal, were tied to specific farm lands, water sources and resources, and other natural resources such as forests, grazing lands, or mineral deposits.

An unfortunate drawback of much of this work was that it ignored peasant interactions with merchants, bureaucrats, soldiers, and others who were not part of their communities, at times portraying these communities with such blinders that they failed to predict major civil insurrections and wars. Few North American anthropologists working in southern Mexico and Central America, for example, had much to say about the forces that led to the particularly bloody civil war in Guatemala in the late 1970s and 1980s, or similar forces underlying the rise of Subcommander Marcos and the Zapatista rebellion in the mid-1990s in Chiapas.

Few anthropologists could be accused of this today, as studies of the social problems that have led to civil wars, refugee and migration flows, class struggle, and other dislocating processes have moved to the center of the social sciences. Once again, peasants and former peasants, as the subjects of social scientific research, may be providing similar theoretical services today as they earlier provided research on fishing folk and our understandings of community. In this case, many people from peasant backgrounds, forced to migrate for work to survive, have been experimenting with new community forms that are only partially tied to specific places. Anthropologists studying migration have called these forms transnational communities or, more recently, transnational social fields (Glick Schiller 1999). This work builds on the idea that communities need not be physically bounded by territory, however much sentimental or symbolic attachments depend on the existence of specific places with familiar characteristics. The fact that Basch, et al. (1994) chose the title Nations Unbound for their seminal statement on transnational social fields highlights this point of departure, just as Glick-Schiller's more recent definition—"social

fields [of] unbounded terrains of interlocking ego-centric networks"—continues to emphasize a people adrift across social space (1999: 97).

As such, one could legitimately ask how these ideas could possibly apply to communities, such as farmers and fishers, that are intimately tied to *places* whose natural environmental conditions and ecological relationships are generally confined to relatively small geographical spaces. We contend that the relevance of transnational theory to such communities derives from recent trends that have forced those who exploit natural resources—fishers, farmers, foresters, pastoralists, and hunters-gatherers—to increasingly reconceptualize their communities as social fields with various kinds of ties to natural resources as well as other social landscapes more or less divorced from natural resources. Our focus here is Puerto Rican fishing communities, but the argument could extend to any group dependent on a circumscribed set of natural resources that has been undergoing changes of the kind we have documented in Puerto Rico (Griffith and Valdés Pizzini 2002). According to a Puerto Rican fisher from the southern coast:

> "The distribution [of where the fishermen live] has changed. They used to live almost exclusively in the barrios right next to the beach, but now they are disseminated among many barrios. Before, all the fishers would live in 'La Playa' (the beach). That is over. The fishing families would all live in the same place, and everybody knew where to find them."

Thus, the literature on transnationalism/diasporas is relevant primarily because of what scholars observing transnational social fields and the behaviors of migrants can tell us about communities with fluid ties to geography. Transnational migrants remain attached, at least sentimentally, for varying amounts of time, to specific places, but their social fields encompass two or more places and engage a wide range of political and economic actors in each setting, including migrants and others who touch and shape their lives. Employers, school teachers, government agency personnel, representatives of justice (from lawyers and clergy to police and sitting judges), merchants, and bankers are a few of the kinds of people whom migrants interact with regularly and who influence their schedules, their ability to communicate with their natal communities, their well-being, and other dimensions of their lives. Similarly, fishers and their families, especially when living in neighborhoods away from the coast, interact with several kinds of people with few ties to marine environments. Ties emanating from these relationships bind them to local government, commerce, and social institutions like churches and may undermine or enhance their ties to marine resources.

In the study of both transnationalism and peasants, attention to the role of the state has always been important. Sending states have capitalized on transnational migrants as sources of remittances and as extensions of sovereignty into the new territories, encouraging their citizens living overseas to gain dual citizenship and advocate for improved international relations between sending and receiving states. Remitted earnings address balance of payments problems, help households meet consumer needs, finance employment in migrants' home communities, pay for education, and are invested directly in community infrastructure (e.g. soccer fields, improved roads to regional capitols). Political candidates from sending nations often campaign in receiving nations in neighborhoods or cities with high concentrations of their compatriots (Guarnizo 2000; Glick Shiller 1999). Finally, states may promote cultural and educational exchanges that more deeply intertwine sending and receiving communities (Grey and Woodrick 2002).

Peasant interactions with the state revolve around several activities: taking advantage of subsidies to direct production (as with *Villas Pesqueras*); securing titles to land; gaining access and usufruct rights to water, common grazing lands, or forests; paying taxes; appealing to the courts in land and other disputes;

and, probably most notably, participating in warfare, revolt, and revolution (Popkin 1979; Scott 1976; Wolf 1969). Recently, peasant interactions with states include their (generally negative) involvement in neoliberal trade policies and their subsequent responses to falling commodity prices and privatization of communal lands. Responses include international migration, the formation of cooperatives, and participation in third-party certification or fair trade initiatives. Each of these involve states at many levels, even when participation is filtered through Non-Governmental Organizations (NGOs).

The state plays an important and contradictory role in the composition of Puerto Rican fishing communities as well as the opportunities and behaviors of fishers. On the one hand, the state has developed fish landing centers and programs to assist commercial fishers such as the *bona fide* fisher program, and local municipal governments occasionally consult with fishing families in the development of working waterfronts or offer other forms of support. On the other, municipal and insular governments often support, through permitting, subsidies, tax holidays, or other mechanisms, coastal development projects that destroy nursery areas, infringe on or privatize fishing territories, and threaten fishing lifestyles. More directly, state and quasi-state agencies, such as the Departamento de Recursos Naturales (DRNA) and the Caribbean Fishery Management Council (CFMC), manage marine resource by various measures, controlling access to many of the principal species of fishing and shellfish upon which fishers depend. As many of the municipality reports and much of the survey data presented here make clear, this often leads to complaints and disputes over specific management measures, especially those which do not take advantage of fishers' knowledge bases or which seem, to fishers, senseless or immoral (e.g. the waste of fish pulled from a great depth).

Part of the process of managing marine resources includes managing fishing populations, which in turn involves representing them in an ethnographic and sociological sense. Over the past few years, as noted in the paragraphs opening this discussion, this process has entailed developing and attempting to standardize research protocols designed to *profile* fishing communities and assess their *dependence* on and *engagement* with marine resources. We emphasize these words because NOAA uses them to develop a kind of typology of fishery-dependent and fishery-engaged communities, and these designations have become important tools in the regulatory process.

The specific components of community profiles and measures of engagement and dependence, presented below, were developed by social scientists within and outside of NOAA, and are included in solicitations for research projects designed to profile fishing communities in different regions of the country. The "minimum data" needed to profile fishing communities are classed in two categories (see table IV.1 below): socioeconomic and sociocultural, and include general groupings of more specific elements. The "indicators" of dependence and engagement (outline 1) are, in part, lists of things you can count grouped into the four categories of fishing activity, economics, social activity, and cultural activity. For the indicators, however, no guidance has been given regarding what the threshold number of pounds is that differentiates a dependent from an engaged community, presumably because these indicators were developed to be used in a variety of settings (i.e. what constitutes a significant catch in New Bedford, Massachusetts certainly differs from what constitutes a significant catch in Cabo Rojo, Puerto Rico).

Table IV.1. Minimum Data Elements for Community Profiles

General Socioeconomic Variables	Specific Dimensions of Variables
Community and coastal county labor market	• Labor dynamics, malleability, annual rounds • Employment/ unemployment • Alternative Occupations • Income
Public investment in marine infrastructure	
Fishing dependence business	• Industry structure • Employment/ seasonal employment • Sales/ revenue • Seasonality • Form of ownership (e.g. owner/owner-operator vs. corporate)
Residency	• Non-resident but based in the community for fishing and related occupations • Resident in the community
Demographic Variables	• General community and coastal county population: e.g., age, education, ethnicity, gender • Fishery-specific: e.g., age, education, ethnicity, gender
General Socioeconomic Variables	**Specific Dimensions of Variables**
Cultural role of fishing	• History • Cultural events, including tournaments • Religious and secular icons (e.g. blessings of the fleet; fishermen's memorial) • Ethnicity • Kinship and family
Fishing related organizations and their roles in the community and fishery	• Commercial fishing associations a) vessel and business organizations b) fishermen's associations • Fishermen's wives associations • Angler's associations and clubs • Unions • Training institutes
Governance	• Fishermen's participation in community and county government • Fishermen's participation in resource management • Industry structure
Fishing-related programs and services	• Extension programs • NGOs • Health and Safety • Coast Guard

Source: NOAA Fisheries, RFP WC133F-04-RP-0045SKC, 2003

Indicators that Define Fishing Community [(*) = required elements]

1. Level and Type of Fishing Related Activity
    A. Substantial Dependence
        - Pounds landed and processed, by species (*)
        - Number of vessels primary or homeported (*)
        - Access to fishing and related infrastructure outside the community
        - Method of harvest—gear, etc. (*)
        - Types of fishing—commercial, recreational, subsistence, charter, etc. (*)
    B. Substantial Engagement
        - Amount and types of infrastructure (docks, fishing-related businesses, etc.) (*)
        - Number of and types of permits (*)
        - Number of households with fishing or related employees resident (*)
2. Economic Role and Importance
    A. Substantial Dependence
        - Level and percent of fishing and related income (*)
        - Economic vulnerability—amount & source of pressure and competition for fishing and related businesses (*)
        - Available alternative employment (*)
    B. Substantial Engagement
        - Level and percent of fishing and related employment (*)
        - Diversity of target species, gears, vessel sizes (*)
3. Social Role and Importance
    A. Substantial Dependence
        - Amount of local public and private organization budgets allocated to fishing and related planning and support
        - Dollar value (in a range) of in-kind services invested by community organizations, government bodies, and business groups in support of fishing and related businesses/ activities
        - Willingness of fishermen to engage in available alternative employment (*)
        - Perceived level of social capital (social networks, community support, etc.) (*)
    B. Substantial Engagement
        - Number of members of fishing organizations also members of other local/ civic organizations (*)
        - Number of column inches devoted to fishing and related topics in local newspaper
        - Number of fishing and related organizations, their membership size, and their effectiveness in achieving results (*)
4. Cultural Role and Importance
    A. Substantial Dependence
        - Perceived relationship of fishing to quality of life (*)
        - Level of community activity (festivals, planning meetings, etc.) related to fishing and related businesses (*)
        - Level of fish sharing (*)
        - Percent of local diet based on local fish (*)
        - Level of fish use for ceremonial events (*)
        - Presence of treaty rights related to fishing (*)
        - Confidence in fishery future (sees self, children, others having a fishing future) (*)
    B. Substantial Engagement
        - Number of and types of concerns expressed by fishermen, fishermen's spouses, etc about care and use of the oceans and its resources (*)
        - Number of and types of concerns about production orientations that reveal concerns beyond direct utility toward commercialization (*)
        - Percent of population that considers the community to be a "fishing community" (*)
        - Presence of community markers related to fishing (*)

These templates, in as much as they serve to organize and guide research, direct our attention toward some behaviors (perhaps at the expense of observing others) as well as confine our analyses to patterns of behavior primarily *within* the fishing community. Yet no one can conduct research among commercial fishers today without hearing about conflicts over a range of issues, including territorial conflicts between different groups of fishers or between fishers and the state, conflicts over environmental degradation and destruction of wetlands, or conflicts over coastal real estate development and historical or traditional access to marine resources. That fishers become involved in conflicts over marine resources, demonstrating a willingness to fight for them, reflects their dependence on fisheries. Nor can we ignore the fact that fisheries research since the early 1990s has made the point that fishing in many parts of the world, including Puerto Rico, is based in family and household/ domestic economies; as such, "kinship and family," currently included in "cultural role of fishing" in Table IV.1, could as easily be included under socioeconomic variables.

These two dimensions of fishing populations today—their involvement in coastal conflicts and their basis in domestic economies—are what make the literature on transnationalism and peasants relevant to a consideration of fishing communities, in Puerto Rico and elsewhere. Working with the list of elements and indicators above, with reference to central tenets of transnational and peasant studies, it is possible to develop a typology of Puerto Rican fishing communities that enables us to predict the likely impacts of MPAs, seasonal closures, and other regulatory developments. We would hope this would also enable a better appreciation of how the places described in the profiles fit within broader patterns of fishing and life in Puerto Rico.

Most Puerto Rican commercial fishing communities are one of two types, place-based and network-based, which correspond to peasant communities on the one hand and transnational social fields on the other. Place-based fishing communities are similar to peasant communities in that they are physical locations with distinct, identifiable structures and infrastructure; institutions such as churches, post offices, municipal governments, and schools; community calendars that include rites of intensification ceremonies (festivals, such as the Virgin of Carmen ceremony, that reinforce residents' sense of belonging to the community); and, perhaps most importantly, senses of community membership that derive principally from attachment to natural resources. Place-based communities are distinguished physically from network-based communities, separated from other areas within municipalities by physical location, such as small coastal towns that sit apart from other towns, or by infrastructure. Thus, for example, Punta Santiago, in Humacao, is a small coastal town that sits by itself, a place-based fishing community, as is Puerto Real in Cabo Rojo. The downtown harbor region of Mansion del Sapo, Maternillo, and Puerto Real, in Fajardo, also a place-based fishing community, is separated from the main town by a single road that winds through the three neighborhoods. People in place-based fishing communities live in houses and neighborhoods that are adjacent to one another yet may also adjoin other houses and neighborhoods that include people who do not identify themselves as part of the fishing community, just as peasant communities sometimes include people such as magistrates, soldiers, and others who do not engage in peasant farming and do not identify with a peasantry.

Network-based fishing communities have significant physical locations—which usually consist of landing centers, marinas, or other locations where fishers gather—but not all their members live in the same neighborhoods or same area. In rare cases they live in different municipalities and constitute a community only by their joint affiliation to a fishing association. In this sense, network-based fishing communities are similar to interest-based, occupational-based, or other non-place-based communities and thus share similarities with transnational social fields. Generally, various activities, events, and practices (e.g seafood festivals, Virgen del Carmen celebrations, regular sharing of food and drink, etc.) reinforce

membership in and allegiance to the community, and the knowledge that members of these communities possess and pool is often a key factor in defining community membership. The fishers who fish from La Guancha in Ponce, for example, constitute a network-based fishing community, as do the fishers from La Puntita in Yabucoa, Palmas Del Mar in Humacao, and Crashboat in Aguadilla. Network-based communities are becoming more common in Puerto Rico and gentrification and leisure capital development force more and more fishers from coastal locations.

The importance of knowledge bases within these community types cannot be underemphasized, suggesting a third community type among Puerto Rican fishers: knowledge-based communities. Knowledge-based communities in Puerto Rican fishing include members of both place-based and network-based communities, but generally cut across municipality lines and include all those who fish a specific territory with a specific gear or who become involved in a dispute against a common opponent for a common purpose. Thus fishers involved in the dispute against the Navy in Vieques, which included fishers from Vieques and nearly all other eastern municipalities, as well as some from as far away as Dorado—all of whom fish the waters between Vieques, Fajardo, and Culebra—could be considered a knowledge-based fishing community.

IV.b.1. Fisheries-Dependent and Fisheries-Engaged Communities in Puerto Rico

Rationale for the Development of an Index of Dependence

Place-based, network-based, and knowledge-based fishing communities in Puerto Rico can be either fisheries-dependent or fisheries-engaged. To assess dependence and engagement in Puerto Rican fishing we include in the table below those data elements and indicators that our ethnographic and other work have shown to be important. While we call this an index of dependence, we view the distinction between dependence and engagement as one of degree rather than kind (see definition at the beginning of this chapter). Hence, the index represents a gradient from substantially dependent to substantially engaged. Given that this is an ordinal measure, which we discuss more below, it is difficult to assign a particular score in which a community shifts from fishery dependent to fishery engaged, yet clearly most of those with scores above 19 are fishery dependent, just as those with score below 10 are fishery engaged. The value of the index, however, lies not in its ability to label each community fishery dependent or fishery engaged based on its score, but to give an indication of what a fishery dependent community looks like and to give some indication where it lies in relation to other fishing communities.

We have created an index of 8 items, along with a scoring system, that includes the data elements and indicators that NOAA fisheries' scientists (and their consultants) have deemed most appropriate to profiling fishing communities and that are relevant to Puerto Rico. Again, the items we included in the index were based on our experience with Puerto Rican fisheries and our understanding of the kinds of social and economic phenomena that are important indicators of an active fishing population. Data for this index come from principally from the ethnographic work on this report, but we have also drawn on landings data and other secondary sources. This index, we argue, reflects the degree to which a fishing community is entangled with other businesses, cultural events, and practices in their coastal environments. As such, it is as much a reflection of how much fishing families rely on their community as how much a community depends on fishing as a central component of its character. The items in the index, scoring system, and the relation of the items to relevant minimum data elements and indicators are as follows:

- Community type: Place-based or network-based. The former are highly likely to be fisheries-dependent, the latter to include a mix of fisheries-dependent and fisheries-engaged communities; thus we assign place-based communities a score of 2 and network based a score of 1. This relates to Table IV.1's variables related to residency.
- Ratio of full-time (bona fide) to part-time fishers (from either the ethnographic work, the fisher census, or both): This item in the index reflects the "labor market" and "fishery dependent business" variables in Table IV.1 above, in that a higher ratio of full- to part-time fishers reflects lower seasonality, lower unemployment within fisheries, and so forth. We can assume, too, that most part-time commercial fishers will be involved in alternative occupations. Because it represents so many of the data elements and indicators in the table and outline above, we computed the ratio as follows:

$$I_s = \frac{\boldsymbol{Nft}}{N} \times 10$$

  Where I is the indicator value at site *s, Nft* is the number of full-time fishers at the site, and N is the total number of fishers at the site. *A* ratio of 0 means that all the fishers from this location fish part-time.[23]
- Ties to Tourism: 1 point for each *type* of seafood restaurant supplied by local fishers (e.g. mobile, kiosk, casual, elegant), 1 for each other service provided to tourists (e.g. "six-pack" for hire, bait sales, allowing the use of *muelle* and facilities for recreational fishing, storing recreational vessels in yards or at association facilities). The nature and extent of ties to tourism indicate a level of community integration, reflecting such indicators as levels of social capital, economic vulnerability, levels of community activities related to fishing, etc. Links to tourism also indicate the wider community's dependence on its fisheries as a source of fresh fish in local, varied seafood restaurants, on fishers for transportation services, and so forth.
- Involvement in coastal conflict: 3 points if directly involved in conflict/ dispute; 1 point if indirectly involved.
- Ties to state: 1 point for each tie that enables improved fishing capability (e.g. the acquisition of fishing vessels in Rincón). This reflects the area of governance as well as local public and private support of fishing in the community.
- Fishing Infrastructure: 1 point for each active *Villa Pesquera* (includes freezers, lockers, pier/*muelle*, etc.), 1 for a *Club Nautico*, 1 for a functioning seafood market, 1 for each functioning seafood restaurant (at the association), 1 for boat building/ repairing on site, 1 for fishers experimenting with new gear designs or possessing special knowledge about gear manufacturing, etc. Minimum data elements these relate to are public investment in marine infrastructure and fishery related organizations; indicators they relate to are amount and types of fishing infrastructure, public and private support, etc.
- Ceremonial Infrastructure/ activity: 1 for holding a Virgen del Carmen festival or other festival (seafood, blessing of the fleet, etc.), 1 for a Virgen Del Carmen Statue, 1 for a Virgen Del

[23] Coming up with this figure often meant examining the census and ethnographic data in extreme detail, because in many communities informants had difficulty giving accurate estimates of the numbers for full-time and part-time fishers. This entailed examining the distribution of fishers who responded to the census, based on specific landing centers or addresses, determining what proportions of fishers from specific communities fished less than 40 hours per week, and then applying that percentage to the total number of fishers for that community, based on the ethnographic work.

Carmen Chapel, 1 for every other piece of ceremonial infrastructure on public display (e.g. fisher statues in Parguera or Juana Díaz, mural in Loiza, historical plaza in La Playa, Ponce, etc.).

- Rank in the landings data: We scored the landings data on a range from 1 to 5, based on the following formula from the Work Environment Index (WEI) developed by researchers at University of Massachusetts (Heintz, Wicks-Lim, and Pollin 2005):

$$I_i = \frac{X_i - min\ \{X\}}{max\ \{X\} - min\ \{X\}} \times S$$

Where I_i is the indicator value for the municipality *i*, X_i is the 1999-2003 landings data for that municipality, *S* is the maximum value in the index (in this case, 5), *min {X}* is the minimum for landings data and *max {X}* is the maximum. The maximum amount reported by a single landing center in our list, from 1999 to 2003, was 655,891 pounds, in La Parguera, and the minimum was 2,371, in El Faro. While the WEI uses a range of from 1 to 10, we selected a range of 1 to 5 for this indicator so that the landings data did not overwhelm the other components of the index. That is, the other indicators will generally score no more than 5.

We emphasize that any one of the above items in the index is fallible, either because we did not thoroughly canvas the community during our ethnographic work or because one or another of the community's features are hidden or difficult to observe readily. When we combine these elements, however, threats to the accuracy of the index are reduced. We also note that we have not scored all of the sites we visited, because in some cases our visits to the site were too cursory or brief, or we were not able to interview any knowledgeable fishers about the site. A complete list of the sites we visited, which constitutes a nearly complete list of all important fishing sites in Puerto Rico, can be found in Table I.5 in the introduction to this report.[24]

Table IV.2. Dependence/ Engagement Index for Puerto Rican Fishing Communities

Community	Type	Ratio	Ties to Tourism	Conflict	State Ties	Fishing IF	Ceremonial IF	Landings Ranking	Total Score
La Parguera, Lajas	2	5.0	7	3	1	5	2	5.00	**30.00**
Puerto Real, Cabo Rojo	2	3.0	5	3	0	8	3	4.74	**28.74**
La Guancha, Ponce	1	3.15	8	0	1	6	2	3.68	**27.98**
La Playa, Ponce	2	6.59	5	0	1	4	4	3.68	**26.27**
Punta Santiago, Humacao	2	6.45	7	0	1	6	2	1.76	**26.21**
Pozuelo, Guayama	2	2.86	7	3	0	7	2	1.58	**25.44**
La Estela, Rincón	2	6.15	5	0	2	5	2	3.61	**25.31**
Downtown Harbor, Fajardo	2	5.00	6	3	0	4	3	2.27	**25.27**
Las Croabas, Farjardo	2	6.25	6	3	0	3	1	2.38	**23.63**

[24] We consider this a "nearly complete" list because we may have overlooked one or more sites, although we consider the list in table I.5 comprehensive in the sense that it includes all place-based fishing communities and all of the most important sites that serve as focal points for network-based fishing communities. It likely does not include all recreational fishing sites, primarily because recreational fishing can be accomplished from nearly any bridge or other infrastructure.

Community	Type	Ratio	Ties to Tourism	Conflict	State Ties	Fishing IF	Ceremonial IF	Landings Ranking	Total Score
Esperanza, Vieques	2	3.65	5	3	1	4	1	3.76	**23.41**
Húcares, Naguabo	2	4.47	5	1	1	4	2	3.68	**23.15**
Playa/ Playita, Salinas	2	6.36	5	3	0	3	2	1.75	**23.11**
El Seco, Mayagüez	2	3.89	6	0	1	4	3	2.35	**22.24**
Isabel Segundo, Vieques	2	3.65	4	3	1	4	1	2.36	**21.01**
Vieques, Loíza	2	3.3	4	3	1	5	1	1.39	**20.69**
Patillas Bajo	2	7.00	4	0	1	4	1	1.44	**20.44**
El Boquete, Peñuelas	1	10.00	4	0	0	3	0	1.99	**19.99**
Puerto Arroyo	2	1.90	5	0	2	4	3	1.66	**19.56**
Guayanes/ La Puntita, Yabucoa	2	6.33	2	3	1	4	0	1.05	**19.38**
Sardinera, Fajardo	1	4.41	5	3	1	3	1	.24	**18.65**
Combate, Cabo Rojo	2	5.00	3	0	0	4	0	4.56	**18.56**
Los Machos, Ceiba	1	5.93	2	3	0	4	0	2.36	**18.29**
Crash Boat, Aguadilla	1	2.37	3	0	1	5	2	3.40	**17.77**
GuaypaoEsperanza, Guanica	2	8.57	0	3	0	2	1	.72	**17.29**
Palmas, Humacao	1	5.26	3	3	0	4	0	1.01	**17.27**
Malecon, Guanica	1	5.0	4	3	0	1	0	3.06	**17.06**
Playa, Santa Isabel	2	4.06	2	0	1	4	1	.88	**15.94**
Culebra	2	1.66	6	1	1	3	0	.80	**15.46**
Cerro Gordo, Vega Alta	2	6.66	3	0	0	3	0	.63	**15.29**
Barrancas, Guayama	2	3.50	2	3	0	2	1	1.66	**15.16**
Punta Tuna, Maunabo	2	7.00	3	0	0	2	0	.93	**14.93**
Playa, Guayanilla	2	3.5	4	0	0	1	2	2.07	**14.57**
Pastillo, Juana Díaz	2	5.38	0	0	0	3	1	2.91	**14.29**
El Maní, Mayagüez	2	4.68	1	0	0	2	3	.54	**13.22**
Espíritu Santo, Río Grande	1	1.15	3	3	0	4	0	1.00	**13.15**
Rio de La Pla, Dorado	2	1.42	6	0	0	2	1	.63	**13.05**
Cataño Centro Agropecuario, San Juan	2	3.66	2	0	2	2	0	1.38	**13.04**
Río Cíbuco, Vega Baja	1	2.5	2	3	0	4	0	.12	**12.62**
Barrio Espinal, Aguada	2	2	3	0	0	2	0	3.08	**12.08**
La Hoare, San Juan	1	1.85	1	0	2	4	0	1.57	**11.42**
Papayo, Lajas	2	5.45	1	0	0	1	1	.87	**11.32**
Luquillo	1	2.5	2	3	1	0	1	.32	**10.82**
Bahia Salinas, Cabo Rojo	2	2.80	3	0	0	2	0	3.62	**10.42**
Tres Hermanos, Añasco	2	2.00	2	2	0	0	3	1.29	**10.29**

Community	Type	Ratio	Ties to Tourism	Conflict	State Ties	Fishing IF	Ceremonial IF	Landings Ranking	Total Score
Boquerón, Cabo Rojo	1	.66	4	1	0	3	0	1.10	**9.66**
Punta Sardina, Isabela	2	0	2	0	1	2	2	.29	**9.17**
Princesa, San Juan	1	3.75	1	0	0	2	0	1.38	**9.13**
El Docky, Mayagüez	1	1.33	1	0	0	1	3	.40	**7.73**
Las Mareas, Salinas	2	0	4	0	0	1	0	.23	**7.23**
Cana Gorda, Guanica	1	0	3	0	0	2	1	0	**7.00**
Jarielito, Arecibo	2	.93	0	0	0	1	0	1.59	**5.52**
El Faro, Guayanilla	2	0	2	0	0	0	0	0	**4.00**
Punta La Cuchara, Ponce	2	0	0	0	0	0	0	0	**2.00**

We need to keep in mind that this is an ordinal measure, or a ranking. In other words, we cannot say that a community or site that receives a score of 10 is half as dependent on fishing as one that receives a score of 20 any more than we can say that 10º Fahrenheit is half as cold as 20º Fahrenheit. We can assume that fishing is probably more important in a community that receives a score of 20 as compared to one that receives a score of 10, but we cannot know *how much* more important. Because of this, too, in cases where scores are within a point or two of one another, it would be difficult to say that fishing is that much more important in the one community over the other. The map below (Puerto Rico Fishing Communities and Dependency Scores) illustrates the regional variation in dependence. Because many of the communities cluster together, the map is intended primarily to give the broad contours of dependence without focusing on any single community. Those who to view more detailed maps, where communities' dependence scores are depicted relative to other communities, to the characteristics of the coastline, and so forth, can refer to the maps in Volumes II and III. Table IV.3., following the map, presents a complete list of fishing communities in Puerto Rico.

Despite whatever lingering problems this index may have, the rankings that emerge from the table conform, in most cases, to our intuitive understandings about these sites and communities, based on years of ethnographic work. We field tested the index by visiting communities where we knew fishing to be central to the community identity and seeing whether or not all the elements the index would predict were, in fact, present, and found that they were. This table thus gives a sense of what more dependent or more engaged fishing communities look like in Puerto Rico. Those at the high end, such as Puerto Real, Puerto Real, Fajardo's Downtown Harbor, are place-based, with relatively high ratios of full-time to part-time fishers, multiple ties to tourism, elaborate fishing and cultural infrastructure, and of course high landings. Generally they are involved in conflicts of some sort, and often have close ties to the state. Those at the low end can be either place-based or network-based, yet they tend to have no or poorly developed fishing and cultural infrastructure, few ties to tourism, and comprised mostly of part-time fishers whose landings are predictably low.

Map IV.1. Fishing Communities and Their Dependency Scores for Puerto Rico

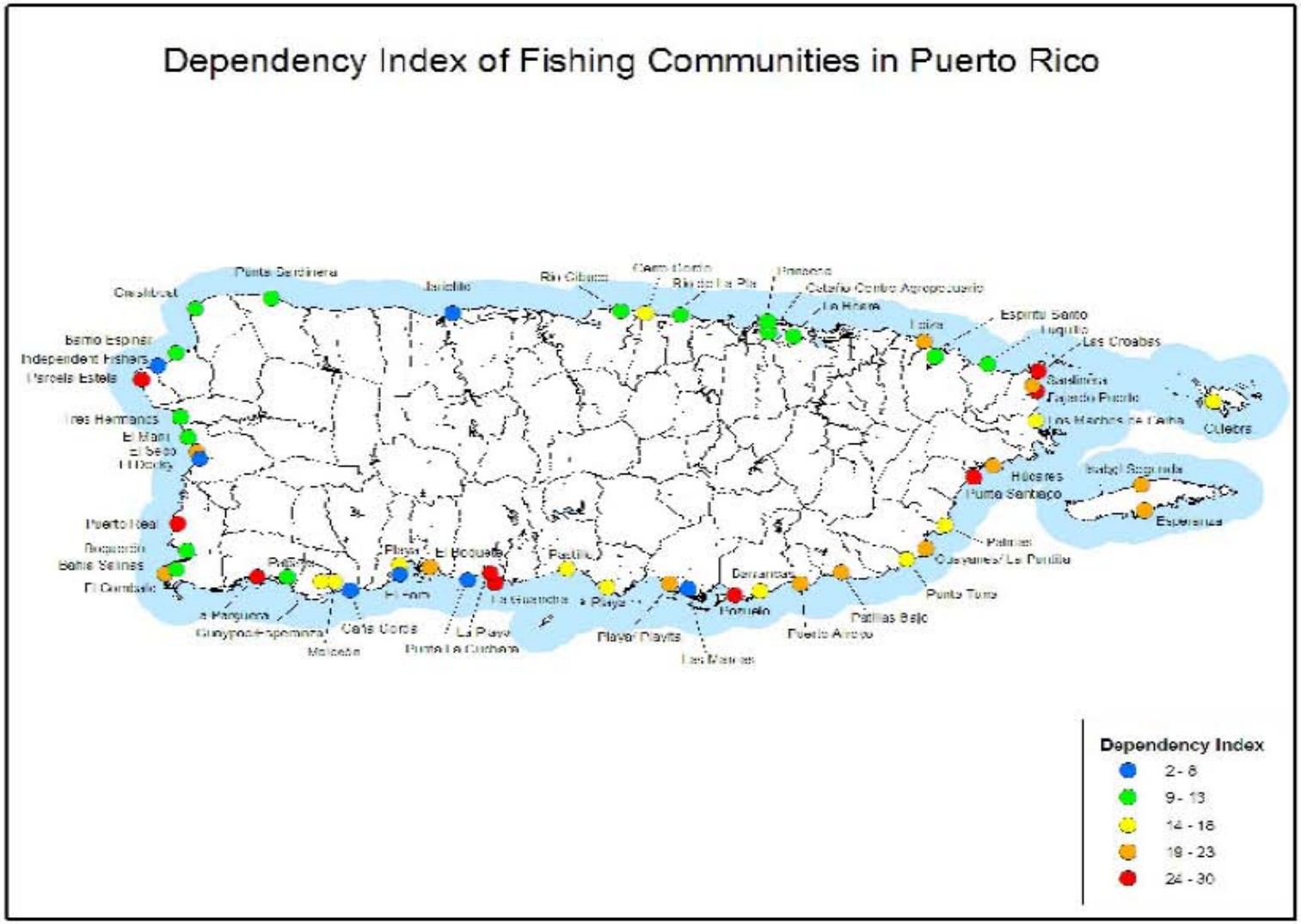


Table IV.3. lists, to the best of our knowledge, all the fishing communities in Puerto Rico, indicating our level of research effort in each. Given the entangled nature of fishing communities in Puerto Rico, combined with the greater importance of fishing in some communities than others, it was inevitable that our research coverage was uneven across Puerto Rico's coast. The list is based on a combination of direct observation through field visits, previous research, DRNA data on landing centers, and maps.

Table IV.3. Fishing Communities and Landing Centers of Puerto Rico

Community Name	Assigned Score	Visited In Study	Needs Research*
1. Punta Sardina, Isabela	X	X	
2. Terranoya, Quebradillas			X
3. Peñon Amador, Camuy			X
4. Puerto Hermino, Camuy		X	X
5. Punta Maracayo, Hatillo		X	X
6. Pueblo, Hatillo			X
7. Jarielito, Arecibo	X	X	
8. Las Palmas Altas, Barceloneta		X	X
9. Punta Manatí, Barcelonta		X	X
10. Boca California, Manatí		X	X
11. Puerto Nuevo, Vega Baja 12. (Rio Cíbuco)	X	X	
13. Cerro Gordo, Vega Alta	X	X	
14. Mameyal, Dorado 15. (Rio de la Pla)			
16. Palo Seco, Toa Baja		X	X
17. La Puntilla, Cataño 18. (Centro Agropecuario)	X	X	
19. Princesa, San Juan	X	X	
20. La Hoare, San Juan	X	X	
21. La Coal, San Juan		X	X
22. Vieques, Loíza	X	X	
23. Ancones, Loíza			X
24. Parcelas Suarez, Loíza			X
25. Mediana Baja, Loíza			X
26. Palmer, Río Grande 27. (Espíritu Santo)	X	X	
28. Luquillo	X	X	
29. La Croabas, Fajardo	X	X	
30. Sardinera, Fajardo	X	X	
31. Downtown Harbor, Fajardo	X	X	
32. Pueblo, Culebra	X	X	
33. Esperanza, Vieques	X	X	
34. Isabel Segundo, Vieques	X	X	
35. Los Machos, Ceiba	X	X	
36. El Corcho, Naguabo			X
37. Húcares, Naguabo	X	X	
38. Punta Santiago, Humacao	X	X	
39. Punta Candelero, Humacao	X	X	

Community Name	Assigned Score	Visited In Study	Needs Research*
40. (Palmas)			
41. Buena Vista, Humacao			X
42. La Puntita, Yabucoa	X	X	
43. Punta Tuna, Maunabo	X	X	
44. El Faro, Maunabo			X
45. Bajo, Patillas	X	X	
46. Guardarraya, Patillas		X	X
47. Playa, Arroyo 48. (Puerto Arroyo)	X	X	
49. Jobos, Guayama		X	X
50. Barrancas, Guayama	X	X	
51. Pozuelo, Guayama	X	X	
52. Playa, Salinas	X	X	
53. Las Mareas, Salinas	X	X	
54. Central Aguirre, Salinas		X	X
55. Playa, Santa Isabel	X	X	
56. Cortada, Santa Isabel		X	X
57. Pastillo, Juana Diaz	X	X	
58. La Playa, Ponce	X	X	
59. La Guancha, Ponce	X	X	
60. Punta La Cuchara, Ponce	X	X	
61. Tallaboa, Peñuelas 62. (El Boquete)	X	X	
63. Bahia, Guayanilla 64. (Playa)	X	X	
65. El Faro, Guayanilla	X	X	
66. Bahia, Guanica 67. (Malecon)	X	X	
68. Salinas Providencia, Guanica		X	X
69. Guaypao, Guanica	X	X	
70. Caña Gorda, Guanica	X	X	
71. La Parguera, Lajas	X	X	
72. Papayo, Lajas	X	X	
73. Puerto Real, Cabo Rojo	X	X	
74. El Combate, Cabo Rojo	X	X	
75. Bahia Salinas, Cabo Rojo	X	X	
76. Boquerón, Cabo Rojo	X	X	
77. El Seco, Mayagüez	X	X	
78. El Maní, Mayagüez	X	X	
79. El Docky, Mayagüez	X	X	
80. Tres Hermanas, Añasco	X	X	
81. Parcela Estela, Rincón	X	X	
82. Barrio Espinal, Aguada	X	X	
83. Guaniquilla, Aguada		X	X
84. Higuey, Aguadilla			X
85. Tamarindo, Aguadilla			X
86. Crash Boat, Aguadilla	X	X	

A SURVEY OF FISHING IN PUERTO RICO

As part of our overview of fishing communities in Puerto Rico, we conducted a survey covering all the municipalities of the main island, using a survey instrument that we developed and pre-tested during the summer of 2004. Survey development, pre-test, and the OMB clearance package were done in conjunction with NOAA fisheries personnel and a research team conducting a sister study in the U.S. Virgin Islands. Our survey was translated into Spanish and reworked slightly due to initial interviews/ additional pre-tests that we conducted in Puerto Rico, given the cultural and linguistic differences between Puerto Rico and the other U.S. Caribbean territories (see Appendix A: Research Protocols & Survey Instrument).

V.a. Sampling and Interviewing

Two groups of university undergraduate students, briefed on current fishing practices by Dr. Valdés Pizzini and overseen by Dr. Pérez Lugo, both of the University of Puerto Rico, Mayagüez, administered the survey: one based in the west and one in the east. They visited the field in pairs to interview fishers, in most cases specializing on a specific region to become familiar with the distribution of fishers' households and places they might intercept fishers. Early visits to coastal communities were necessary both to familiarize research assistants to fishers and to familiarize fishers to the idea of participating in a survey. The latter was particularly important, given the contentious environment that surrounds fishing and fishing regulations in Puerto Rico today. This environment has led many fishers to withhold information such as landings data from official collection, and there was ample reason to believe that we would encounter opposition to surveying at this time. Our response rate, however, was quite high when we were able to contact the person selected (in 122 cases, the person's contact information was not accurate or was obsolete).

Once field researchers familiarized themselves with the areas, we provided interviewers with lists of randomly sampled fishers from the Puerto Rican census of fishers as well as a list of sites where they were liable to intercept recreational or subsistence fishers. The potential respondent universe included commercial, professional recreational (charter boat fishermen), recreational, and subsistence fishers across Puerto Rico, although we allowed fishers to self-identify themselves. In some cases, fishers whose names we obtained from the Puerto Rican fisher census identified themselves as recreational fishers; in other cases, fishers we intercepted at popular recreational fishing locations identified themselves as commercial fishers. The following attributes of these populations recommended a multi-method approach to sampling:

1. The numbers of commercial fishers captured in the Puerto Rican census have fluctuated from around 1,500 to 2,500 since the early years of the census, although the most recent census included only 1,132 records. Both the fluctuating numbers and the low recent count reflect common patterns of moving in and out of fishing in response to such factors as alternative, non-fishing employment opportunities, particularly in construction, migration to the U.S. mainland for work or family reasons, declining catches, and other causes, and other factors. In addition, the census may be more likely to include full-time fishers, those affiliated with associations, and other highly visible fishers but to overlook those who fish more casually. While the census is an important sampling tool, random sampling from the census alone would yield a biased sample.

2. There is no current list of all recreational and subsistence fishers in Puerto Rico, and it is unlikely that many of these individuals are included in the fisher census or other official information sources. Vessel licensing data, for example, includes too many individuals who are only recreational boaters and have little or nothing to do with fishing.
3. The numbers of professional recreational fishers (charter boat captains) are very low, highly visible, and a majority of them were easily captured during an ethnographic phase of the project.
4. Fishing activity varies through the year, with the first five months of the year highly active, the summer and autumn months (hurricane season) often the slowest, and November and December moderately active (in part because holiday demand for poultry and pork reduce the demand for fish).

Given these attributes of the fishing populations of Puerto Rico, we combined random sampling from the census of fishers with intercept sampling. Intercept sampling is the most common sampling method used for recreational fishers. It consists of intercepting fishers at common recreational fishing locations: Clubs Nauticos, marinas, piers, bridges, and other coastal infrastructure that allow fishing. We determined where these were during the ethnographic phase of the research and randomized the times we visited these areas, concentrating primarily on weekend visits. Combining these methods, we believe we have produced a sample population that is normally distributed, or one in which 68.26% of all those surveyed fall within one standard deviation of the mean and 95.44% within two standard deviations, or a confidence interval of 95% (Bernard 2002: 172; Norusis 2002: 236).

This sampling strategy resulted in 439 successfully completed interviews, part of which have been selected at random and part through an intercept method; for portions of this report, we focus exclusively on those randomly selected, believing that they are a more accurate representation of Puerto Rican fishers. Regardless of how they were sampled, survey respondents were paid $10.00 for participating. Of the 439 total interviewed, 269 were randomly selected from the census of fishers, with a handful of these identifying themselves as primarily recreational fishers.[25] This figure constitutes between 7% and 14% of the total number of commercial fishers in Puerto Rico, depending on whether or not one places the total at 1,500 or 2,500. In either case, this represents a solid cross-section of the population. Table V.1 presents additional data regarding the sampling.

[25] Although 439 individuals were surveyed, the total number for each table presented in this section is rarely 439, but less, due to missing data.

Table V.1 Survey Response Success

Variable	Number
Estimated Total Population	
> Commercial	1,500
> Recreational	167,000
Number Targeted	450
Number of Contacts	671
Number Completed	439
> Number Randomly Selected	269
> Number Intercepted	170
Reasons for Non-Response	
> Unable to contact	122
> Unable to arrange time	76
> Refusal to participate	21
> No longer fishing or other	13

V.a.1. Data Quality Issues

Survey data are usually problematic, for the simple reason that they provide a cross section of a population based on brief interactions with respondents about whom we usually cannot know things such as their propensity to misrepresent facts, remember incorrectly or selectively, or their state of knowledge about a specific phenomenon. We held a small focus group with five of those involved in the data collection and data processing to address problems with the interviewing and with the questionnaire, and we present some of the results from that discussion here to assist in the interpretation of the results. First, the interviewers acknowledged that the field settings in which they worked were often settings of conflict and, occasionally, hostility. These field conditions derive from widespread perceptions among fishers in Puerto Rico (in line with fishers elsewhere) that state regulations will eventually displace them from fishing entirely. Specific complaints included the recent changes to the licensing system, which they view as too costly and complex, the failure of state agencies to deal with marine resource contamination or destructive fishing practices (e.g. reef fishing for octopus with Clorox), recreational divers stepping on reefs, the destruction of habitat (particularly mangrove forests), size limits on local species but not on imports, and the heavy-handed enforcement of the *Departamento de Recursos Naturales* (who, some claimed, will circle and board their boats repeatedly and intentionally scare away fish).

One of the problems of the questionnaire was that it attempts to capture a complex activity that changes through the week and through the year with a series of mostly closed questions. Questions about how many days they fish in a given month, for example, were often answered with *"depende"*—it depends: on weather, primarily, but also on other jobs, fuel prices, the availability of crew, and so forth. Asking about the "targeting" of species was also problematic, suggesting that many fishers do not target single species but instead engage in multispecies fishing. This is especially the case with the use of gear such as traps, which catch a variety of species, or where fishing takes place over coral reefs, where several species are liable to take the same bait with the same or similar gear. Only divers can truly target species.

Some fishers declined to participate in the survey because they believed their responses would fall on deaf ears among regulators, and that it was, in short, *"no vale la Peña"*—not worth the trouble. Interviewers were instructed not to be confrontational, but to elicit data and refrain from questioning respondents when

contradictions within the questionnaire occurred (e.g. a fisherman calling himself recreational but then selling 100% of his catch to a fishing association).

We have broken down the discussion of the survey data into several components, given the varied nature of fishing in Puerto Rico. The first section, an overview, gives basic statistics about the survey data itself: regional distribution of the interviews, the ways in which they were selected (intercepted vs. randomly from the census), the distribution of the survey respondents over types of fishing groups (e.g. commercial, recreational, crew, captain, etc.), and so forth. Following this, however, we examine a few variables with reference to the entire sample, some of which are better considered in light of subsamples of, say, recreational vs. commercial fishers. We reserve most of our discussion of the section of the survey on MPAs, however, for the policy section at the end of this report.

V.b. Overview of the Data: Regional Distribution, Sample, and Types of Fishers

Table V.2 presents the distribution of recreational and commercial fishers by sampling method, showing clearly that many more commercial fishers were picked up by the random technique while many more recreational fishers were included via an intercept sample. This was expected, of course, but it is interesting that 3% of those sampled from the fishery census labeled themselves recreational fishers. During our focus group with interviewers, there was a general consensus that these individuals were very likely calling themselves recreational because they did not report commercial fishing income on their taxes.

Table V.2. Sample Type by Commercial vs. Recreational Status*

Sample	Commercial Fishers	Recreational Fishers
Random	256 (58.6%)	13 (3%)
Intercept	54 (12.4%)	113 (26%)
Total	**310 (71%)**	**126 (29%)**

Pearson's chi-square = 197.963; df = 1; p< .001[26]
*Missing data for 3 fishers.

The sampling scheme resulted in uneven representation across the regions, with some areas overly represented and others, such as Lajas, underrepresented.[27] While this would be in line with the uneven regional distribution of fishing effort around Puerto Rico, it is clear that it was influenced by interviewer bias (e.g. some interviewers being more zealous than others) and other sources of bias. Table V.3 shows the distribution of interviews by municipality, listing the municipalities in the order they appeared in Table I.1, which ranks them by landings.

[26] Generally, $p < .05$ is considered statistically significant.
[27] Vieques and Culebra were not included in the survey work.

Table V.3. Interviews by Municipality

Municipality	N. Interviews	Percent	Municipality	N. Interviews	Percent
1. Cabo Rojo	29	6.8	22. Arecibo	3	.7
2. Lajas	9	2.1	23. Loíza	11	2.6
3. Vieques	0	0	24. Vega Baja	17	4.0
4. Aguadilla	24	5.6	25. Yabucoa	11	2.6
5. Guánica	4	.94	26. Añasco	10	2.3
6. Fajardo	33	7.7	27. Patillas	2	.47
7. Naguabo	12	2.8	28. Cataño	8	1.9
8. Rincón	15	3.5	29. Rio Grande	7	1.6
9. Juana Díaz	2	.47	30. Carolina	5	1.2
10. Ponce	19	4.4	31. Maunabo	6	1.4
11. Guayama	14	3.3	32. Culebra	1	.23
12. San Juan	24	5.6	33. Barceloneta	7	1.6
13. Mayagüez	33	7.7	34. Vega Alta	5	1.2
14. Humacao	31	7.3	35. Dorado	5	1.2
15. Aguada	12	2.8	36. Manatí	2	.47
16. Ceiba	4	.94	37. Isabela	22	5.1
17. Salinas	6	1.4	38. Luquillo	2	.47
18. Guayanilla	2	.47	39. Camuy	4	.94
19. Peñuelas	3	.7	40. Hatillo	1	.23
20. Santa Isabel	7	1.6	41. Toa Baja	4	.94
21. Arroyo	6	1.4	Other	5	1.2
			TOTALS	**427**	**100**

In designing the survey instrument, we were sensitive to the fact that there are many different kinds of recreational and commercial fishers, ranging from boat or shore fishermen to *proeles* (commercial fishing crew) to captains of commercial vessels or charter boats. We developed a list of these categories based on our ethnographic work and familiarity with Puerto Rican fishers, asking fishers to identify themselves according to one of 11 categories. The majority self identified themselves as commercial fishers. Table V.4 presents these data.

Table V.4. Types of Fishers Interviewed

*("Actualmente, que tipo de pesca realiza mayormente?")**

Type of Fisher	Number Interviewed	Percent
Commercial Vessel Captain	257	58.9
Commercial Crew	36	8.3
Charter Boat Captain	3	.7
Charter Boat Crew	2	.5
Dive Boat Captain	10	2.3
Dive Boat Crew	2	.5
Recreational Vessel Captain	46	10.6
Recreational Vessel Crew	22	5.0
Shore Recreational Fisher	19	4.4
Subsistence Fisher (fishes for food)	14	3.2
Fishes for Supplemental Income	7	1.6
Other	18	4.1
Total	**436**	**100**

*Actually, what type of fishing do you do most often?

We collected very few demographic statistics, in hopes of keeping the interview short, avoiding issues of a private nature, and keeping the questions focused on fishing. These data are included in the following table, which show that the majority of those interviewed are married and living in households that range in size from around 2 to 5 individuals, where between 0 and 3 people earn income from fishing.

Table V.5. Marital Status and Household Characteristics

Marital Status	Percent
Married	66.0
Single, never married	18.9
Divorced	8.2
Widowed	3.0
Other	3.9
Mean Household Size	3.24 (sd = 1.577)
Mean Number who Earn Money from Fishing	1.30 (sd = 1.153)

V.b.1. General Results

In this section we examine data we collected for the entire sample, prior to conducting work of a more comparative nature and focusing on groups within the larger data set. One of the early questions we asked concerned learning about fishing, in part to address the commonly held notion that fishing in Puerto Rico is a family enterprise. Table V.6 seems to confirm this.

Obviously, most respondents learned to fish from their fathers, although many learned from friends. While we asked specifically about who had taught them fishing *as a profession or occupation*, recreational fishers answered this question as frequently as commercial fishers, perhaps viewing fishing as more than a mere leisure activity (e.g., one that can yield food or income). This would be in line with historical information about fishing, which suggested it was critical to coastal livelihoods during dead

times in the sugar industry, as well as with the common complaint by commercial fishers that, during downturns in the economy, those who know fishing fall back on it for additional income.

Table V.6. Person who Introduced Respondent to Fishing
*("Quién lo introdujo a la pesca como profesión u ocupación?")**

Person	Number Interviewed	Percent
Father	202	47.1
Mother	5	1.2
Spouse	2	.4
Brother	7	1.6
Sister	1	.2
Son	5	1.2
Cousin	5	1.2
Friend	92	21.4
Father or Mother-in-law	15	3.5
Other	95	22.1
Total	**429**	**100**

*Who introduced you to fishing as a profession or occupation?

Respondents used a variety of gear types for many species. We cannot list them all because there are too many species to fit into tables neatly. As noted earlier, Puerto Rican fishers fish multiple gear types for multiple species. Survey data reflect this. Table V.7 shows the percentage of fishers who reported using from 1 to 7 gear types, comparing the entire sample with the commercial and recreational groups. A majority of the commercial fishers (63%) use at least three gear types and over one-third use at least 4 types, while a majority of recreational fishers use at least two types and over one-third use three types.

Table V.7. Number of Gear Types Reported by Commerical and Recreational Fishers (n=439)

N. Gear Used	Percent of Total Reporting	Percent of Commercial Fishers Reporting	Percent of Recreational Fishers Reporting
1	98.9*	99.0	99.2
2	80.2	85.2	68.3
3	56.5	63.2	39.7
4	32.8	37.4	20.6
5	18.9	21.6	11.1
6	5.0	6.1	1.6
7	2.1	2.6	.8

*Total lower than either of the two groups due to rounding error.

Even though commercial fishers, as predicted, use multiple gear types, it is notable that the proportion of recreational fishers using three or more gear types is also fairly high. The most common gear type listed, for the total sample, was "hooks and lines," listed by 25.8% as their first gear, followed by traps (12.4%), trammel and gill nets (10.1%), beach seines (9%), and SCUBA gear (8.8%). The most common two species listed as their first most important species were *chillo* (silk snapper—14.1%) and *langosta* (lobster—12.1%), with other common species being *colirubia* (yellowtail snapper—9.1%), *sierra*

(kingfish or king mackerel—5.5%)[28], *arrayo/ arrayado* (lane snapper—4.6%), *carrucho* (conch—4.3%), *mero* (grouper—4.1%), but like the landings data, fishers listed dozens of species, most accounting for less than 1% of the catch. Table V.8. examines these data in somewhat more detail, matching specific gear to the three most important species targeted by those who use that gear type. We emphasize, however, that in some cases the gear and species seem not to match (e.g. silk snapper captured by beach seine or kingfish with SCUBA gear). This is due to the fact that, just noted, that fishers use multiple gear types and they reported as their 1st Species one that they do not normally catch with their principal gear.

Table V.8. Principal Gear by Principal Species Captured (n=439)

Gear Type	1st Species	2nd Species	3rd Species
Hooks & Lines	Silk Snapper	Yellowtail Snapper	Kingfish
Traps	Lobster	Conch	Silk Snapper
Gill net/ trammel net	Snappers (variety)	Snook	Lobster
Beach seine	Silk Snapper/ other snappers	Lobster	Tuna
SCUBA gear	Lobster	Conch	Kingfish

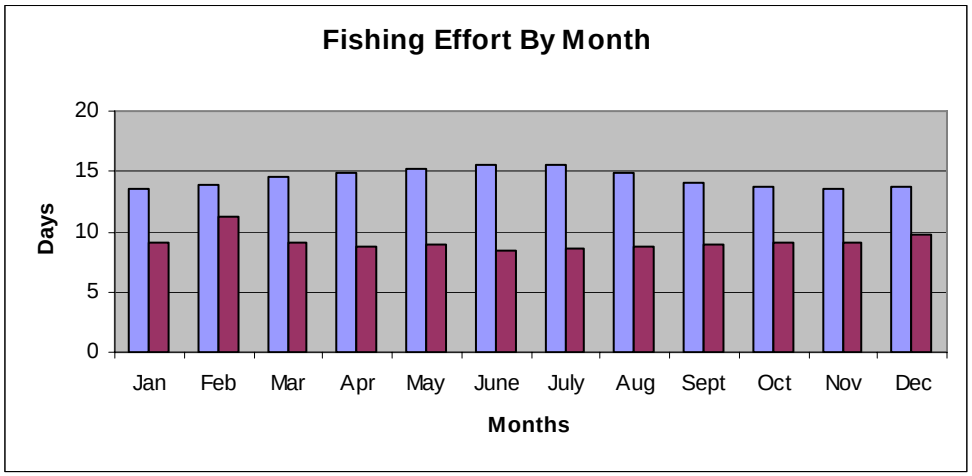
Given the changes affecting marine resources from a variety of sources, we were interested in examining whether or not gear types and species captured had changed over the five years prior to the interview. Few had. The same five principal gear types show up in more or less the same proportions in the population, and the species they capture, as one would expect, were not radically different five years ago than today either. Four out of five surveyed said they had made no changes, and the 20% who did make changes most commonly (56%) said that they had improved or modernized their equipment. Other reasons given for the change were changes in the marine environment, including contamination (15%), changes in fishery regulations (14%), increased expenses associated with fishing (6%), and other, more personal reasons (health, family problems, etc.).

V.b.2. Fishing Seasons

What times of year do Puerto Rican fishers most often fish? The data indicate that the summer months are most active, although fishing effort across the entire population does not change greatly through the year. Although we found no statistical difference in the number of days per month, our ethnographic interviews suggested that there are distinct spikes and troughs in fishing activity through the year, and we note that these should be taken into account by managers as they put fishing regulations into place. The regional profile of Lajas, for example, gives more detailed information on annual rounds. Figure V.1 shows the mean (long bars) number of days of fishing effort and the standard deviation (short bars) by month.

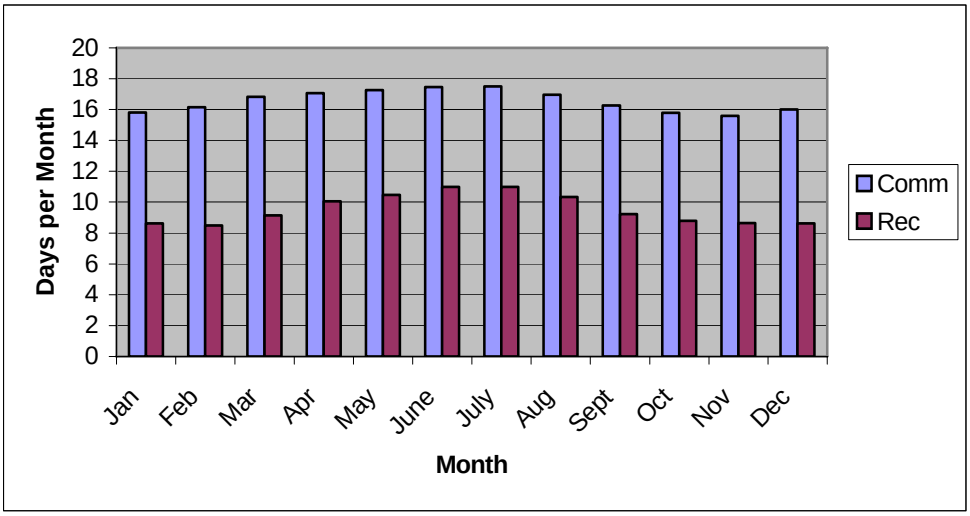
[28] There is some confusion over the type of mackerel that fishers refer to when they use the word *sierra*. Some Puerto Rican fishers insist it refers to king mackerel (*Scomberomorus cavalla*) and others to a cero (*Scomberomorus regalis*). Kingfish seems to be used generically. Erdman uses the term for both species.

Figure V.1. Days of Fishing Effort by Month (N=439)



By showing the standard deviation (short bars), we can get a sense of the range of fishing effort across this entire population. That is, although the mean number of days hovers between 12 and 16 through the year, the standard deviation means that the range for, say January, where the mean is 13.61, is more like from 4 days per month to 23 days per month (13.61 – the s.d. of 9.151 to 13.62 + 9.151). These figures are higher, by about two to three days per month, for those who reported that they were commercial fishers, and lower for recreational fishers by about three to five days per month. Statistical tests[29] for comparing means show that the differences are significant.

Figure V.2. Effort by Commercial vs. Recreational



[29] Analysis of variants (ANOVA) were computed to determine statistical significance. Month by month F-ratios ranged from 57.174 in December to 74.019 in March (df = 1), and in all cases were significant at the p<.000 level: in other words, highly significant. As noted earlier, a probability level of <.05 is usually significant.

V.b.3. Fishers' Other Activities

It is well documented that fishers in Puerto Rico engage in other occupations in addition to fishing. We again confirmed this in our survey, with 56% listing at least one other income-generating activity, 13.7% listing two activities, and an additional 5% to 6% listing three or more activities. This should not be surprising for recreational fishers, but the proportions for commercial fishers were only slightly lower: 47.1% listing one, 14.5% listing two, and between 4% and 7% listing three or more.

The kinds of work fishers perform is concentrated in the working classes: primarily construction work, *chiripas* (temporary jobs, which are often in construction), factory work, mechanics, and so forth, although those interviewed listed over 220 occupations, or approximately one for every two interviews. When employed outside of fishing, most often commercial fishers reported that they squeezed work into the times that they could not fish, when fishing had been poor for some time, or the opportunity arose. *"De vez en cuando,"* (From time to time) characterizes how fishers talk of working. The most common *amount* of work done outside of fishing was 20 days per month, although only 10% of the fishers said this, with most (around 70%) working less.

V.b.4. Levels of Satisfaction with Fishing

The following table shows relatively high levels of satisfaction among both commercial and recreational fishers with fishing. Over 60% of both groups are either satisfied, satisfied enough, or extremely satisfied with fishing, with satisfaction levels slightly higher among commercial than recreational fishers. It is interesting, however, that so many of the recreational fishers, over one-third, said that they were either not very satisfied or dissatisfied with fishing. This may be a response to perceived problems with the resource, which may make fishing less satisfying today than it may have been in an earlier era.

Table V.9. Level of Satisfaction by Commercial vs. Recreational Status

Level of Satisfaction	Percent of Commercial Fishers	Percent of Recreational Fishers
Extremely satisfied	12.9	15.3
Satisfied enough	22.7	14.5
Satisfied	31.1	33.1
Not very satisfied	24.3	28.2
Dissatisfied	8.4	6.5
Cannot answer	.6	2.4

We also asked respondents how difficult it might be to find work outside of fishing. Table V.10. shows that commercial fishers seem more pessimistic about the prospects of working outside of the fishing industry than recreational fishers, although neither group seems particularly optimistic, perhaps responding to Puerto Rico's extremely high unemployment rates. Nevertheless, 60% of the commercial fishers, compared to 40% of the recreational fishers, view moving from fishing into other sectors of the economy problematic.

Table V.10. Perceived Difficulty of Finding Work Outside Fishing by Commercial vs. Recreational Status

Level of Difficulty	Percent of Commercial Fishers	Percent of Recreational Fishers
Extremely Difficult	20.3	10.6
Difficult Enough	39.9	29.3
Not very difficult	19.6	29.3
Easy	10.1	17.9
Cannot answer	10.1	13.0

V.b.5. Ties with the Community

We asked several questions about economic ripple effects of fishing, including whether or not vessels, equipment, bait, and other inputs were locally purchased and maintained. The following tables illustrate that, first, of the 439 interviewed, between 77% and 88% have boats, equipment, etc. that require purchase or maintenance. In all cases but electronic equipment, the majority purchases these locally—in some cases over 90% purchase or maintain inputs locally.

Table V.11. Percentages of Fishing Inputs Purchased or Maintained Locally

Variable	Percent
Boat constructed locally? (n=371)	61.2
Boat maintained locally (n=371)	95.9
Service motor locally (n=368)	93.2
Fishing equipment purchased locally (n=385)	76.4
Electronic & navigational equipment purchased locally (n=338)	43.8
Bait purchased locally (n=379)	62.3

V.b.6. Crew Variables

With regard to the crew variables—relations between captains and crew, numbers of crew, and difficulty finding crew—we examined only those who identified themselves as commercial fishers (including charter boat captains and crew). First, most use between one and two crew members (mean = 1.80; median = 2.00), usually drawing on friends or family. The largest percentage (49.4) fish with friends, followed by those who fish with fishing partners (16.2), with children (11.9), and with brothers (7.9). Overwhelmingly, crew members are Puerto Rican, with a small minority, under 1%, from the Dominican Republic. In terms of their ability to find adequate crew, a little over half (51%) reported that it was difficult or very difficult, while a little more than one-third (37.2%) reported that it was easy or very easy (the remainder either didn't or couldn't answer).

V.c. Disposition of Catch

The data on disposition of catch, elicited and reported in percentages, should be considered with some caution. Prior to the administration of the survey, researchers familiar with the fishing industry suggested that asking for percentages would be problematic, for two reasons: one is that it's difficult to recall,

accurately, proportions that shift through the week and season; the second is that many fishers have low levels of education and are not familiar with percentages. During interviewing, interviewers confirmed that many fishers had problems with these questions.

Due to these problems, the data elicited suffer from a variety of gaps. Many respondents, instead of giving percentages, merely gave pounds. We thus present the information in narrative form, rather than focusing on specific statistics, because presenting the statistics in a table would be misleading, probably grossly inaccurate, and hence irresponsible. In this section of the questionnaire, we asked two sets of questions: one about what proportions of the catch was consumed at home, sold, given away, given to crew members, and so forth.; and the second, for those who sold fish, what proportions went to fishing associations, private markets, street vending, and so forth. In both cases, the answers given were sometimes in percentages, sometimes in pounds, and sometimes in other forms (e.g. "four to five fish"). While this vagueness may be troubling from the perspective of statistical analysis, it reflects the reality of a phenomenon that shifts through the week, season, and year.

V.c.1. Uses of Catch

When asked about home consumption, the four most common responses were that they consumed 5% of their catch (13.4% reported this), 10% (14.4%), 50% (6.6%), and 100% (15.5%). Among those who did respond with percentages, about one-third (32.9%) responded that they consumed between none and one-third of their catch; 8% responded that they consumed between one-third and two-thirds of their catch, and the remainder (around 60%) consumed between two-thirds and all of their catch.

Those who responded to the question about selling their catch (69.5% of those interviewed) were more likely to give their answers in percentages, although not always. Only 13% of these said that they sold 100% of their catch, although those who answered this question were more likely to sell most of their catch than just a small portion. Only around 4% sell between none and one-third of their catch, 7% sell between one-third and two-thirds, and the remainder, 89%, between two-thirds and all of their catch.

Only one in five interviewed answered the questions about giving catch to the crew and to the community, and these were split more or less evenly between those who answered in pounds and those who answered in percentages. In terms of fish to the crew, those who answered in pounds gave ranges from three to twelve pounds, with the most common being in the middle range of between 5 and 8. Those who answered in percentages most commonly gave between 10% and 50% to their crew. Most commonly, when fishers gave to the community, they gave between 5% and 10% of their catch, or rarely more than 10 to 20 pounds. Under 6% answered the questions on giving fish to other alternatives (e.g. customers, other uses such as to recreational fishers for bait).

V.c.2. Marketing

Of the questions about the marketing of catch, only one, about selling to the association, was answered by more than 14% of those interviewed and to most only a handful (under 10%) responded. Regarding sales to fishing associations, answered by about one-third of those surveyed, slightly less than one-quarter (22.5%) said that they sold between 90% and 100% of their catch to the association. About 5% sold between 50% and 90% of their catch to the association, and the remainder sold under 50%.

Data on the disposition of catch, though sketchy, underscore the fact that fish marketing and disposing of catch is a complex process in Puerto Rico, involving several alternatives and changing through the year. In La Parguera, one fisher told us that he occasionally gave fish to a neighbor woman who occasionally gave him a cup of coffee. In Punta Las Cucharas, we encountered a fisher who had fished all morning to provide *pulpo* for octopus salad for a birthday party that afternoon. By such examples, irregular yet significant, we can understand how it may be difficult to relate the commerce of gift and market exchange that characterizes the destinies of fish in Puerto Rico.

V.c.3. Conditions of Marine Resources

Among the goals of this research has been to assess fishers' views of the resources with which they interact on a daily, weekly, or seasonal basis. As such, we asked survey respondents to consider the health of three part of their coastal/marine environment at four different time periods, on a scale ranging from dead or absent to healthy. The three environmental components were coral reefs, fishing resources, and mangroves, and the time periods were ten years ago, five years ago, now, and five years in the future. The following tables present these data, illustrating a relatively pessimistic view of the future for all three environmental components, with 65% believing that coral reefs will be dead or nearly dead, 70% believing there will be no or few fishery resources, and 61% believing that the fate of the mangroves is no better than reefs or fishery resources. These data also suggest, however, that most of the decline in the health of these resources, in fishers' minds, occurred between 10 years ago and 5 years ago. While around two-thirds perceived these resources as healthy ten years ago, this figure fell to around one-fifth between ten years ago and five years ago and fell to around one in ten after that. That these perceptions exist and are this widespread is, perhaps, a place to begin in the process of promoting participatory management in Puerto Rico, bringing stakeholders together on the basis of shared beliefs regarding resource problems. Clearly, that these problems are perceived to exist could be an important component in re-establishing the legitimacy of the state and fishery managers.

Table V.12. Condition of Coral Reefs (n=381)*

Time	Dead/ Absent	Nearly dead	More or less healthy	Pretty healthy	Healthy	Don't Know
10 years ago	1.6	1.6	7.3	19.4	64.8	5.3
5 years ago	2.6	7.9	31.1	32.2	20.8	5.4
Today	18.5	31.6	21.5	13.3	10.9	4.2
5 years from now	47.6	17.4	11.5	7.8	10.9	4.8

*Figures are percentages

Table V.13. Condition of Fishery Resources (n=421)*

Time	Dead/ Absent	Nearly dead	More or less healthy	Pretty healthy	Healthy	Don't Know
10 years ago	.5	1.0	7.4	16.9	73.2	1.2
5 years ago	1.7	7.8	35.2	34.0	20.2	1.2
Today	16.1	39.1	23.7	11.6	9.0	.5
5 years from now	47.7	23.1	11.4	7.1	9.1	1.6

*Figures are percentages

Table V.14. Condition of Mangroves (n=371)*

Time	Dead/ Absent	Nearly dead	More or less healthy	Pretty healthy	Healthy	Don't Know
10 years ago	1.9	2.4	5.9	15.9	70.4	3.5
5 years ago	2.7	6.5	31.0	34.5	21.2	4.1
Today	19.8	29.0	22.5	14.4	11.4	2.9
Five years from now	45.4	16.0	12.0	9.5	12.6	4.5

*Figures are percentages

In terms of the perceived causes of declines in the health of marine resources, contamination or pollution emerged as the principal culprit, often in combination with construction activity, boating traffic, and trends in coastal development that result in municipal, chemical, or other sources of pollution. It was not uncommon for respondents to list multiple causes, saying, for example, that the coral reefs suffered from "the abuses of contaminants, hurricanes, and little consciousness about their health" or from "contamination, boating traffic due to tourism, and aquatic sports"—offering, in other words, complex responses that included multiple sources of degradation, some beyond the control of humans (hurricanes), some due to factors that are critical to the Puerto Rican economy (tourism), and others due to a perceived lack of "consciousness" or attention by individuals, by government officials, or others. Overall, however, contamination emerged as a cause of resource decline in over 107 responses (27.5%), followed by construction and boating traffic.

Finally, we asked fishers two questions about their economic situation: one about what percent of their income derived from activities other than fishing and a second about how their economic situation today compared to their economic situation five years ago, in part to see whether or not it reflected the health of the marine resources that, in some cases, are so much a part of their lives. Responses to the first question were confounded by the unfamiliarity with percentages among much of the population. Regarding the second question, table V.15. shows that although a sizeable number report worse circumstances, the majority reported they were the same and over 20% reported they had improved.

Table V.15. Economic Condition Today vs. 5 Years Ago (n=436)*

Economic Situation	Percent
Much better	5.7
Better	15.1
About the same	42.0
Worse	28.3
Much Worse	8.3

*Three respondents could not say.

V.d. Focus on Recreational Fishers

As we noted elsewhere, much recreational fishing takes place across the island from coastal shipping and storage infrastructure reminiscent of earlier eras in Puerto Rico's economy and from bridges, public piers, ferry terminals, and from the piers that serve Puerto Rico's commercial fisheries. In this sense, Puerto Rico's recreational fishers are less dependent on government-sponsored developments to ply their crafts, instead adapting to existing infrastructure. While we sampled at CNs, we also intercepted fishers at these

other sites during both the ethnographic and survey phases of the project. The following analysis thus represents a larger group than merely CN members.

V.d.1. Recreational Fishing Gear & Species Preferences

As with the general population of fishers, recreational fishers were introduced to the craft most often by their fathers (40.2%), friends (28.7%), or some other, unspecified person (22.1%). The following table shows that most frequently they use hooks-and-line rigs, including hand lines and rigs with poles, but that SCUBA equipment are also important. These three gear types represent nearly two-thirds of all recreational fishers, with a minority using traps, nets, or other rigs that catch large numbers of fish at one time. Those who fish with the most popular gear catch primarily species from the snapper-grouper complex, including, most frequently, silk snapper (14%) and yellowtail snapper (12%). Recreational SCUBA divers, on the other hand, tend to heavily target shellfish: lobster (23.1%) and conch (15.4%).

Table V.16. First Gear of Choice Among Recreational Fishers (n=125)

Gear Type	Percent who Use Now	Percent who Used 5 years ago
Hooks & Lines*	40.0	41.4
Cane pole	14.4	12.9
SCUBA gear	10.4	10.3
Fish Traps	5.6	5.2
Beach seine	4.8	6.9
Gill net	4.0	5.2
Cast net	3.2	2.6
Multihook rigs	3.2	.9
Other	5.6	6.0

*Respondents distinguished between cane poles and hook & line rigs.

We noted earlier that a little over two-thirds of recreational fishers use two gear types and around one-third use three gear types, yet in the secondary and tertiary gear categories the same principal gear appears as most important: hooks & lines. Nets and traps become more important in the secondary gear category, tying for the second most common secondary gear named, and in the tertiary gear category free diving is the second most common fishing style mentioned. Overall, however, the recreational fishery is primarily a hook & line fishery. This has not changed significantly in the past five years, nor have the species captured with these gear types. Indeed, over 80% reported that they had made no change to their fishing operations in the past five years.

Of the 17.4% who did mention making changes to their fishing in the past five years, the majority (15 of the 21 reporting changes, or around 71%) reported modernizing their equipment. Of the others, two simply reported "other," one said there had been changes in the resource, one said changes in fishing regulations changed his fishing, one blamed rising expenses associated with fishing, and the final person blamed personal problems.

V.d.2. Employment and Household Characteristics

Beyond the quarter or so of the recreational sample who either did not answer the question about their occupation or answered that they were retired, recreational fishers in Puerto Rico do not cluster in any

specific occupation or class, but come from many walks of life, from teachers, physicians, and other professionals to skilled workers such as masons to government employees, firemen, police, unskilled laborers, and the self-employed. Nearly every industrial sector—medical, legal and other professional services, education, manufacturing, construction, agriculture, government, transportation, business—was represented in the list of occupations recreational fishers gave. We elicited 76 different occupations, with few occupations represented by more than one person; at the same time, declining percentages reported more than one occupation, with only 12% listing two, 4% listing three, and only one individual, under 1%, listing four. Clearly, this range of backgrounds among our informants suggests that recreational fishing touches several segments of Puerto Rican society and likely satisfies needs ranging from leisure to supplemental food.

Recreational fishers are not remarkably different from the total population in terms of their household characteristics, except that slightly fewer are married and slightly more are single. Their households are neither appreciably larger nor smaller than the total either. Interestingly, however, nearly half the population reported that they earned some income from fishing, confirming that selling fish may not be uncommon among recreational fishers in Puerto Rico. Many times during our ethnographic work commercial fishers complained that recreational fishers sold portions of their catch, often at reduced rates simply to cover some of their trip costs, and that this practice depressed the market price for fish.[30]

Table V.17. Recreational Fishers' Marital Status and Household Characteristics (n=126)

Marital Status	Percent
Married	60.0
Single, never married	24.8
Divorced	8.8
Widowed	2.4
Other	3.2
Mean Household Size	3.37 (sd = 1.614)

Supplemental income from recreational fishing may be important in some households, however. About one-quarter of the recreational fishers household do not have individuals working, and the mean number of people working in the households was 1.35 (s.d.=1.294). Among the retired or unemployed, fishing may provide not only necessary high quality protein but may also add to incomes that are otherwise low and usually fixed.

V.d.3. Economic Ripple Effects of Recreational Fishing and Fishing Partners

Around 70% of the recreational fishers interviewed have vessels; of these, 60% reported that their vessels were purchased or constructed locally and nearly 90% (87.6%) report that their vessels are maintained locally. In so far as maintenance might include storage, we noted in the ethnographic work that boat storage has become a large source of revenue for coastal communities generally and for some fishing households in particular. Stored recreational boats have become a ubiquitous part of eastern La Parguera, where most of the fishing families have their homes. Table V.18 shows that similar percentages apply to motor maintenance and fishing gear purchases, but that recreational fishers purchase bait and electronic gear locally with less frequency.

[30] Another explanation for this finding may be that some commercial fishers identified themselves as principally recreational because they feared that identifying themselves as commercial might jeopardize their receipt of government assistance.

Table V.18. Use of Local Business for Vessels, Gear, and Services among Recreational Fishers

Local Ripple Effect	Percent Reporting	Percent Using Locals
Vessel Construction	71.4	87.6
Vessel Maintenance	70.6	87.6
Motor Maintenance	70.6	87.6
Fishing Gear	80.1	86.1
Electronic Gear	65.1	48.8
Bait	80.1	68.3

Recreational fishers tend to fish with between 2 and 3 others (mean = 2.3; sd = 1.338). Overwhelmingly, recreational fishers fish with friends rather than family, with nearly 70% reporting "amigos" or "amigas." The second most common category was "fishing partner" (7.6%) and the third siblings (4.3%). No other kind of relative was reported by more than one or two respondents.

V.d.4. Recreational Fishers' Views of Marine Resources and Protective Measures

The above section presented data for the entire sample regarding respondents' views of the health of three types of marine resources: coral reefs, fishery resources/ fish stocks, and mangroves. These data suggested that only around 11% of respondents viewed coral reefs as healthy, less than 10% viewed fishery resources as healthy, and a little more than 11% viewed mangroves as healthy. The following tables show that recreational fishers do not deviate greatly from the general population, seeing more or less precipitous declines in the health of all three types of resources over the past ten years and the cascade continuing into the future, if perhaps less rapidly.

Table V.19. Recreational Fishers' Perceptions of Condition of Coral Reefs (n=100)*

Time	Dead/ Absent	Nearly dead	More or less Healthy	Pretty healthy	Healthy	Don't Know
10 years ago	1.0	1.9	3.8	21.2	61.5	10.6
5 years ago	2.9	3.9	33.0	32.0	18.4	9.7
Today	15.4	33.7	24.0	6.7	12.5	7.7
5 years from now	40.0	22.0	12.0	7.0	11.0	8.0

*Figures are percentages

Table V.20. Recreational Fishers' Perceptions of Condition of Fishery Resources (n=119)*

Time	Dead/ Absent	Nearly dead	More or less Healthy	Pretty healthy	Healthy	Don't Know
10 years ago	0	2.5	2.5	13.4	78.2	3.4
5 years ago	2.5	8.4	38.7	24.4	22.4	3.4
Today	14.9	45.4	18.2	9.1	9.9	2.7
5 years from now	45.0	25.2	11.7	5.4	9.9	2.7

*Figures are percentages

Table V.21. Recreational Fishers' Perceptions of Condition of Mangroves (n=101)*

Time	Dead/ Absent	Nearly dead	More or less Healthy	Pretty healthy	Healthy	Don't Know
10 years ago	2.9	2.9	3.8	15.2	67.6	7.6
5 years ago	2.9	8.7	30.1	33.0	17.5	7.8
Today	20.0	31.4	21.9	10.5	11.4	4.8
Five years from now	41.6	18.8	10.9	10.9	10.9	6.9

*Figures are percentages

Perceived causes for the declines in coral reefs were also similar to the general population, in that, most often, over 25% of the time, recreational fishers cited contamination deriving from construction, boating traffic, industrial pollution, or poor waste and water treatment practices by municipalities or hotels. Contamination was also cited frequently as a source of problems with fish stocks, but other causes included overfishing, abuse of or lack of knowledge of regulations by fishers, the taking of small fish, and the use of certain gear, such as nets, that captured protected species indiscriminately. Finally, regarding mangroves, construction of coastal hotels and other coastal development, and its resulting contamination, emerged as the overwhelming causes of mangrove destruction. Included in this list was the mining of sand for construction projects, something that was mentioned in the ethnographic work as well. Again, these responses were not very different from the general population.

Regarding the MPAs, the following table shows the percentage of recreational fishers familiar with the various MPAs. It suggests relatively low levels of interaction with MPAs by recreational fishers, particularly regarding those in the U.S. Virgin Islands. No fishers we interviewed had ever fished the USVI MPAs.

Table V.22. Recreational Fishers' Familiarity with MPAs

MPA	Percent Familiar with MPA
Boya 8/ Tourmaline	21.4
Bajo de Sico	15.9
Abrir la Sierra	17.5
Mona/ Monito	15.9
Desecheo	16.7
Canal de Luis Peña	20.6
Laguna Condado	15.1
St. John's Park	0
Hind Bank	0
St. James Marine Reserve	0
Grammanik Bank	0

In terms of MPA functions, a majority of recreational fishers in general agreed strongly that each of the MPAs served its purpose of protecting fish stocks, but their responses were more mixed when it came to the social and economic impacts of MPAs. Few (usually around 10%) said that MPAs adversely affected them personally, but more (usually around 30%) agreed that MPAs would have detrimental consequences for communities that depended on fishing. These results are similar to those for the total population, which we present in our policy discussion.

V.e. Focus on Subsistence Fishers

While only 14 fishers identified themselves as fishing exclusively or primarily for food, this section of the report focuses on 68 fishers who reported that 100% of their catch provides food to their household. This is an important subgroup because of the high levels of unemployment in Puerto Rico and the importance of fish as a high quality source of protein that may be secured with little energy expenditure. While we are not arguing that these 68 fishers are necessarily poor, unemployed, or in desperate need of supplemental food, we do suggest that those who use their catch exclusively to feed their families offer insight into the business of fishing specifically for food.

V.e.1. Recreational Fishing and Gear & Species Preferences

Fathers and friends, for this group, were no less important as mentors in fishing than they were for the total sample or the other two groups of fishers. Forty percent of subsistence fishers listed fathers and 33.8% listed friends, with another 20% listing "other," and other relatives mentioned by only around 6% of the group. These figures were nearly identical to those mentioned by recreational fishers, as are the gear types they prefer to use. Subsistence fishing is done primarily with hooks and lines and cane poles, and has not changed much over the past five years.

Table V. 23. First Gear of Choice Among Subsistence Fishers (n=68)

Gear Type	Percent who Use Now	Percent who Used 5 years ago
Hooks & Lines	39.7	40.6
Cane pole	20.6	17.2
SCUBA gear	5.9	6.3
Fish Traps	1.5	3.1
Beach seine	5.9	6.3
Gill net	1.5	1.6
Cast net	2.9	1.6
Multihook rigs	4.5	4.8
Other	17.5	18.5

Target species included the several snapper-grouper species most commonly (reported by around 40%), which should not surprise us, given their preference as food fish, yet a few pelagic species also showed up in the list of most commonly caught species. Dorado (dolphin), in fact, was the most commonly mentioned (7.4%) fish—a fish which is both fun to catch and excellent eating, as well *sierra/carite* (king mackerel), which was caught 5.9% of the time. Missing from the list entirely was conch, and only one subsistence fisher reported landing lobster. Subsistence fishing is thus a fish fishery rather than a shellfish fishery.

The fishery has been remarkably stable over the past five years, too. Over 90% reported making no changes to their fishing styles or the gear they used. Those who had made changes had done so to modernize their equipment or because the resource or regulations had changed. Three-fourths of this group expressed some level of satisfaction with fishing, with 40% either very or extremely satisfied; only 4.5% were dissatisfied with subsistence fishing. It is, evidently, meeting most of the participants' expectations and desires.

V.e.2. Employment and Household Characteristics

Subsistence fishers were unevenly split over the question of whether or not it was difficult to find work outside of fishing, with around 30% saying it was, 60% saying it wasn't, and the rest having little or no idea. One quarter were either retired or unemployed, and the others clustered in no specific occupation: of the 51 remaining we elicited 43 occupations. Subsistence fishers did, however, seem to cluster more in working class, skilled or semi-skilled, occupations: construction workers, mechanics, maintenance or janitorial work, police, plumber, and so forth.

Slightly fewer subsistence fishers than recreational fishers are married, 55.9%, and slightly more, 13.2%, are divorced. Their households are not significantly larger or smaller than the other groups, nor are they any more likely to have a greater number of employed people, either in or out of fishing.

V.e.3. Economic Ripple Effects of Subsistence Fishing

Subsistence fishers are less likely to contribute to their local economies than either recreational or commercial fishers. Table V.24 shows that most who have vessels purchase them elsewhere, although they tend to have them and their motors serviced locally. Still, the levels are below those that we find among the other groups.

Table V.24. Use of Local Business for Vessels, Gear, and Services among Subsistence Fishers (n=68)

Local Ripple Effect	Percent Reporting	Percent Using Locals
Vessel Construction	64.7	36.3
Vessel Maintenance	63.2	81.3
Motor Maintenance	63.2	79.0
Fishing Gear	78.0	88.7
Electronic Gear	58.8	42.5
Bait	73.5	78.0

Subsistence fishers do not differ from recreational fishers regarding their fishing partners, fishing with between two and three individuals and in most cases (75.6%) with friends. Slightly over 10% (12.3%) fish alone, although this figure may actually go as high as 26%, if we include those who didn't respond to the question ("How many people normally fish with you during a typical fishing trip?"). That is, if they fish alone they might not have considered the question applicable to them.

V.e.4. Subsistence Fishers' Views of Marine Resources and Protective Measures

A majority of subsistence fishers, slightly over 60%, in line with recreational fishers, viewed coral reefs, fishery resources, and mangroves as healthy 10 years ago but then perceived a precipitous drop from 10 to 5 years ago in their health and other, less precipitous drops from 5 years ago to today and from today to 5 years in the future. These are in nearly complete alignment with responses of recreational fishers, as are the reasons they give for the failing health of marine resources (e.g. contamination, boat traffic, etc.). Similar comments apply to their views of MPAs.

V.f. Focus on Commercial Fishers

In this section we focus on the 256 fishers who satisfied two criteria. First, they self-identified as commercial fishers—including captains and crew—and, second, they were selected randomly from the fisher census. We believe that this sample constitutes an accurate representation of all Puerto Rican commercial fishers, constituting roughly between 10% and 20% of the total population. Most of those interviewed (87.8%) identified themselves as vessel captains, while the remaining 12.2% identified themselves as crew. Commercial fishers do not deviate in any way from the overall sample in terms of who introduced them to fishing, with around half citing their fathers and around 20% each citing "other" or "friends"—these three categories thus make up 90% of the responses. Another 5% learned from in-laws, which is slightly higher than the total sample and which was a fishing relationship that Griffith and Valdés found to be important during their study (2002), particularly in cases where fishers married the daughters of other fishers and the daughters were themselves actively involved in fishing in some capacity (e.g. fishing, staffing a seafood market, making handicrafts from marine materials).

V.f.1. Gear & Species

As is common among small-scale U.S. fishers, Puerto Rican fishers use multiple gear types to target multiple species. Here we find that the majority of commercial fishers use at least three principal gear types and target a variety of species. Nearly 90% (84.8%) use more than one gear, 62.9% use more than two gear, 38.3% use more than three, and 22.3% use more than four. Table V.25 shows the use of the top three gear types during the survey year (2005) and five years prior to the survey (2000):

Table V.25. Gear Use among Commercial Fishers, 2005 and 2000

Gear	% 1st 2005	%2nd 2005	%3rd 2005	%1st 2000	%2nd 2000	%3rd 2000
Beach Seine	10.7	3.7	3.1	13.1	3.3	1.9
Gill net	14.6	13.4	7.5	13.9	13.4	9.0
Trammel Net	1.2	7.4	3.1	.8	7.2	3.9
Cast net	5.9	5.5	9.9	5.3	7.2	9.7
Lobster pot	2.8	4.1	6.2	2.4	5.3	6.5
Fish trap	15.8	13.8	9.9	15.9	12.9	9.7
Palangre*	13.5	13.5	15	13.4	11	14.1
Hook & line	18.2	19.8	23.6	17.1	22.0	22.6
Free diving	2.4	6.0	3.7	2.4	5.7	3.9
SCUBA	7.5	3.7	6.2	7.8	4.8	5.8
Spear	1.2	1.4	5.6	.8	.5	6.5
Cane pole	.4	0	0	.8	0	0
Other	5.9	7.8	6.2	6.1	6.7	6.5

*One of two varieties of long lines that is weighted with multiple hooks, its hooks arranged either parallel or perpendicular to the bottom, sometimes called a trot line (see Matos-Caraballo & Torres Rosaldo 1989).

Combining all the hook-and-line rigs, we find that such rigs are and were clearly in the majority, although nets and traps constitute important supplements to hooks & lines. This makes sense, of course, from a time input perspective, in that traps, gill nets, and trammel nets are stationary gear, allowing fishers to fish with hook & line rigs, SCUBA, or free diving while their other gear are soaking. *Palangre* rigs are also stationary gear, allowing time to use other hook & line rigs while they are soaking, and their popularity attests to the popularity of multiple-hook rigs in general among this population. Here they are cited as 1st

gear of choice among 13.5% of the population, and similar proportions list them as their 2nd and 3rd choices. This contrasts with the recreational sample, under 5% of which reported using multiple-hook rigs.

Examining these data in somewhat more depth confirms that fishers do seem to be using multiple gear at the same time. Over one-third (37.5%) of those who report traps as their primary gear report using hook & line rigs for their secondary gear, and another 32% reported hook & line rigs as their third gear. From our ethnographic work we know that fishers also shift among gear during the course of the year, as pelagic species come and go through the Caribbean or as the seasons for various species, or various MPAs, open and close.

Regarding the types of fish commercial fishers catch, at least 45% listed various snapper-grouper species as their first most commonly caught species, with silk, yellowtail, and lane snappers the most common (*chillo, colirrubia,*and *arrayado/ manchego*).[31] Of all the snapper-grouper species, grouper varieties were far less common than snapper varieties, with the generic name *mero* accounting for only 4.7% of the total (snappers, that is, account for slightly over 40% of the total). It is also interesting to note that only one fisher admitted to landing red hind, whose spawning aggregations underlie the creation of several of the MPAs off the Puerto Rican and US Virgin Island coasts. Other grouper species (e.g. Nasau) are also protected in these waters. These low reported landings of grouper may thus suggest that the restrictions against landing grouper have been effective. Two other commonly listed first species among commercial fishers are lobster/ *langosta* (13.7%), kingfish or king mackerel/ *sierra o carite* (7.4%), and conch/ *carrucho* (5.9%). There were no dramatic differences between the species fishers caught in 2005 and in 2000; during both time periods, snapper-grouper species predominate, followed by lobster, kingfish, and conch.

Certain gear types favor certain species or groups of species, of course. For example, if we focus only on those who listed SCUBA gear as their first gear of choice, landings of lobster and conch increase dramatically, to 36.8% and 26.3% respectively. Trap fishers also tend to catch more lobster, with 25% reporting it as their most commonly caught species, although over 40% continue to catch snapper-grouper varieties as well. Hook-and-line fishers, on the other hand, report little to no lobster or conch, but higher percentages of snapper-grouper varieties (58.6%). Finally, those reporting multiple-hook gear as their gear of choice (long lines or *palangre* rigs) overwhelmingly (76.3%) report capturing snapper-grouper species.

V.f.2. Levels of Satisfaction with Fishing, Views of Finding Work Outside Fishing, and Work Outside Fishing among Commercial Fishers

We present these data together because they may be, in some sense, reflections of one another: that is, satisfaction with fishing may reflect perceived and real occupational alternatives. On the one hand, some fishers who believe it is difficult to find work outside of fishing may be satisfied with fishing because, at

[31] These **particular** snapper species may not be exactly those fishers meant in response to this question. *Chillo,* for example, is often used generically, like *pargo,* to refer to several varieties of snapper (family *Lutjanidae*). In addition, species nomenclature varies from place to place across the island and the same fish can be called by different names in different places. We also say that "at least 45%" listed these species because a minority answered even more generically, saying they catch "fish/*pescado.*"

least, they have some work. Others, however, may feel trapped in fishing because of a lack of other occupational pathways.

We have already shown, in table V.9 above, that two-thirds of commercial fishers are satisfied with fishing, though only just a little more than 10% are extremely satisfied and just under one-third of the total just "satisfied." Table V.26 compares commercial fishers grouped by level of satisfaction in terms of their views of how difficult it is to find work outside of fishing. Although chi-square analysis finds that the proportions are not significant for the entire sample, the figures do suggest some interesting differences. If we confine our comparison to only the first column, we see that higher proportions of those dissatisfied with fishing believe that it is "extremely difficult" to find work outside of fishing, over 65% compared to only around half of those satisfied with fishing.

Table V.26. Satisfaction with Fishing by Perceived Difficulty to Find Work Outside of Commercial Fishing (n=228)

Satisfaction & Perceived Difficulty	Extremely Difficult	Difficult	Not Difficult	Easy
Extremely Satisfied	19.4	45.2	16.1	19.4
Satisfied Enough	16.7	51.9	20.4	11.1
Satisfied	15.4	52.3	24.6	7.7
Dissatisfied	26.7	50.0	13.3	10.0
Very Dissatisfied	38.9	22.2	27.8	11.1

Chi-square = 13.653; df = 12; p=.323 (not significant)

As with most commercial fishers in Puerto Rico, many of those in our sample, as well as those we interviewed in our ethnographic work, are currently working outside of fishing. Nearly half (46.5%) reported other work besides fishing, another 15% to 20% reported more than one additional occupation. The most commonly reported occupations were in the construction trades, listed by around 20% of those surveyed. This included masons, carpenters, welders, plumbers, cabinetmakers, painters, manual laborers, and those who listed merely "construction work" as their alternative activity. An additional 5% listed mechanical trades, associated with either auto or boat mechanics, and another 2 to 3% listed factory work. As this list suggests, fishers did not cluster in any particular occupation, listing a total of 63 primary occupations and another dozen or more secondary and tertiary occupations, although they did seem to work primarily in working class or blue collar type occupations, with only one, a dentist, listing a somewhat more lucrative profession.

At the household level, occupational multiplicity becomes more complex, but just slightly. When asked how many people in the household earned incomes from fishing and from other pursuits (including the person being interviewed), commercial fisher responses resulted in an average of 1.53 (s.d. = 1.07) for the first and .89 (s.d. = 1.035) for the second. This suggests that fishing occupies the time and effort of other household members in some cases, and that in fewer cases other household members contribute to household incomes with other jobs. In general, fishing occupies the core income source for most of the sample, yet we cannot discount the importance of other income, which may be subsidizing fishing operations. Specifically, around two-thirds (64.3%) of those interviewed reported only one person earning income from fishing, and slightly more than half, 56.5%, reported income from other sources contributing to household well being.

With average household sizes just over three persons (not significantly different from recreational or subsistence fishers), extrapolated to the total population of commercial fishers, these data suggests that commercial fishing supports, at least partially, between 4,500 and 7,800 people in Puerto Rico, depending on whether or not one accepts the 1,500 or 2,500 figure for the total number of fishers.[32] Because 56.5% of fishing households earn income from other sources, however, the number of persons wholly dependent on fishing are somewhat lower. If we extrapolate from the percentage of households that report income solely from fishing (43.5%), then we can estimate that between 2,035 and 3,393 Puerto Ricans depend completely on commercial fishing.

These figures do not account for the so-called ripple effects of this support: the extent to which fishing households purchase goods and services locally and, over generations, produce individuals who make additional socially beneficial contributions to Puerto Rican society, as police, fire personnel, teachers, scientists, and so forth. While we could make the same argument for nearly any job in Puerto Rico, we mention this here because fishers typically point to the success of their children as being a direct result of their ability to raise them on fishing. Along with Griffith and Valdés Pizzini (2002), during this work we encountered families of fishers that had produced highly educated, skilled individuals as well as a variety of productive members of society occupying positions in many sectors of the Puerto Rican economy.

V.f.3. Economic Ripple Effects of Commercial Fishing

Like recreational fishers, a majority of commercial fishers in Puerto Rico contribute to local economies through fishing-related expenditures. This is particularly true with maintenance, which is certainly more costly for commercial than recreational fishers. A lower proportion of commercial fishers have their vessels constructed locally,[33] however, and gear and bait purchases are, not surprisingly, lower.

Table V.27. Use of Local Business for Vessels, Gear, and Services among Commercial Fishers (n=256)

Local Ripple Effect	Percent Reporting	Percent Using Locals
Vessel Construction	92.0	70.6
Vessel Maintenance	92.5	98.3
Motor Maintenance	91.4	94.4
Fishing Gear	92.6	70.9
Electronic Gear	83.2	43.2
Bait	90.2	59.7

Clearly, many fishers make their own gear and capture their own bait, which accounts for this difference between recreational and commercial fishers. We know from previous research and from our ethnographic work that a large proportion of recreational fishers purchase bait from commercial fishers. During our research we encountered a few commercial fishers who specialized in catching and selling

[32] We calculated this quite simply, multiplying the mean household size by 1,500 (3.12 x 1500 = 4,680) or by 2,500 (3.12 x 2500 = 7,800). For the lower figures, we calculated these amounts with 43.5% of 1,500 and 2,500.

[33] This may be due to differing interpretations of the word "local," which may mean Puerto Rico to some yet the municipality or region for others. We do know from our ethnographic work that some boat builders build boats for fishers in municipalities some distance from them, and may not be considered local by respondents.

bait, including one that supplied a prominent marine supply store in Ponce, where many recreational and charter boat fishers bought bait.

V.f.4. Crew Dynamics among Commercial Fishers

In spite of the fact that the largest percentage (50%) of commercial fishers listed "friends" as their crew, they are more likely to fish with other family members than either subsistence or recreational fishers. Family members were the second most common category (30.6%), with son or daughter being the most common type of family member (12.9%). Another 16.7% listed "fishing partner." Overwhelmingly, crew are ethnically Puerto Rican, with under 1% mentioning Dominican crew.[34]

These statistics confirm that family still plays a powerful role in the reproduction of fishing households, with parents not only teaching children, as statistics we presented earlier show, but also, in many cases, working with them on vessels as crew. A few fishers, around 10%, fish alone, but most commercial fishers (around 70%) fish with either one or two other crew members and 16% reported fishing with three.

Finding reliable crew, unfortunately, can at times be difficult. Pretty close to two-thirds said that it was either very difficult or difficult to find crew, while another 28% said it was not difficult and around 8% said it was easy. The difficulty of finding crew may be due to the tendency for fishers to move among fishing and other occupations, choosing to fish or not to fish as a crew member depending on the employment opportunities outside of fishing. The fact that many jobs outside of fishing are *chiripas*, or odd jobs, makes it easy to move between the two regularly, without the paperwork and other hiring protocols associated with work in the formal economy.

V.f.5. Disposition of the Commercial Catch

We noted in an earlier section that deciphering marketing behavior was difficult because many of those surveyed did not understand percentages and instead offered responses to questions about the amounts they sold, consumed, gave away, etc. with statements like, "5 pounds," "a few fish," or "most." Over 10% of the commercial group did not even answer the question about how much they sold to the market, but those who did answer this question were more likely to answer in percentages than those who responded to questions about percentages they kept for household consumption, percentages for gifts, and so forth.

Among those who answered in percentages, the most common two responses were 100%, reported by 20.3% and 90%, reported by 20.3%. An additional 10.2% reported selling 75% of their catch. Overall, 75.8% of those who responded to this question said they sold 75% or more of their catch, which corresponds, roughly, to our sense of the disposition of catch from the ethnographic work. That is, it is probably the rare fisher who sells 100% of his or her catch. Most fishers we interviewed during the ethnographic phase of the project reported giving away some of their catch to neighbors, elderly, family,

[34] Ethnicity in Puerto Rico is a complicated phenomenon and something that asking direct questions about in a survey rarely elicits reliable data. The African consciousness of Loíza fishers, for example, does not translate into people classifying themselves, or others classifying them, as African American or black, as people have a tendency to do on the United States mainland. Instead, Puerto Ricans inevitably identify themselves as Puerto Rican or, sometimes, as "Hispanic" or "Latino."

etc. and we heard in several locations that fish consumption made up substantial portions of the diets of fishers and their families. We also witnessed a great deal of fish consumption among fishers during our fieldwork.

Another way to approach these data is to examine the proportions of commercial fishers who answered the different questions about disposition of catch, making the assumption that those who did not answer the question did not because it was irrelevant to their behavior. Table V.28 shows these percentages, demonstrating that nearly 90% answered that they sell fish to "the market," which includes more than one of the fish market's dimensions: from fishing associations to selling from one's house. Yet the ranking conforms, more or less, to our sense from the ethnographic work of how fish gets distributed around the island from commercial fishing. That is, based on our ethnographic work, we would have predicted that household consumption and for the support of associations are two of the most important ways that fish are utilized around the islands, and that fish given to crew, the community, and sold to restaurants would also rank highly (although we would have thought more would have responded giving fish to their crew). These figures nevertheless testify to the important role that fish and seafood play in Puerto Rico, most of it, as fishers report, being channeled toward socially beneficial ends.

Table V.28. Rank Ordering of Disposition of Catch Based on Percent Responding (n=256)

Catch Disposition	Percent Responding
Sells some or all fish to "the market"*	87.1
Uses some fish for household consumption	74.2
Sells some or all fish to association	39.1
Gives some fish to crew	18.4
Gives some fish away in the community	17.2
Sells some fish to restaurant(s)	15.6
Sells some fish from own house ("Hay pescado")	14.5
Sells some fish to fish dealer	12.5
Sells some fish along the highway	10.5
Other outlets**	<10/outlet

*This could include some of the other marketing outlets mentioned below (e.g. association, fish dealer)

**This included private fish market, large company or supermarket, selling from the pier, etc.

V.f.6. Commercial Fishers' Views of Marine Resources

Due to their daily or nearly daily interaction with marine resources, we believe that commercial fishers' understandings of coral reefs, fishery resources, and mangroves are very likely more highly developed and more thoughtful than those of either recreational or subsistence fishers. We do not mean to belittle the opinions of the other two groups about these elements of the marine environment, yet most anthropological and sociological work on commercial fishing families and communities would attest to the fact that commercial fishers' knowledge of the marine environment is highly sophisticated precisely because they depend on that knowledge to predict fish behavior, understand and respond to problems with marine environments, and stay in business. Quite simply, their survival depends on such knowledge, and there are selective processes at work that enable some fishers to continue commercial fishing while others cannot compete.

With this in mind, we present the same statistics for commercial fishers as we presented for recreational fishers above, in Tables V.19-V.21.

Table V.29. Commercial Fishers' Perceptions of Condition of Coral Reefs (n=226)*

Time	Dead/ Absent	Nearly dead	More or less healthy	Pretty healthy	Healthy	Don't Know
10 years ago	1.8	1.8	9.3	19.8	63.9	3.5
5 years ago	2.2	11.1	29.2	31.4	21.7	4.4
Today	19.3	30.5	20.6	16.6	9.0	4.0
5 years from now	44.1	14.7	12.3	8.5	10.0	10.4

*Figures are percentages

Table V.30. Commercial Fishers' Perceptions of Condition of Fishery Resources (n=248)*

Time	Dead/ Absent	Nearly dead	More or less healthy	Pretty healthy	Healthy	Don't Know
10 years ago	.8	.4	10.4	19.2	69.2	0
5 years ago	1.2	8.4	35.3	36.5	18.1	.4
Today	19.9	37.1	23.8	14.5	7.3	.4
5 years from now	48.1	21.3	11.5	8.1	8.1	2.9

*Figures are percentages

Table V.31. Recreational Fishers' Perceptions of Condition of Mangroves (n=218)*

Time	Dead/ Absent	Nearly dead	More or less healthy	Pretty healthy	Healthy	Don't Know
10 years ago	.8	2.7	6.4	18.7	68.9	2.3
5 years ago	1.8	6.4	29.8	37.2	21.6	2.2
Today	17.1	27.6	23.5	18.0	10.1	3.7
Five years from now	41.7	14.2	13.3	9.5	12.8	8.5

*Figures are percentages

Like recreational fishers, commercial fishers view marine resources as generally in poor shape, with most seeing the drop in resource health occurring most precipitously between 10 years ago and 5 years ago. Again, the most common reasons that commercial fishers cited for declines in marine resource health were contamination (22.6%) from construction and boating traffic, also implicating anchoring behavior in the destruction of coral reefs.

V.f.7. Impacts of MPAs on Commercial Fishers

We present data on the impacts of MPAs in the policy section that follows, yet here we present data only on the socioeconomic effects of MPAs among commercial fishers. This is because, nearly universally, fishers express strong agreement or at least some agreement that the biological objectives of the MPAs have been met, yet have more mixed feelings about the social and economic impacts. We asked survey respondents whether or not the MPA created problems for themselves specifically or for communities that depend on fishing, or whether or not they created opportunities for employment or investment. Table V.32 presents these data for those MPAs that fishers we interviewed were familiar with:

Table V.32. Percent of Commercial Fishers Who Agree or Strongly Agree with Social Impacts of MPAs

MPA	Creates Problems for Respondent & Family	Creates Problems for Community	Creates opportunities of Employment & Investment
Tourmaline(n=197/ 77%)*	**37.3**	**52.6**	**27.1**
Bajo de Sico (n=198/ 77%)	**36.2**	**53.5**	**20.7**
Boya 6 (n=56/ 22%)	**33.4**	**49.2**	**26.4**
Mona (n=209/ 82%)	**29.7**	**21.3**	**21.3**
Desecheo (n=199/ 78%)	**42.1**	**52.7**	**22.8**
Luis Peña (n=49/ 19%)	**26.6**	**37.8**	**43.6**
Condado (n=45/ 18%)	**31.1**	**35.0**	**24.3**
St. Johns (n=25/ 10%)	**32.0**	**36.0**	**21.7**
Hind Bank (n=21/ 8%)	**38.1**	**47.6**	**15.0**
St. James (n=25/ 10%)	**36.0**	**37.5**	**43.4**
Grammanik (n=21/ 8%)	**38.1**	**40.0**	**20.0**

*Refers to number & percent familiar with the MPA.

Extrapolated to the population of Puerto Rican fishers who fish off the west coast (approximately 50%), these figures suggest that between 250 and 300 fishing families have been negatively impacted by Tourmaline and Bajo de Sico.[35] Desecheo has been slightly more disruptive, creating problems for between 300 and 350 families, and La Mona slightly less, creating problems for around 250 families. We need to consider, however, that these negative impacts are not spread evenly over Puerto Rico, but are likely concentrated in the western municipalities. In fact, one third of those who reported being negatively impacted by Tourmaline were from Cabo Rojo, and another one-third from Rincón and Mayagüez.

As we move east, the MPAs seem to have affected fewer people, with Luis Peña and Condado causing problems for around 100 families each and the Virgin Islands MPAs negatively affecting between 50 and 100 families each. It is interesting that both the Luis Peña and St. James reserves are seen as being generally beneficial, with greater percentages saying that they created opportunities for employment and income (presumably through tourism) than believed they were causing problems. These were, however, the only two MPAs so designated.

[35] Assumes a figure of 2,000 total commercial fishers (x 77% who are familiar with the MPA = 1,540 x 37.3% who reported being negatively impacted = 574.42).

Fishers' Perceptions of the Performance of Marine Protected Areas of Puerto Rico and the U.S. Virgin Islands

In the first paragraphs of this report, we noted that our work was intended to profile the fishing communities of Puerto Rico with special attention to the ways in which they have been affected by Marine Protected Areas (MPAs). MPAs, according to the National Science Council, are specified territories in marine environments "designated for special protection to enhance the management of marine resources" (2001: 1). They are, in other words, fishery, habitat, and even cultural resources management tools, and they have been growing in importance worldwide over the past two decades. MPAs may be in force year-round, indefinitely, seasonally, or on a temporary basis (for example, until fishery managers perceive stock recovery). As such, MPAs are *part of* broader management regimes that include several other measures, including licensing requirements, reporting requirements (often tied to licensing), size requirements on specified species, gear modifications, and so forth. MPAs, however, constitute a departure from species-specific fishery regulations, emphasizing the importance of protecting habitat as well as the fish, shellfish, and other marine resources within the MPA. They reflect an ecosystem approach to management, rather than one that focuses on individual species whose stocks may be in decline at a given time, however much they may be justified as protective measures for specific threatened species. For example, several MPAs of Puerto Rico are designed to protect red hind spawning aggregations, yet they also protect other species that share territory with the red hind. It is this aspect of MPAs—their protection of fish stocks that may not be threatened—that many fishers oppose.[36] MPAs can be designated by federal or local agencies, with the burden of enforcement therefore falling to either federal or local enforcement agencies. Thus, just as fishing families and communities are intertwined with many other components of coastal society, MPAs are intertwined with many other management initiatives, levels of government, past performance of government representatives or agencies, and enforcement measures.

The location of MPAs, as with many fishery management measures, is nearly always a contested process, although at least two factors influence the extent of support for or opposition to an MPA: first, the more resource users believe their needs have been considered in the design of the MPA, the more likely they will support it; second, the more the scientific justification for an MPA coincides with resource users' knowledge of the marine environment being protected, the more likely users will support the MPA (Guerrón-Montero 2005; Berkes 1999; Blount 1999). In Puerto Rico, as in other locations where commercial fishers and others justify fishing on moral grounds, as a productive endeavor oriented toward socially beneficial ends, MPAs and other marine resource regulations, to be acceptable to resource users, must also not appear wasteful or misguided.

Opposition to MPAs usually reflects the failure of one or more parts of MPA development, including its specific design (size, shape, time of year, etc.), its objectives, its implementation, the education associated with implementation, and the manner in which it is enforced. Opposition to any one of these parts of

[36] This is both in line with and contradictory to a prevailing view of fishers toward the marine environment: on the one hand, fishers tend to possess a broad, ecosystem view of marine habitat, understanding the complexity of interactions among the components and the many factors that contribute to resource health and decline. This view would recommend protecting habitat instead of individual species. On the other, fishers understand well predator-prey relationships in an environment, and they may view the overprotection of individual species that may not be threatened as potentially upsetting the balance of predator-prey relationships, favoring some predators over others. The observation that fishers' knowledge tends to be highly localized is a step toward resolving this contradiction, however, in that, *within specific localities*, habitat protection and selective fishing practices may be beneficial.

MPA development is likely to undermine the legitimacy of the organization that developed and enforces regulations surrounding the MPA, as well as to promote the civil disobedience that resource users and their associates (e.g. fish buyers) may engage in as part of their opposition. Common problems that have undermined the effectiveness of MPAs include:

1) Stakeholders were not consulted or were consulted in a manner that was either cursory or not in line with their recognized modes of communication, argument, and debate;
2) Stakeholders' perceptions and knowledge were not taken into account in the development of the MPA;
3) Stakeholders perceive the biological knowledge used in the development of the MPA as flawed or irrelevant;
4) Stakeholders believe that the MPA is not being enforced evenly, fairly, or effectively;
5) The organization developing the MPA suffers from a general crisis of legitimacy because of past performance; or
6) MPA resources are critical to stakeholder ways of life.

In addition to problems such as these, there are a variety of costs associated with developing and implementing an MPA. These include costs to management, such as soliciting opinions about the proposed MPA, usually through public hearings, research into the MPAs biological and socioeconomic impacts, educating the public about MPAs, marking MPA boundaries and maintaining the markers, and enforcement. Yet individuals, families, and communities also bear costs associated with MPAs, such as lost revenue from prohibitions against landing specific fish, declines in tourism revenues, restrictions on coastal development, and the emotional problems associated with declining fisheries or tourist related businesses.

Although in many cases commercial fishers oppose the creation of MPAs (e.g. Valdés Pizzini 1990), fishers are not wholly opposed to either the idea of MPAs or specific MPAs that they have been involved in establishing. MPAs are in line with what have been called folk conservation methods that many fishers commonly practice to preserve fish stocks for future generations, often knowing or hoping that their own children and grandchildren are likely to take up fishing as a way of life. The commercial fishers of Ceiba, for example, reported that they routinely allow portions of the sea floor to recover from their fishing efforts, after the fashion of farmers letting fields lie fallow. In Culebra, the current MPA between the main island and Luis Peña key was encouraged and supported by local commercial fishers, who perceived stresses to marine stocks and coral reefs in that area over thirty years ago, yet the reserve was not established until 1999 (Desrosiers, et al. 2005). Rincón fishers reported supporting the reserve just off the coast of Rincón called *Tres Palmas* (Three Palms).[37] These few cases, along with the many reported in the literature from other areas (Blount 1999; Berkes 1999; Guerron-Montero 2005), illustrate that fishers are willing to work with regulatory agencies in the creation of MPAs and, equally important, in encouraging fellow fishers to abide by the prohibitions that MPAs establish, perhaps even assisting with enforcement efforts. Without actively involving fishers in MPA development, however, we are likely to witness what we have seen in Southwest Puerto Rico, where some of the most prominent fishers and fish dealers are encouraging civil disobedience toward MPA regulations that they perceived were established without serious consideration of their input.

[37] It should be noted that fisher support for *Tres Palmas* occurred only after initial attempts, forged largely by an outside organization (the Surfrider Foundation), failed because of a lack of active fisher involvement in the development of the MPA.

Puerto Rico and the U.S. Virgin Islands have 11 federal MPAs, each of which was created to protect habitats that were associated with species whose stocks biological analyses have designated depressed, threatened, or otherwise compromised, or to protect habitats that are important to the health and reproductive fitness of fish, shellfish, and other marine life such as manatees and sea turtles. The MPAs are:

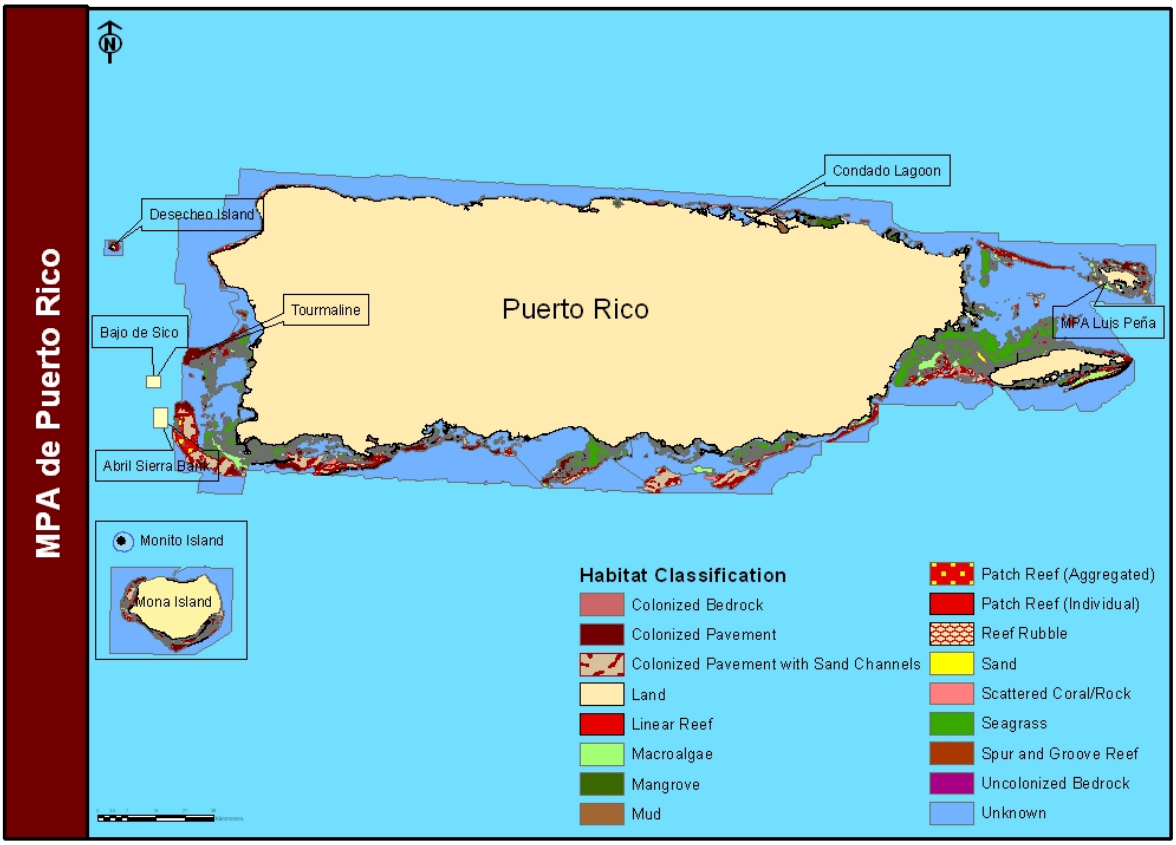
1. Abrir la Sierra Bank. Located off the west coast of Puerto Rico, near navigational buoy #6, this MPA is a seasonal closure designed to protect spawning aggregations of Red Hind (*Epinephelus guttatus*) that occur on the insular platform between December 1 and February 28. Red Hind are a particularly slow-growing, long-lived species, and their stocks have been depressed across the Caribbean. The substrate of Abrir la Sierra is predominantly a coral reef ecosystem, and it has been an MPA since 1996.
2. Arrecifes de Tourmaline. This is a coral and rock reef site, 27.769 square miles in size and seven and a half miles west of the border between Cabo Rojo and Mayagüez that, like Abrir la Sierra, was designed to protect Red Hind as well as the coral reef. It is a natural reserve, closed to fishing through the year.
3. Bajo de Sico Bank. Also west of Mayagüez, some of it over 9 nautical miles from shore and hence in U.S. federal jurisdiction, this MPA is near the edge of the shelf of the insular platform; fishing is prohibited from December 1 to February 28 to protect Red Hind spawning aggregations.
4. Desecheo: This is a small island and its surrounding waters 14 miles west of Puerto Rico, between Puerto Rico and the Dominican Republic, which has been used for military bombing, to establish colonies of rhesus monkeys, and as a stopover point for criminals ferrying illegal immigrants or drugs across the Mona Passage. Formerly the site of large bird colonies, particularly the Brown booby, seabirds have abandoned the island, but the surrounding reefs remain productive grounds. The MPA extends for one-half mile all around the island, covering 2.329 square miles, and is a marine reserve. The entire area is closed to the public at all times, primarily because unexploded military ordinance create a safety threat.
5. La Mona/ Monito: Formerly the site of heavy fishing activity that targeted fish aggregations, La Mona and La Monito are 42 miles west of Cabo Rojo; the larger La Mona is popular with tourists because of its sandy beaches, a feature that Monito lacks. Both islands are rocky and home to important bird colonies and turtle rookeries, particularly the Hawkbill's, the largest rookery in the Caribbean, as well as unique reptiles, amphibians, birds, and plants that occur no where else on earth. Its bird populations once supported a guano fertilizer industry. It is a natural reserve, 599.677 square miles, closed to fishing and other extractive activities.
6. Luis Peña Channel Marine Reserve. Located between mainland Culebra and Luis Peña key, this MPA was established to protect coral reefs and the several species of fish, shellfish, and other marine life such as sea turtles that feed in this area. It is a natural reserve, closed to fishing through the year.
7. Condado Lagoon: Located in the heart of San Juan's tourist district, this area is closed to fishing but, as noted elsewhere in this work, still contaminated with boating traffic and industrial runoff from the surrounding port.[38]
8. Grammanik Bank, St. Thomas: This is a seasonally closed area south of St. Thomas, off limits to fishing from February 1 through April 30.

[38] Condado Lagoon was the only MPA not listed on the inventory of MPAs maintained by the U.S. Government, which can be viewed at www.mpa.gov.

9. Cas Cay-Mangrove Lagoon/ St. James Marine Reserve: Cas Cay-Mangrove Lagoon has been protected as a complex ecosystem important to primary production, sheltering juvenile species of fish, lobsters, birds, and other animals with its extensive mangroves, salt ponds, lagoons, and cays. 1.127 square miles in size, it is a marine reserve and wildlife sanctuary, where fishing and other activities are prohibited year round. Nearby St. James Marine Reserve and Wildlife Sanctuary has many of the same environmental features of Cas Cay, but also has coral reefs that protect juvenile fish. It is 2.681 square miles in size.
10. Hind Bank Marine Conservation District (MCD): Around 20 fathoms deep, Hind Bank is a complex set of substrates that aggregate several species of importance to Caribbean fishers, including yellowtail snapper, red hind, yellowfin grouper, and others. Its 100-year old coral reefs are broken here and there with sandy bottoms. It was first closed during the Red Hind spawning aggregation period, December through February, but in 1999 it was converted to year round protection as a MCD.
11. St. John's Park: This is one of the largest protected areas in the Caribbean, covering 7,146 acres of land and 5,650 acres of water (22.489 square miles), with rich biological and cultural resources, including coral reefs, bays and estuaries that protect juvenile fish and shellfish, shipwrecks, slave plantations, and remnants of a subsistence culture with an historical continuity reaching to prehistoric times up through the post-Emancipation period. It has been a national park for several years. A national monument, the Virgin Islands Coral Reef National Monument, lies three miles south of St. John and includes 12,708 acres (19.67 square miles) of submerged coral reef. President Clinton established it in 2001 in recognition of its role in maintaining water quality through filtering mechanisms as well as in the health of fish and shellfish.

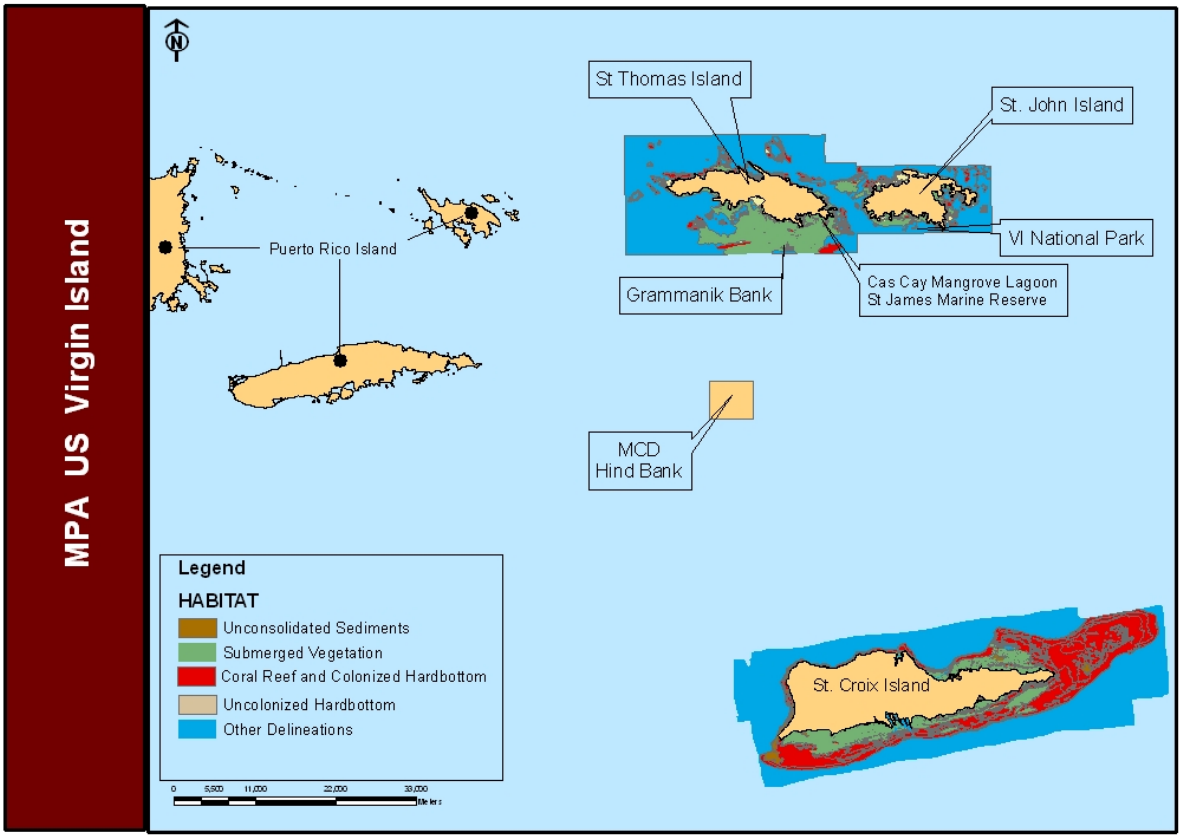
The maps that follow portray the MPAs in Puerto Rican and U.S. Virgin Islands waters, also showing the complexity of substrates that Puerto Rican fishers encounter today.

Map VI.1. Federal MPAs of Puerto Rico, with Mona/Monito as Insert



This map, based on data from NOAA Fisheries and the Caribbean Fishery Management Council, shows the approximate locations of the seven federal Marine Protected Areas of Puerto Rico, including the one in San Juan, one near Culebra, and five off the west coast of the island—site of many of the island's most productive fishing communities. The islands of Mona and Monito are farther off shore than this map depicts, to the west of Bajo de Sico. In addition, this map shows the various kinds of substrates and littoral environmental features common throughout the Caribbean. Six additional MPAs, closer to the U.S. Virgin Islands, may also influence Puerto Rican fishing practices, and so are also depicted below.

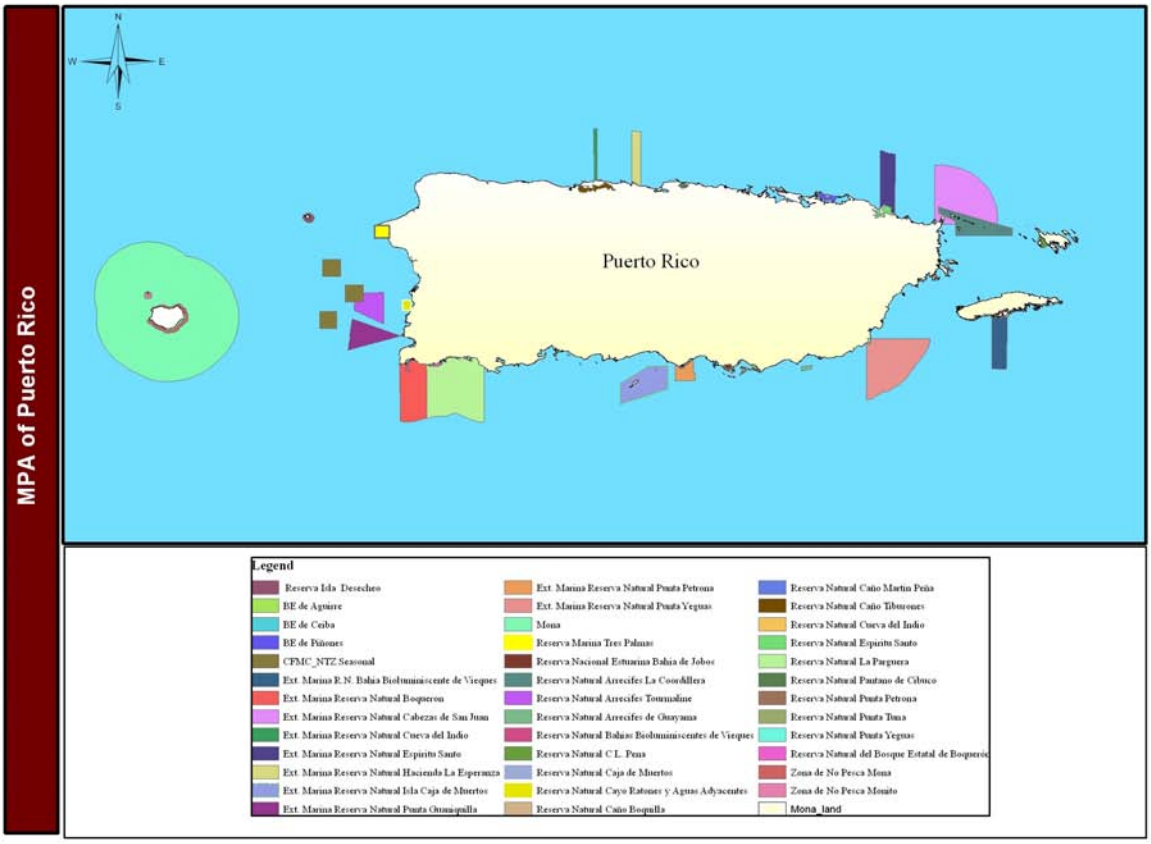
Map VI.2. MPAs of the U.S. Virgin Islands



The U.S. Virgin Islands MPAs include one known spawning aggregation location for red hind, Hind Bank, which is closed seasonally, and five other regions in which fishing is prohibited. These regions, as well as those in Puerto Rico, also affect navigation, in that fishers cannot cross these regions if they have fish on board their vessels. At times this causes increases in fuel costs and at other times it increases hazards, if circumnavigating the MPA means that they cannot get to shore as quickly as possible during a sudden storm.

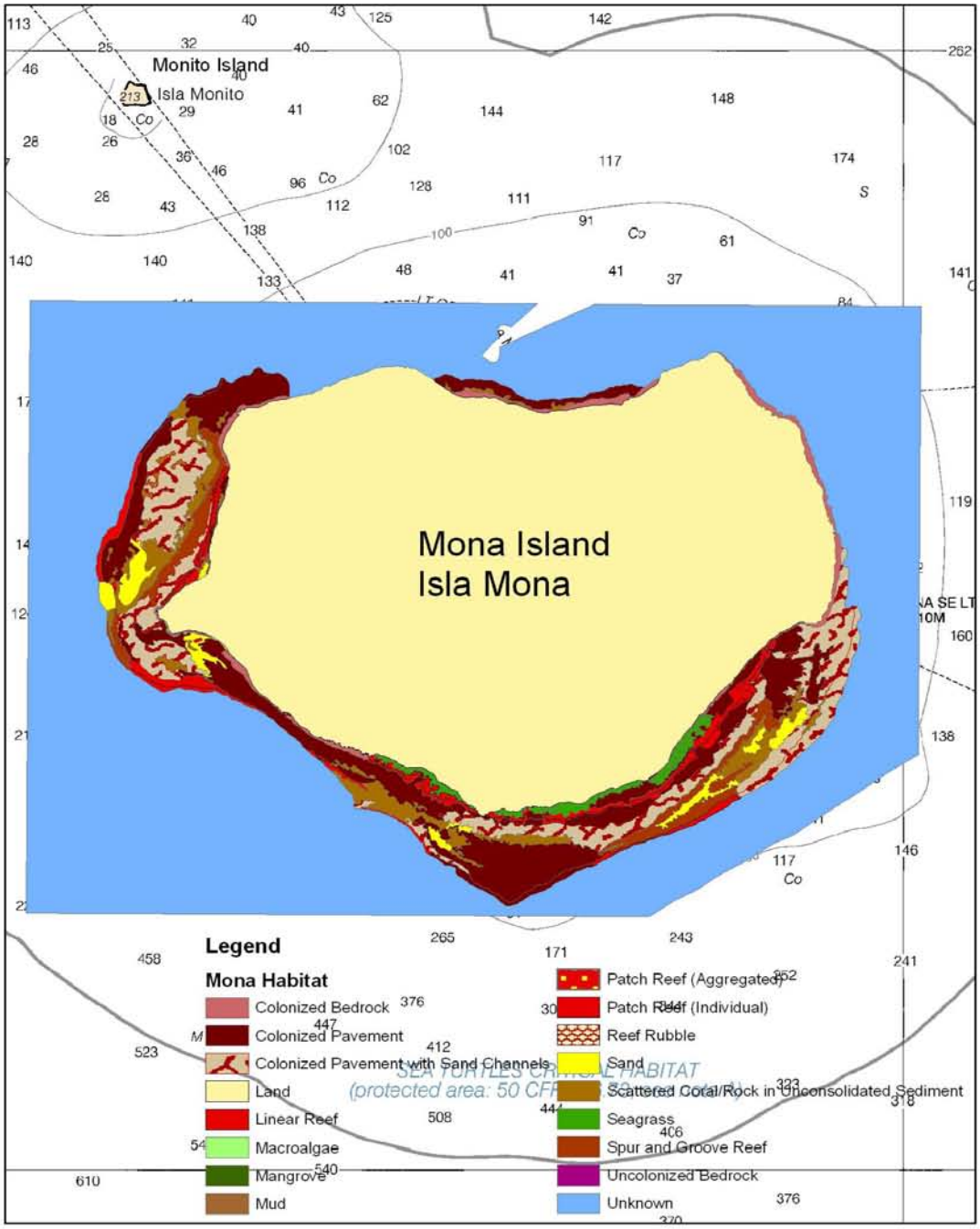
While our task was to assess the impacts of federal MPAs on Puerto Rican fishing, it is impossible to disentangle federal MPAs from those that have been developed and implemented by the local *Departamento de Recursos Naturales y Ambientales* (DRNA—Department of Natural Resources and the Environment). The map that follows shows these areas (as well as the federal MPAs). Those under the jurisdiction of the DRNA are all within 9 miles of Puerto Rico's coast, and are adjacent to some of the most important fishing communities in Puerto Rico.

Map VI.3. Federal and Commonwealth MPAs in Puerto Rico

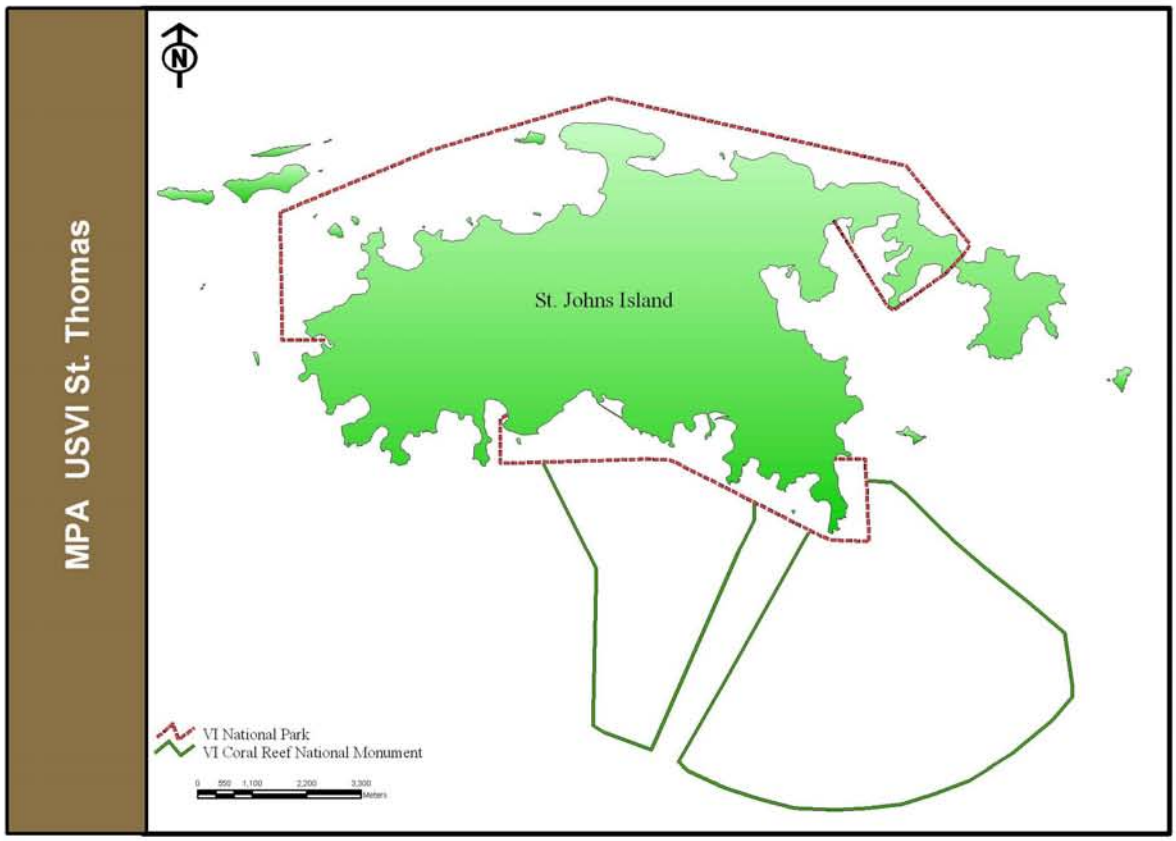


Briefly, those that are in areas where fishing is a particularly strong presence are those off the southwest, northeast, and Vieques (the large island to the east of the main island) coasts; in addition, the area off of the south central coast encloses an island called Caja de Muertos (Coffin Island), which is a favorite fishing spot among recreational and commercial fishers. The following close-up maps of the individual federal MPAs give additional insight into the nature of substrates in the U.S. Caribbean territories.

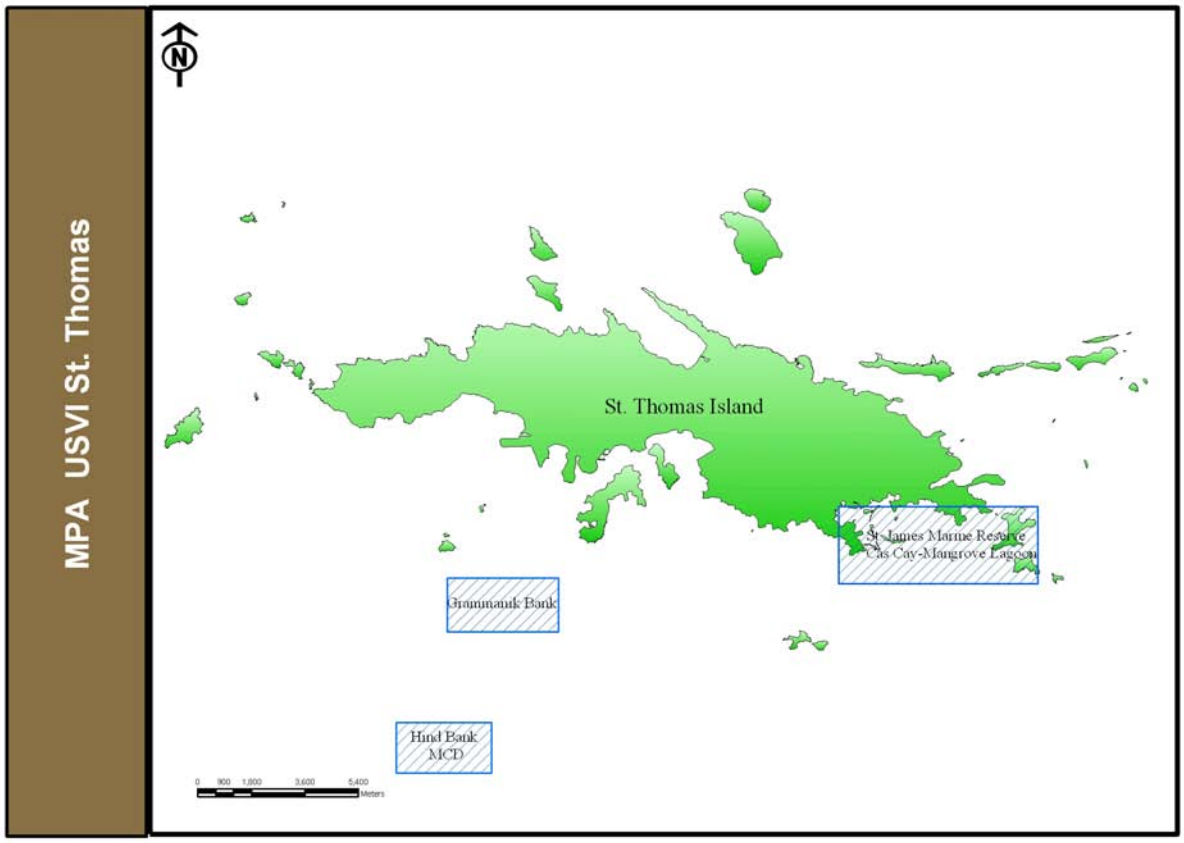
Map VI.4. Mona/Monito MPA



Map VI.5. St. Johns Island MPA



Map VI.6. St. Thomas MPAs



VI.a.1. Problems and Benefits of MPAs in Puerto Rico

Not all of these MPAs have received the same amount of attention from NOAA Fisheries, UPR Sea Grant College Program, marine biologists, or others associated with their development and implementation. Three of the federal reserves, however, were recently included in a study of Puerto Rico's MPAs: Luis Peña, Bajo de Sico, and Tourmaline (Desrosiers, et al. 2005). This study identified several problems that have attended federal MPAS, and a brief review of these problems may provide marine resource managers with clues about methods of improving MPA effectiveness.

Luis Peña MPA began in a way that nearly assured its success, with the wholehearted support of the local fishing community. In fact, as noted earlier, fishers had pressed for a marine reserve prior to the state's involvement, concerned primarily over two practices that threatened the reserve's coral reefs and fish stocks: 1) that increasing boating traffic was leading to damaging anchoring behaviors; and 2) that long-term bombing by the U.S. Navy had damaged substrates. While the project began with the support of the fishing community and a cooperative arrangement between locals and an NGO (CORALations) interested in protecting coral reefs, community support for the MPA has waned over time, primarily due to sporadic and poor enforcement efforts. Poaching from the MPA has become common and, in one case, a DRNA officer found fishing in the MPA received little punishment, further undermining the legitimacy of an

agency which already has poor relations with fishers across Puerto Rico; some poaching takes place inadvertently, as the MPA is poorly marked and fishing just inside its boundaries is possible without one knowing they are violating the law (or, poachers can claim they were unaware they were inside its boundaries). Overall, however, fishers believed that their role in co-management efforts was cursory and confined to early but irregular support for the MPA. Fishers believe that they could play a more active role in enforcing MPA regulations, which would enable more sustained involvement and more successful co-management.

Luis Peña has not been a total failure, however, and it is not too late for DRNA to utilize the MPA as a tool to engage local fishers in management efforts. Our ethnographic work found that Culebra fishers routinely use the MPA for educational purposes, teaching the school children of Culebra about the importance of coral reefs and other marine environments. In addition, they are willing to assist with monitoring efforts as long as DRNA demonstrate some responsiveness to their participation in enforcement efforts; these efforts would be aided significantly with clearer boundaries and more visibly posted information about the MPA. Culebra fishers believe that poachers are largely fishers coming from outside the community, and that the boating traffic that continues to damage the reef is also from outside the community. Many of these visitors simply are unaware of the MPA and its regulations.

A different set of problems and positive outcomes has attended the two MPAs *Tourmaline* and *Bajo de Sico*, in Western Puerto Rico. Both of these MPAs are located in the rich fishing grounds off the coast of Mayagüez, Rincón, and Cabo Rojo—three municipalities with serious and productive fisheries. They were developed in response to the CMFC's 1985 Reef-fish Fishery Management Plan to protect red hind spawning aggregations, as alternatives to other kinds of protective measures, including the size limits that many Puerto Rican fishers object to. Early input into the planning process for *Tourmaline* led to reductions in its size and to the establishment of two other MPAs to protect red hind: *Bajo de Sico* and *Abrir la Sierra*. The reduction was based on fisher knowledge as well as potential negative impacts, in that fishers argued that the area protected included too many other species and that parts of the protected area included sandy bottoms where fishermen could leave traps during stormy weather. Some problems continue, however. Our ethnographic work found that the areas occasionally increase the costs of fishing and pose threats to navigation, in that fishers with fish in their vessels are not allowed to cross the MPAs and circumnavigating them can lead to more time in stormy seas and increase fuel expense.

The council's consideration of fisher input into the design of the MPAs was a laudable effort and one that has contributed to fishers abiding by the regulations. This is particularly the case because through the formation of the MPA they avoided placing restrictions on size limits that too often result in wasted fish and that fishers particularly detest. However, an island-wide ban on catching red hind from December through February, along with other size limits, continues to result in wasting catch that is pulled from deep water.

As with Luis Peña, fishers also perceive enforcement of MPA regulations as a problem. While the Coast Guard regularly patrols the area, fishers believe that they concentrate more on drug trafficking and illegal immigration than on fishery regulations. The presence of the Coast Guard provides some deterrent, however, and fishers report that they comply with the MPAs, learning about them from word-of-mouth, but that their compliance is in part due to fear that if the closures fail that other, less palatable restrictions will be put into place.

The above assessments of MPAs dovetail well with our ethnographic work around Puerto Rico. In general, we found limited *direct* opposition to MPAs compared to, say, licensing requirements and size

limits, yet this apparent indifference toward MPAs was often mixed with criticism of them on the basis of fishers' observations and knowledge of marine life. The direct opposition we did encounter came from fishers and fish dealers who were actually encouraging their peers to violate MPAs as a form of civil disobedience, or a protest of the general way in which fishery policy is designed and fishery management takes place; these sentiments have certainly influenced the reporting of landings, fishery earnings, participation in the census, and other official attempts to track fishing behavior.[39] Clearly, this has been an unintended impact of MPAs.

Regarding fishers' criticism, fishers often disagreed with either the placement of MPAs or the times of seasonal closures, believing that they did not reflect the true spawning habits of fish or shellfish. They also pointed to the fact, noted earlier, that MPAs often unnecessarily protected species that were not endangered. Commenting on the seasonal closures off of Western Puerto Rico, the Executive Director of the Caribbean Fishery Management Council "pointed out the possibility of a 'Big Mamma' syndrome, where a reserve that favors one species causes that species to displace others and actually reduce the biodiversity and health of the ecosystem" (Desrosiers, et al. 2005: 71).

The issue of MPA enforcement raises a different and potentially more important set of issues. Many fishers we interviewed during the ethnographic phase reported that either they or fishers they knew routinely "risked" punishment to fish in MPAs or for species protected by seasonal closures. Although other fishers reported that they will report offenders, this did not seem to be as widespread as those who said they knew of offenders but didn't report them, or were offenders themselves. This suggests that there is widespread belief among fishers that violating marine regulations will result in few or no consequences. Once successful at evading enforcement personnel, barriers to fish sales could occur at the market level, yet we know that some fish dealers are willing to buy protected or undersized species from fishers as part of civil disobedience campaigns or simply because it is in their economic interests, and the interests of maintaining good relations with suppliers, to do so. As long as imports of protected and undersized species are allowed, fish dealers also suffer few to no consequences for buying these fish and shellfish.

The failure of enforcement efforts resonate all too well with fishers' general attitudes toward fisheries management in Puerto Rico. Again and again, we encountered the sense that there was a widespread crisis of legitimacy affecting coastal and marine managers. Their attitudes toward the DRNA enforcement personnel are particularly troubling, especially when enforcement efforts could serve as a common ground for both fishers and the DRNA. Fishers in Puerto Rico are on the water daily or nearly daily, monitoring not only the resource but also other fishers' and boaters' behaviors, and they could, with limited training, assist with enforcement if they believed their efforts would be worthwhile, if they believed that their views were being incorporated into management, and if they believed that the DRNA was truly interested in protecting marine resources. The latter becomes questionable to them when they witness widespread mangrove destruction and contamination of in-shore marine environments due to construction, industry, and other sources. If fishers and coastal and marine managers agree on anything, it is that these and other habits have in fact caused declines in coastal and marine resources. We take up this and other views toward MPAs and the marine environment in the following section.

[39] It is possible that the apparent declines in landings around Puerto Rico from 2002 to 2003 may be due to reporting error rather than actual declines in fish; this is unfortunate, given that the landings data are figured into the formula that biologists use to assess fish stocks.

VI.a.2. Consensus and Disagreement

Efforts to protect marine environments and fish and shellfish stocks and habitats in Puerto Rican waters have been met with ambivalent reactions among those who depend on fishing for some or all of their livelihood and identity. On the one hand, broad consensus exists among commercial fishers that fish stocks are currently threatened and need to be protected. On the other, fishers and regulators appear to disagree about the causes of fishery problems and certainly disagree about the methods they need to employ to address fishery problems.

The Puerto Rican fishery census, along with our 2005 survey, demonstrate this consensus, with the minority viewing fish as abundant or fishery resources in better condition today than in years past.

Table VI.1. Commercial Fishers' Opinions of Fishery Resources

Status of Fishery Resources	Percent from Puerto Rican Fishery Census (n=1061)	Status of Fishery Resources	Percent from Aguirre Survey (n=298)*
Better	3%	Abundance of Fish	8%
The Same	30%	Middle Range	39%
Worse	67%	Absence of Fish	53%

*In the Aguirre Survey, respondents were asked to rank the status of fishery resources on a scale from Absence (1) to Abundance (5). Here ranks 1 and 2 are combined in Absence box, 3 and 4 in middle range, and 5 in Abundance box. We include only commercial fishers.

Although everyone seems to agree that the fisheries resources are in difficulty straights, there is far less agreement on the causes of resource and habitat problems or, given certain causes, what measures should be put in place to address resource and habitat problems. Slightly more than 15% of commercial fishers in the fishery census reported that fishery resources were worse off because of overfishing. Instead, 37% listed pollution and 20% listed habitat destruction. In the Aguirre survey, a similar proportion, 38%, listed "contamination" as the cause of declines in fish stocks, including contamination leading to loss of fish habitat, with only 10% listing overfishing as a cause (most of those who listed overfishing designated particularly destructive gear types or fishing styles, rather than overfishing in general). Just under 7% surveyed listed fishery regulations as part of the problem facing fishery resources, as opposed to part of the solution.

Because most marine protective regulations are aimed at reducing fishing pressures rather than addressing pollution or other known causes of fishery resource declines, many commercial fishers we interviewed voiced the opinion that current management measures and enforcement practices are neither based on accurate information nor fairly applied. The DRNA and other regulatory agencies may have difficulty preventing contamination when polluters are out of their jurisdictions, yet the destruction of mangroves, the problems with recreational boating and diving, the pollution that comes from coastal construction may be within their jurisdictions.

Relations between commercial fishing families and the Department of Natural Resources are particularly poor, yet these are only symptomatic of a broader crisis of legitimacy facing the state when it comes to fisheries. In many fishers' minds, quite simply, the state has lost its moral authority to oversee the management of fisheries. This crisis of legitimacy hinders effective management of fisheries and undermines attempts to protect marine environments, threatening the existence of agency personnel interested in balancing the needs of fishing families with the protection of marine resources.

The regional studies that comprise Volumes II & III of this report present some clues as to how to proceed. Initially, it is important for NOAA Fisheries, the Caribbean Fishery Management Council, and the DRNA to reestablish legitimacy with commercial, recreational, and subsistence fishing populations. The current study is a step toward this goal, in that it solicits fishers' input regarding fishery regulations by assessing how they have impacted fishing families and communities. Yet more work could be done along the lines of participatory co-management, especially that which encourages the incorporation of the vast wealth of fishery knowledge about the habits of fish and shellfish, the ways that changing environments influence fish behaviors, and the alternative steps that might be taken to protect marine resources.

VI.b. Impacts of Fisheries Regulations on Puerto Rican Fishing Families and Communities

VI.b.1. General Themes Regarding Regulations: Fishers' Opinions

With the exceptions of a few loud and vehement voices, including the voices of active leaders of fishers, neither the ethnographic nor the survey phases of this research uncovered widespread opposition to or concern about the *specific* federal MPAs that are listed and mapped in the introductory sections of this report: Luis Peña, Condado, St. Johns, Hind Bank, St. James, Grammanik Bank, Tourmaline, Bajo de Sico, Abrir de Sierra, Mona/Monito, or Desecheo. However, neither did our research uncover widespread support for these MPAs; instead fishers seemed to view them with a kind of indifference and resignation, repeating several of the same themes regarding regulations in general, whether federal or local. While we examine responses to each MPA from the survey data below, we first present those general problems that fishers in Puerto Rico experience with regulations.[40] These are drawn from the regional studies in Volume II:

- Regulations do not take into account fishers' knowledge of the resource, particularly local knowledge about areas where fish congregate, times of fish aggregations, other habits of fish and shellfish.
- Regulations seem to have been designed for waters off the coasts of the South Atlantic and Gulf states. Fishers have not participated in, nor do they know of, many studies that have been conducted in the fishing grounds around Puerto Rico. In other words, regulations do not reflect *local* knowledge, and much fisher knowledge is highly localized.
- Regulations focus on fishing practices to the exclusion of protecting mangroves and other coastal habitats/nursery grounds. Among those who are responsible for the destruction of fish and shellfish habitats are resorts/ hotels (largely on the north coast and near large urban areas), factories and energy plants (primarily on the south and north coasts), recreational boaters/ marinas (all around the islands), general contractors constructing housing and housing developments (all around the islands), and owners of small, illegal *casetas* built in mangroves (primarily southwest coast).

[40] We emphasize that these are the opinions of fishers, as represented to the researchers for this project and as relayed as accurately as possible here, rather than proven facts. That is, specific opinions of fishers may be flawed (e.g. that there is little to no marine science being conducted in Puerto Rican waters), yet part of profiling fishing communities involves profiling their beliefs, regardless of whether they are factually correct, and understanding their beliefs—*their* reality—is a first step toward working with fishers to construct more amenable relations between fishers and marine resource managers and, possibly, toward effective co-management.

- MPAs present navigational problems, increasing the cost and risks associated with circumventing them after a day of fishing. Fishers in Aguada and Rincón, for example, complained that, as long as they are carrying fish, they need to go around rather than through Tourmaline, and that, during rough seas, this increases the risk of their being capsized.
- Seasonal closures can also increase the risks to fishers, in that they encourage "derby fishing"—or fishing intensely for species immediately prior to the closure and thus taking more risks at sea (see section on Vieques, in regional profiles). Divers are especially at risk of being afflicted with the bends during these times.
- Size limits on deep-water species lead to wasteful (and, many fishers believe, immoral) practices. Pulling deep-water species to the surface kills them, yet they have to discard them if they are under legal size limits, despite that they have little control over what takes their hooks or enters their traps. In addition, fishers believe that if Puerto Rican fishers are forced to abide by size limits, seafood importers should be forced to abide by them as well, yet they see undersized fish in *Pueblo* (Puerto Rico's large supermarket chain) and other seafood marketing outlets.[41]
- Violations of regulations are common, but enforcement of regulations is uneven and often heavy handed, focusing on specific groups of fishers (e.g. those of Puerto Real and other parts of Cabo Rojo) at the expense of ignoring others who may be damaging reefs or other habitats (e.g. recreational boaters, fishers, and divers who drop anchors or walk on reefs).
- The current licensing system is costly and flawed, in particular because it depends on records that many of the more experienced, elder fishers have never bothered to keep, have kept irregularly, or have deliberately withheld landings data for some purpose (e.g. fear of being taxed, resistance to the state).
- Fishers are not given credit for the many ways they attempt to protect resources themselves, preventing or assisting in the prevention of misuse of resources (e.g. the use of *filetito*—little gill nets—that damage coral reefs, designing traps to work more efficiently beside rather than on top of reefs, reporting violators).

This list presents those themes that emerged again and again during the course of our fieldwork; it is not exhaustive. In these themes, however, are the grains of how fishery managers might approach regulations or engage fishing families and communities in the crafting of marine policy. They also illustrate the extent to which fishers, even when coming from backgrounds of low levels of formal education, are people who think critically about marine resources and habitats, developing stores of knowledge that management could benefit from. Specifically, the following areas of fisher knowledge could assist managers in the ways designated:

- **Knowledge of the conditions of substrates, particularly coral reefs.** Fishers possess detailed knowledge bases regarding several kinds of substrates that are key to their understanding of fish habits and their ability to catch fish. These substrates include seagrass beds, sandy bottoms, coral reefs, etc. that often change radically with various kinds of events (e.g. hurricanes, bleaching, contamination incidents). Fishers often understand the cause and nature of these changes and are usually the first to witness changes in substrates that may interest fishery managers.

[41] Although fishers, to our knowledge, have not mentioned this, having size limits on local species yet failing to apply them to imports also serves to externalize environmental problems, passing on whatever problems attend the capture and sale of undersized species to those countries from which Puerto Rico imports fish. Similarly, it is conceivable that fish populations from Mexico, the north coast of South America, and other parts of the Caribbean (particularly the Dominican Republic and the British Virgin Islands) overlap with fish populations in Puerto Rico, and allowing the importation of undersized species from these areas directly impacts Puerto Rican stocks.

- **Knowledge of the habits of fish and shellfish**, including spawning times, the migration patterns and times of pelagic species, the abundance of some species relative to others, changes in the sizes or other characteristics of species, the influence of lunar cycles on fish, and the relationship between species health and abundance and specific coastal developments (e.g. sedimentation, mangrove cutting). Again, because changes in fish habits take place from season to season and year to year, and fishers are often the first to perceive these changes, closer coordination between fishers and biologists could track these changes more precisely and empirically, rather than relying on fishery science that may be dated or more relevant to areas outside the Caribbean.
- **Knowledge of the effect of various gear types of marine environments.** Fishers regularly experiment with gear designs in ways to make gear catch more effectively, be less prone to loss, easier to handle, etc. They also observe fishing practices of others and how these practices affect the environments they observe daily. Through this process they learn the ways that different gear types may be less or more harmful to substrates such as coral reefs.
- **Knowledge of the effects of anthropogenic practices on marine environments.** This is perhaps one of the richest areas of fisher knowledge, ranging from the ways in which the disposal of conch shells to the development of marinas affect the health of fishery resources. In this area, fishers often understand complex relationships that could be framed as hypotheses and tested in field settings by marine biologists. For example, many fishers of the West and South coasts suspect that changes in near-shore ecosystems are due to the decline of the sugar industry
- **Knowledge of the history of specific marine ecosystems.** Given the long-term interaction of fishers with the marine ecosystems of Puerto Rico, many fishers' knowledge has an historical depth that could be useful to managers in assessing how different marine environments have changed and are liable to change in the future based on past trajectories. Historical information from fishers could also enable improved understandings of the impacts of hurricanes, bleaching, earthquakes/tsunamis, or other major environmental crises on coral reefs and fish stocks, and the time it takes these to recover from large-scale trauma.
- **Knowledge of the optimal means of educating fellow fishers about rationale underlying different marine regulations.** While this is not knowledge about the marine environment, it is critical knowledge for management to have, given the current communication problems that exist between fishing communities and the DRNA and other regulatory agency personnel. Fishers could provide clues about how information is currently disseminated among themselves, how this might vary from place to place across the island, and what they consider credible sources of information (e.g. UPR Sea Grant).

These are only a few examples. Others are sure to emerge the more fishers believe that managers respect and value their knowledge. As in other areas of the U.S., where biologists and fishers assist one another in conducting studies of marine resources, fishers and managers in Puerto Rico need to work more closely together for an improved understanding of the marine environment. Puerto Rican officials may benefit, moreover, by paying attention to the variety of ways that participatory co-management and knowledge sharing has proceeded in other parts of the United States and globally. In North Carolina, for example, the state has implemented a Fisheries Research Program specifically to match university and agency scientists with members of the commercial fishing population to address current problems and issues facing the fishery. In more than one case, this program has been used to test hypotheses based on fishers' understanding of the function of the marine environment, such as the idea that dragging scallop dredges and other gear along the bottom in certain kinds of substrates, such as mud, increases productivity.

VI.b.2. Fishers' Opinions Regarding the Performance of MPAs

The following section presents the results of the survey data on each MPA. We asked several questions about the 11 federal MPAs listed and mapped earlier. These included:

- Does the MPA maintain or augment spawning aggregations?
- Does the MPA improve the quantity of fish within its boundaries?
- Does the MPA improve the quantity of fish adjacent to its boundaries?
- Does the MPA protect species exploited in vulnerable areas?
- Does the MPA restore or maintain the quality of habitat?
- Does the MPA create livelihood problems for my family and me?
- Does the MPA create social or economic problems for communities that depend on fishing?
- Does the MPA maintain or augment opportunities for investment or employment?

Tables VI.2 through VI.8 show the results of the interviews for seven of the eleven MPAs. We have only included those who had experience fishing in the MPAs, because most of those who answered had no idea what the MPAs were, let alone whether or not they were effective. This included the majority of those interviewed, especially regarding the U.S. Virgin Islands MPAs, where fewer than 5 fishers had any experience with these MPAs. We thus do not present tables on the four U.S. Virgin Islands MPAs. We begin with the western MPAs and Tourmaline, off the coast of Rincón.

Table VI.2. Fishers' Opinions Regarding Tourmaline (n=83)

	Strongly Disagree*	Disagree	Neutral	Agree	Strongly Agree	Don't Know
Maintains Spawning Aggregations	4.9	1.2	3.7	4.9	80.5	4.8
Improves quantity of fishes inside	6.1	1.2	2.4	7.3	75.6	7.3
Improves quantity of fishers in adjacent area	3.7	2.5	2.5	7.4	75.3	8.6
Protects species in vulnerable areas	6.1	2.4	2.4	6.1	79.3	3.6
Restores or maintains habitat quality	9.8	4.9	0	6.1	75.6	3.6
Creates problems for my family and myself	42.7	8.5	11.0	7.3	26.8	3.6
Creates problems for communities	17.1	7.3	14.6	7.3	47.6	5.1
Creates employment / investment opportunity	31.3	5.0	11.3	3.8	25.0	23.9

*Figures are percentages

These figures suggest that, with regard to Tourmaline, most fishers believe that the MPA is effective in protecting fish stocks. The species they thought that the MPA protected, both inside its boundaries and adjacent to it, were primarily grouper and snapper species. Nearly everyone listed *chillo* and *colirubia,* for example, and several mentioned *mero.* When it comes to the MPAs' impacts on communities (the bottom three rows), responses are more mixed.

Between one-third and nearly three-fourths (if we include the "don't know" category) of those interviewed were not very sanguine about the MPAs creating opportunities for investment or employment, although between one-quarter and one-third agreed that this was possible. By contrast, over one-third of those interviewed agreed or strongly agreed that Tourmaline created problems for their family or themselves, and over half agreed that it created problems for communities. To our thinking,

these figures reflect an appreciation of the nature of fishing and its entanglement with coastal communities in Puerto Rico: restrictions on fishing are liable to hurt families and individuals, but more probable to hurt communities, given fishing's cultural importance and the importance of seafood in the lives of coastal residents.

Table VI.3. Fishers' Opinions Regarding Bajo de Sico (N=70)

	Strongly Disagree*	Disagree	Neutral	Agree	Strongly Agree	Don't Know
Maintains Spawning Aggregations	5.7	2.9	5.7	4.3	78.6	2.8
Improves quantity of fishes inside MPA	5.9	2.9	2.9	4.4	75.0	8.8
Improves quantity adjacent to MPA	4.3	2.9	4.3	7.2	79.9	7.2
Protects species in vulnerable areas	4.3	4.3	4.3	5.7	77.1	4.3
Restores or maintains habitat quality	5.7	5.7	1.4	4.3	80.0	2.8
Creates problems for my family or me	40.0	11.4	12.9	10.0	22.9	2.8
Creates problems for communities	11.4	7.1	20.0	11.4	45.7	4.3
Creates employment / investment opportunity	32.8	4.5	13.4	6.0	23.9	3.0

*Figures are percentages

With the exception of the species listed under the improvement in quantity of fish inside and adjacent to the MPA, the survey results regarding Bajo de Sico are similar to those for Tourmaline: those interviewed perceived the MPA's value for fish stocks and habitat, but high percentages believed they had detrimental impacts on families and communities, with around one third indicating that the closures were hurting them directly. The species listed still included high proportions of demersal species, such as a variety of snapper and grouper species, but also more pelagic species, such as tuna and king mackerel. The following tables present nearly identical results for the Western MPAs, with but few minor differences.

Table VI.4. Fishers' Opinions Regarding La Mona/Monito (N=57)

	Strongly Disagree*	Disagree	Neutral	Agree	Strongly Agree	Don't Know
Maintains Spawning Aggregations	0	1.8	3.5	5.3	80.7	8.8
Improves quantity of fishes inside MPA	0	1.8	1.8	3.6	82.1	10.7
Improves quantity adjacent to MPA	0	1.8	1.8	7.1	76.8	12.5
Protects species in vulnerable areas	1.8	1.8	1.8	5.3	86.0	3.5
Restores or maintains habitat quality	1.8	5.3	1.8	1.8	89.5	0
Creates problems for my family or me	48.2	7.1	12.5	7.1	25.0	0
Creates problems for communities	15.8	5.3	19.3	8.8	47.4	3.5
Creates employment / investment opportunity	29.8	5.3	8.8	8.8	26.3	21.1

*Figures are percentages

Table VI.5. Fishers' Opinions Regarding Boya 6/ Abrir de Sierra (n=73)

	Strongly Disagree*	Disagree	Neutral	Agree	Strongly Agree	Don't Know
Maintains Spawning Aggregations	4.2	1.4	2.8	2.8	87.5	1.4
Improves quantity of fishes inside MPA	4.2	1.4	1.4	2.8	80.3	9.8
Improves quantity adjacent to MPA	2.8	1.4	1.4	7.0	80.3	7.0
Protects species in vulnerable areas	2.8	2.8	2.8	5.6	81.9	4.2
Restores or maintains habitat quality	5.6	4.2	0	4.2	83.3	2.8
Creates problems for my family or me	38.9	12.5	11.3	8.3	25.0	4.2
Creates problems for communities	13.9	8.3	18.1	9.7	45.8	4.2
Creates employment / investment opportunity	21.4	4.3	14.3	4.3	30.0	25.8

*Figures are percentages

Table VI.6. Fishers' Opinions Regarding Desecheo (n=73)

	Strongly Disagree*	Disagree	Neutral	Agree	Strongly Agree	Don't Know
Maintains Spawning Aggregations	4.2	2.8	2.8	4.2	80.3	5.6
Improves quantity of fishes inside MPA	4.3	2.9	1.3	2.9	78.6	10.0
Improves quantity adjacent to MPA	2.9	2.9	2.9	5.8	75.4	10.1
Protects species in vulnerable areas	4.2	2.8	2.8	4.2	80.3	5.6
Restores or maintains habitat quality	2.8	7.0	1.4	4.2	81.7	2.3
Creates problems for my family or me	44.3	10.0	8.6	7.1	28.6	1.4
Creates problems for communities	17.1	4.3	25.7	4.3	45.7	2.8
Creates employment / investment opportunity	31.3	6.0	7.5	7.5	26.9	20.9

*Figures are percentages

Again, when asked about species these MPAs were benefiting, it was principally the deep water, snapper and grouper species that fishers listed. On the other hand, the few fishers who were familiar with the eastern MPAs were more apt to mention species such as conch, lobster, and even crab, along with some snapper species (e.g. yellowtail snapper).

Regarding the eastern and U.S. Virgin Islands MPAs, fewer fishers were familiar with them and those that had fished the MPAs were less enthusiastic about their importance in conserving fish stocks and habitat. Only 26 fishers were familiar with the reserve at Culebra, and those who believed it increased fish stocks within the reserve and adjacent to it pointed to snapper and grouper species but also lobster and conch. While the frequencies regarding beliefs about effects on communities and families are similar to those found regarding the western MPAs, more survey respondents, about two-thirds, seemed to believe the MPA would create investment and employment opportunities. This may reflect general fisher support for the Luis Peña reserve.

The other eastern MPAs were viewed with slightly different proportions. For Condado, in San Juan, where 30 fishers were familiar with the MPA, slightly more than 45% of those surveyed agreed or strongly agreed that the MPA created problems for themselves and their families, compared to only 41.6% who said it created problems for the community. Over one third seemed to believe that it could create employment or investment opportunities.

Table VI.7. Fishers' Opinions Regarding Reserva Natural Canal de Luis Peña, Culebra (n=26)

	Strongly Disagree*	Disagree	Neutral	Agree	Strongly Agree	Don't Know
Maintains Spawning Aggregations	11.5	0	3.8	3.8	65.4	15.3
Improves quantity of fishes inside MPA	16.0	0	0	4.0	72.0	8.0
Improves quantity adjacent to MPA	16.7	0	0	8.3	70.8	4.2
Protects species in vulnerable areas	7.7	3.8	7.7	0	76.9	3.8
Restores or maintains habitat quality	8.0	4.0	8.0	4.0	68.0	8.0
Creates problems for my family or me	64.0	0	0	4.0	28.0	4.0
Creates problems for communities	45.5	0	4.5	4.5	40.9	4.5
Creates employment / investment opportunity	19.0	0	4.8	4.8	66.7	4.8

*Figures are percentages

Table VI.8. Fishers' Opinions Regarding Condado, San Juan (n=30)

	Strongly Disagree*	Disagree	Neutral	Agree	Strongly Agree	Don't Know
Maintains Spawning Aggregations	18.5	7.4	0	14.8	51.9	7.4
Improves quantity of fishes inside MPA	12.5	4.2	0	4.2	58.3	20.8
Improves quantity adjacent to MPA	13.0	0	13.0	0	60.9	13.0
Protects species in vulnerable areas	14.8	7.4	7.4	3.7	55.6	11.1
Restores or maintains habitat quality	16.0	4.0	8.0	8.0	52.0	12.0
Creates problems for my family or me	37.5	0	4.2	12.5	33.3	12.5
Creates problems for communities	33.3	4.2	8.3	8.3	33.3	12.5
Creates employment / investment opportunity	25.0	0	25.0	4.2	33.3	12.5

*Figures are percentages

These last two MPAs fared less well in the minds of fishers as means to protect fish and habitat, with lower percentages strongly agreeing with the positive statements about their impacts. When we examine these fishers' responses to other parts of the interview—those in which they were asked to explain what they believed were the problems with the health of coral reefs, fishery resources, and mangroves—we begin to understand why these fishers rated these MPAs as less effective. Nearly 70% of those familiar with the Canal de Luis Peña, an MPA protecting a large coral reef, viewed contamination from boating traffic (including abuses from anchoring behavior) and from coastal construction as primary causes of declines in the health of coral reefs. Similarly, in terms of the Condado MPA, over 60% of those familiar with this MPA view contamination, from boating traffic, coastal construction, and industrial sources, as responsible for the declining health of marine resources.

Based on these tables, it is clear that those familiar with the MPAs view their impacts on fish stocks and habitat as positive while being disruptive to fishing families and communities. We believe that this reflects an astute recognition of the fact that fishing communities extend beyond the confines of fishing families themselves, including others who are dependent on marine resource to lesser degrees or who simply enjoy local seafood occasionally. Certainly the problems that fish dealers have with MPAs, voiced in the ethnographic interviews, supports the view that other businesses directly related to fishing and landings may be adversely affected by MPAs. That fewer people view MPAs as vehicles to employment or investment—or methods to maintain those at current levels through conservation of

stocks—certainly suggests that there may be room for educational initiatives that point out how and where this has been accomplished.

VI.c. Relations between Fishing Families and Coral Reefs

> *"Es como un pueblo."* ("It's like a city.")
> —*Cabo Rojo fisher, describing a coral reef (Benedetti 1997: 3).*

One goal of this study has been to document the reported ways that fishers interact with coral reefs in both beneficial and detrimental ways. Nearly all, if not quite all, commercial fishers we interviewed understand the value of substrates to their way of life. In the Caribbean, coral reefs are among the most important substrates they encounter. Because the Caribbean sea is characterized by low levels of phytoplankton and few large river systems to replenish stocks of nutrients, coral reefs and other fish-aggregating substrates are particularly important to Puerto Rican commercial fishers.

Nearly all commercial fishers are liable to have some interaction with coral reefs, but the extend of that interaction will vary regionally and by type of gear they tend to utilize. Divers probably have the most direct interaction with coral reefs, followed by trap fishers and net fishers, although all fishers may affect coral reefs with their anchoring behaviors or from fishing with hooks and lines over coral reefs. Regionally, fishers who interact with coral reefs most frequently are those who specialize in diving (e.g. Peñuelas, Patillas, Arroyo, Naguabo) as well as those who specialize in trap fishing (e.g. Guayama). Thus, collecting local knowledge about the condition of coral reefs or the roles of coral reefs in marine ecosystems would be accomplished most effectively in these locations. At the same time, educational efforts about coral reefs (e.g., bleaching events) would be most efficiently distributed if they focused on these locations over others. The following table compares divers and trap fishers regarding their views of coral reefs, showing that trap fishers are far more pessimistic than divers.

Table VI.9. Divers' and Trap Fishers' Views of Coral Reef Health

Percent* who believed that reefs were:	Divers	Trap fishers
Healthy 10 years ago	73%	70.7%
Healthy 5 years ago	25%	17.2%
Healthy Today	24.3%	3.6%
Will be Healthy 5 years from now	20.6%	3.7%

*Includes those who listed SCUBA diving or trap as first in their list of equipment utilized.

During our research, fishers reported several ways in which they interact with coral reefs. While it would take direct observation and additional research to know whether or not fishers' relations with coral reefs protect or damage them, the fishers reports that follow, along with our own observations, provide clues to areas that marine biologists and others may want to investigate more thoroughly, converting fishers folk theories and questions into testable research hypotheses. A list of some of fishers' views, interactions with, and relations with coral reefs follow:

- Boating Traffic and Coral Reefs. Many fishers we interviewed considered boating traffic, principally recreational boating traffic, as detrimental to coral reefs, primarily because of anchors. Recreational boaters, especially those diving or snorkeling, are liable to place their anchors directly onto coral reefs. Fishers who are sensitive to this are less likely to damage reefs in this way.

- Recreational diving traffic and coral reefs. Similar comments were heard from fishers about recreational diving: fishers reported that they had seen them standing on top of coral reefs, rather than swimming over them.
- *Filetitos*. In our work in Guánica, we encountered a group of fishers who said that they had defended coral reefs by discouraging, through direct confrontation, the use of *filetitos* (small gill nets), which snagged on coral reefs and caused damage.
- Conch graveyards. We noted in a few of the regional reports, especially those in the east and south, that fishers—principally divers—possess two theories regarding the discarding of conch shells: 1) that conglomerations of empty conch shells attract conch; and 2) that conglomeration of conch shells repel conch by giving them the impression of a conch graveyard. Whichever view a fisher holds it is likely to influence where they dispose of empty conch shells. Those who hold the first view are likely to leave them on or next to coral reefs, while those who believe the second are likely to leave them on sandy bottoms where they will be covered, or in grass beds where they will be hidden. An additional belief about conch shells was that they provided protection for juvenile fish and crabs, and that in this way they helped maintain the resource, regardless of where they were placed.
- Trap design and placement. Traps are a major gear that can affect coral reefs, both as working traps, as they sit on top of coral reefs, or as ghost traps, that continue fishing (and rolling) over coral reefs after they have been lost. Designing and placing traps in ways that are sensitive to coral reefs is something we encountered in both Fajardo and Yabucoa. There, fishers reported that they were careful to place their traps alongside coral reefs, on sandy bottoms, rather than on top of them.
- Use of Clorox on coral reefs. Some fishers reported that they had witnessed part-time fishers fishing for octopus, on coral reefs, with Clorox.

Bringing Fishers into the State: Policy Implications of the Community Profiles

The findings presented earlier and the regional profiles that follow have several implications for fisheries and marine resource policy in Puerto Rico. These address such things as the operations of regulatory bodies, communication between resource managers and resource stakeholders, and the future of fisheries in Puerto Rico, and they range from concrete proposals to those that address the philosophy of management. We emphasize that these are suggestions that emerge from the survey and ethnographic analysis and, to the best of our knowledge, reflect the current reality of Puerto Rican fishing. We do not claim that they are exhaustive, however. Other readers of this document may find additional recommendations that we failed to consider. Before discussing policy, however, we briefly reiterate the goals of our research and some of the project's principal findings, considering the policy implications of each finding. We conclude this chapter with a focus on the advantages and disadvantages of participatory co-management in a setting, like Puerto Rico, where network-based fishing communities are becoming more common, and suggestions for future research.

Project Goals:

Again, we point out that the specific goals of the research underlying the report were to:

3. Conduct community profiles to satisfy the legal requirements of the Magnuson-Stevens Act, particularly National Standard 8, the National Environmental Policy Act, and Executive Order 12898 in Puerto Rico;
4. Conduct a socioeconomic evaluation of the performance of the region's federal MPAs, including 'Reserva Natural de Canal Luis Peña' (Culebra Island, Puerto Rico), Laguna del Condado, the Marine Conservation District (US Virgin Islands), the seasonal closures off the west coast of Puerto Rico (Buoy 8/Tourmaline Bank, Buoy 6/Abrir la Sierra Bank, and Bajo de Sico) on the fishers, their families, and their communities of Puerto Rico. We also evaluated Desecheo. We emphasize that the notion of *performance* here refers to how they have performed vis-à-vis fishing lifestyles, and not how they have performed in a biological sense (except in terms of how fishers perceive their benefits to fish stocks and habitats).

In the course of this work, we have paid particular attention to the notion of *community* as it applies to the fishing populations of Puerto Rico, attempting to determine various communities' levels of dependence on, and engagement with, fishing. We define a community as a group of people living and working together, exchanging services and goods, who share some common interests while diverging at times according to different class backgrounds, where many also share a common cultural and linguistic background. Communities are social fields, comprised of overlapping networks of kin, neighbors, friends, co-workers, and others who interact with one another regularly. Communities may be place-based, network-based, knowledge-based, or may transcend specific geographic locations, although many community members usually share attachments to a specific place.

Our understanding of dependence and engagement derive from a combination of language from the Magnuson-Stevens Act, from NOAA scientists' lists of minimum data elements and indicators (see Table IV.1 and outline above), and from our sense of how well these applied to the Puerto Rican setting. Because the Magnuson-Stevens Act frames much of this work, we repeat their language here:

> "Substantially dependent implies that loss of access may lead to some change in the character of the community, perhaps a major change, or may even threaten its existence. Substantially engaged, on the other hand, implies a level of participation in commercial, recreational, or subsistence fisheries that includes social and economic networks that are directly and indirectly associated with these fisheries (such as the harvesting and/or processing sector)" (NOAA, 2004; see, 63 FR 24235, May 1, 1998).

We have emphasized that, in Puerto Rico, it is impossible to characterize any specific municipality and few communities as "fishery dependent," given that fishing families in Puerto Rico tend to be dispersed rather than concentrated and that, through occupational multiplicity and other activities, fishing families are entangled in several economic sectors of coastal and more distant environments. Despite this, we argue that fishing communities continue to occupy an important economic and cultural niche in Puerto Rican society, and that their entanglements with other sectors are in fact critical to this importance, enhancing the economy, society, and culture of the region in many ways.

VII.a. Policy Implications of Project Findings

Here we draw together the principal findings from our ethnographic and survey work, paying less attention to findings that derive from landings data, the fisher census, and other official sources of information about the fisheries of Puerto Rico. The findings from the ethnographic and survey work are, we believe, the original contributions of this report, along with the detailed descriptions of the communities in Volumes II and III. We arrange these findings in line with their arrangement in the Executive Summary above, following each finding or set of related findings with implications for policy.

VII.a.1. Profiles of Puerto Rican Fisheries

1. Seasonal Variation in Fishing Effort. Commercial fishing effort is highest during the months of May through July and lowest in October and November. Recreational fishing effort fluctuates more or less in tandem with commercial fishing, although the spring and late summer are the busiest months for tournament fishing. Marketing factors also affect levels of fishing activity, in that the demand for seafood is particularly robust during Lent but less robust during the period leading up to Christmas, when pork is in particularly high demand for the holidays.

Policy Implication: To the extent that fishing effort varies seasonally, regulatory officials may wish to consider the timing of seasonal closures to coincide with periods in which fishing activity is lower, if such closures can still meet their biological objectives.

2. Fishing and Occupational Multiplicity. Fishing provides the sole income for around 40% to 45% of commercial fishing families, yet nearly half (46.5%) of commercial fishers interviewed in the survey reported working outside of fishing, most primarily in the construction trades, including masonry, carpentry, welding, plumbing, painting, and manual labor. At the household level, this figure rises to 56.5%, which includes working spouses, children, and others. This suggests that fishing and other coastal occupations subsidize one another. Earlier studies of fishers have found that over 90% of commercial fishers work outside of fishing at some time during their lifetime.

Policy Implication: Fishery managers need to recognize that during any given year, it is unlikely that the full 1,500 to 2,000 officially licensed commercial fishers will be engaged in fishing full time. Instead, a

substantial proportion will leave fishing, partially or completely, as alternative opportunities arise, thus reducing the extent to which they exploit marine resources. Managers may be able to predict where this is likely to happen based on where new construction or other kinds of employment expansion is taking place, and consider that in those regions, fishing restrictions may have less of an impact than in areas where there are fewer employment alternatives to fishing. At the same time, it may be beneficial to fishers to educate coastal residents (particularly employers) regarding the importance of fishing as a cushion against unemployment, poverty, and other socially negative conditions.

3. Relations between Fishing and Seafood Marketing in Fishing Families. Puerto Rico's commercial fishery is family-based, similar to commercial fisheries in many other parts of the United States: specifically, women play important supportive roles in fishing and children usually learn fishing from their parents or from other family members. Family involvement in fisheries seems to increase with the elaboration of fish markets, and especially when *Villas Pesqueras* and private fish markets add seafood restaurants to their facilities. Women often manage or staff seafood restaurants, add value to or process seafood, and assist with fish marketing; children often work in these areas as well. Fishers' households tend to be between 3 and 4 people in size, with most fishers (60-70%) married. These figures do not vary significantly among commercial, recreational, or subsistence fishers.

Policy Implication: Adding value to marine resources in this way reduces the quantity of fish and shellfish fishers need to land to survive, thus reducing overall pressure on the resource. As such, managers should, where possible, promote and support the increasing involvement of families in fishing operations in this way.

4. The Changing Faces of Fishing Communities. Fishing communities in Puerto Rico can be place-based, network-based, or knowledge-based, with the first becoming less common and the other two increasing in importance. Place-based communities are those in which a majority of fishing families lives in a specific, relatively small, geographical location, such as a neighborhood or small town. Network-based communities are comprised of fishers who work together but live mostly apart, dispersed over several towns or neighborhoods in one or two municipalities. Knowledge-based communities tend to overlap with both place-based and network-based communities, consisting of groups of fishers who share knowledge about, for example, fishing territories, gear, fishing practices, political aspects of fishing, etc. Knowledge-based communities often serve as the basis for opposition to, or cooperation with, fishery management.

Policy Implication: As place-based communities become less common and network-based communities become more common, the significance of coastal gathering places as places where fishers exchange knowledge has increased. In addition, network-based communities have become repositories of *social capital*, or social relationships that enable members of meaningful groups (e.g. groups of fishers) to influence the economic well-being of the group and group members. Social capital can benefit individual group members or it can constrain group members' behavior. The more fishery managers learn about the ways network-based fishing communities marshal their social capital, the more they may be able to assist fishers in adding value to fishery products and to join them in their own efforts to pressure network members to learn about and abide by existing fishery regulations.

Fishery managers may use the information on the communities presented in this report to locate knowledgeable and well-respected fishers and locations where fishers are likely to exchange information. Place based communities are preferable to network based communities for communication purposes, but

when working in network-based communities, managers need to locate significant coastal locations where fishers gather.

5. The Diversity of Recreational Fishers. The recreational fishery of Puerto Rico draws participants from all walks of life, from professionals and government officials to factory workers, the temporarily employed, the unemployed, and the retired. The survey elicited 76 occupations spread over 98 working respondents, suggesting that recreational fishers do not cluster in any specific occupation.

6. Multiplier effects of Recreational Fishing. A majority of recreational fishers contribute to local economies by purchasing vessels, gear, bait, and other services locally. Of the 70% who own vessels, nearly 90% have purchased vessels constructed locally and have their vessels and motors maintained locally. Most fishing gear and bait are purchased locally as well, although electronic gear is purchased elsewhere (e.g. Miami) about half the time.

Policy Implication: Because of the diversity of the recreational fishing population, restrictions on recreational fishing are unlikely to affect any single economic sector in a negative way, except perhaps tourism and businesses related to fishing and other marine supplies, and vessel sales, storage, and maintenance. However, our ethnographic work suggests that recreational fishers make up a small proportion of recreational boaters.

The diversity of recreational fishing also suggests that recreational fishing has a broad base of popular support in Puerto Rico, and that restrictions on recreational fishing may be difficult without sufficient and well-communicated biological or social justifications.

7. Subsistence Fishing. The subsistence fishery in Puerto Rico—or people who fish primarily for food for their households—is made up mostly of people from working class backgrounds who target snapper-grouper species (40%) and pelagic species such as dolphin (7.4%) and king mackerel (5.9%), but almost no shellfish. Their gear varieties are similar to those of recreational fishers, but few use SCUBA gear.

Policy Implication: The working class backgrounds of subsistence fishers suggests that subsistence fishing may serve as a subsidy to employers, providing high quality protein to individuals who might not otherwise be able to afford it and thereby encouraging a healthier, more productive workforce. Managers may want to educate employers about these indirect benefits they receive from subsistence fishing, in their efforts to create alliances with employers in general attempts to control shore-based pollution for which those employers may be partially responsible.

8. Community Dependence on Fisheries. Dependence on fishing varies around the islands by several factors. For the commercial fishery, in addition to high average annual landings (> 100,000 lbs) and revenues (> $250,000), most fishing dependent communities are place based (as opposed to network based), where at least one third of its fishers fish full time, where ties between the commercial fishery and the tourist sector are complex, where both commercial and recreational fishing infrastructure are highly developed, and where the cultural significance of fishing is reaffirmed in festivals, statues, sculptures, murals, or other icons. Many fishing dependent communities also have close ties with the state, receiving government funding for vessels or infrastructure, and many are actively involved in conflicts over coastal development, new regulations, or other issues. Examples of communities that are highly dependent on fishing include: La Parguera, Lajas; Puerto Real, Cabo Rojo; La Playa, Ponce; Punta Santiago, Humacao; Pozuelo, Guayama; La Estella, Rincón; and the Downtown Harbor neighborhoods of Fajardo (Maternillo,

Mansion del Sapo, and Puerto Real). The north coast has the fewest communities that are highly dependent on fishing.

Policy Implication: Our work has shown that the number of pounds and value of landings, as well as other official sources of information, constitute a small part of several measures of dependence on fishing. Relying on official statistics to understand variations in dependence, therefore, may lead to unreliable conclusions. Understanding regional differences in dependence can aid managers in concentrating their efforts to educate fishers about the necessity of certain regulations.

VII.a.2. Issues Related to MPA Perfomance

1. Attitudes toward MPAs. In general, most fishers believe that most of the MPAs of Puerto Rico are achieving their biological goals of protecting fish stocks, spawning aggregations, etc., but have more mixed views about the sociological effects of MPAs.

Policy Implication: Managers need to monitor the sociological impacts of MPAs more closely, paying particular attention to fishers' responses to MPAs (including seasonal closures) immediately before and after they go into effect. They need to worry less about justifying MPAs on biological grounds, although soliciting opinions from fishers about the biological goals of MPAs is advisable.

2. Navigation and MPAs. MPAs present a problem for navigation, in that fishers need to sail around them when they have fish in their vessels. During stormy seas this increases the danger of seagoing travel and on a routine basis this increases trip expenses, particularly fuel costs.

Policy Implication: Fishers are able to contact DRNA, Coast Guard, or other officials to tell them of their intention to traverse a MPA with fish in their vessels during times of stormy seas or if facing other kinds of distress, but officials need to be sensitive to the possibility that denying requests can have serious, even fatal, consequences. Officials should judge, on a case-by-case basis, whether or not the crossing is justifiable.

3. Conch Closures. The seasonal closure for conch, which some fishers believe occurs at the wrong time of year in terms of conch breeding, has caused two problems: 1) it encourages "derby fishing" among divers, or fishing at high levels, making repeated hazardous dives, in the days immediately prior to the closure; 2) conch shells provide protection from predators from juvenile species.

Policy Implication: Basing their closures on local observations and analyses (rather than on studies done outside of Puerto Rican waters), managers need to prove to fishers that the closures are occurring during times of the year that conch are, indeed, breeding. Some fishers recommended interrupting the closed season with occasional openings. While this would address the conch-shells-as-protection issue, it would likely lead to increased derby fishing.

The prevalence of derby fishing among divers points to the more general problem of contracting the bends among divers. Educational materials regarding the hazards of diving should be developed and distributed to dive shops, fishing associations, and other locations, to increase awareness of the dangers of diving and surfacing too quickly.

4. Variations in MPA Performance. For Tourmaline, Bajo de Sico, La Mona/ Monito, Abrir la Sierra, and Desecheo, between 70% and 90% of those interviewed in the survey strongly agree that MPAs maintain

spawning aggregations, improve the quantity of fish inside the MPA, improve the quantity of fish adjacent to the MPA, protect species in vulnerable areas, and restore or maintain habitat quality.

Experienced fishers interviewed in the survey were less sanguine about Canal de Luis Peña in Culebra and Laguna Condado in San Juan, however. For Canal de Luis Peña, while over 70% believed that the MPA improved the quantity of fish inside and adjacent to the MPA and protected species in vulnerable areas, only 65.8% believed it maintained spawning aggregations and only 68% believed that it restored or maintained habitat quality. Around 70% of fishers familiar with Canal de Luis Peña cite contamination from the boating traffic and coastal construction projects as responsible for the declining health of marine resources.

The MPA viewed as least effective by those interviewed was the Laguna de Condado, in San Juan. Only between 50 and 60% of fishers believed that this MPA maintained spawning aggregations, improved fish quantities inside and adjacent to the MPA, protected species, or restored or maintained habitat quality. Over 60% of those familiar with Condado viewed contamination, primarily from boating and construction but also from industrial sources, as the principal cause of resource decline.

Policy Implication: The waters to the west of Puerto Rico may be overly protected, as all of the MPAs, according to fishers, have been accomplishing their biological objectives. Studies should first be conducted to examine whether or not fishers' perceptions about these MPAs are correct; if they are, some consideration should be made of opening currently closed waters to fishing.

Managers may wish to balance MPA placement with the current conditions of habitat. Areas that are already highly contaminated are unlikely to achieve the biological goals of closure.

VII.a.3. Issues Related to Coral Reefs

1. Coral Reef Health. Overall, fishers believe that the health of coral reefs has been declining over the past ten years and that it will continue to decline in the next five years.

Policy Implication: The high degree of consensus within the fishing populations of Puerto Rico about the health of coral reefs bodes well for developing monitoring systems that combine the expertise and experience of reef ecologists, fisheries biologists, and social scientists with the expertise and experience of fishers.

Protection of coral reefs will likely be seen as a high priority management effort among fishers, and thus easily justifiable by managers. However, their protection against fishing pressures must be combined with the effective monitoring of recreational boating and diving activity associated with reefs. That is, enforcement cannot concentrate on fishing alone.

2. Contamination, Recreational/ Tourist Traffic, and Coral Reefs. Survey respondents cited "contamination" as the principal cause of the declining health of coral reefs, with boating traffic, coastal construction, and industrial run-off as the three principal sources of contamination.

Regarding boating traffic in particular, many fishers viewed it as detrimental to coral reefs primarily because of anchoring behavior. Especially recreational boaters are liable to place their anchors directly on coral reefs. Fishers sensitive to this are less likely to damage reefs in this way.

Commercial divers report that they have witnessed recreational divers damaging coral reefs by standing on top of them instead of swimming over them. The increase in divers in Puerto Rico in recent years is important to coral reef health in that commercial divers are often the first to spot problems with coral reefs such as bleaching, damage from anchors, etc. Fishery managers and others interested in the health of coral reefs would benefit from engaging in more cooperative efforts with commercial divers to monitor coral reef health.

Policy Implication: Managers need to take active steps, when it is within their jurisdiction, to protect habitats from contamination by shore-based activities. One method managers could use to address contamination from coastal construction, for example, would be to prevent construction that is also destroying mangroves, since the protection of mangrove forests is usually within the jurisdiction of those agencies also responsible for protecting other marine resources.

3. Fishers' Protective Methods. Fishers in Gúanica claimed that they had defended coral reefs by discouraging, through direct confrontation, the use of *filetitos* (small gill nets), which snagged on coral reefs and caused damage.

In both the ethnographic work and the survey, fishers reported that they had witnessed people fishing for octopus, on coral reefs, with Clorox.

Policy Implication: These are two example of fishers monitoring activity around coral reefs (and, by extension, other marine resources) and taking steps to protect reefs on their own. Managers may want to assist fishers in these efforts, if they feel they are justifiable, or they may want to expand the role of fishers as marine resource observers and monitors.

4. Local Theories about Conch Shells. Divers in the east and south possess two conflicting theories regarding the impacts of discarding conch shells: 1) that conglomerations of empty conch shells attract conch; and 2) that conglomerations of conch shells repel conch by giving them the impression of a conch graveyard. Whichever view a fisher holds, it is likely to influence where they dispose of empty conch shells. Those who hold the first view are likely to leave them on or near coral reefs, while those who believe the second are likely to leave them on sandy bottoms where they will be covered, or in grass beds where they will be hidden. Other divers report that conch shells provide shelter for juvenile species on and near reefs.

Policy Implication: Research may be desirable to determine the behaviors of conch toward empty shells.

5. Trap Design and Placement. Traps are a major gear that can affect coral reefs, both as working traps, as they sit on top of coral reefs, or as ghost traps, that continue fishing (and rolling) over coral reefs after they have been lost. Commercial trap fishers in Fajardo and Yabucoa design and place traps in ways that are sensitive to coral reefs, and most commercial fishers are careful to place their traps alongside coral reefs, on sandy bottoms, rather than on top of them.

Policy implication: Information about less destructive fisher trap designs and placement techniques should be disseminated throughout trap-fishing communities.

VII.a.4. Issues of Importance to Fishing Communities

1. Seafood Quality and the Health of Fishing Communities. Among the most important goods fishers provide is high quality, fresh fish to locally-owned and -operated seafood restaurants. Commercial fishers commonly hold the view that they "defend themselves with *fresh* fish", contrasting their product to imported frozen, canned, dried, or other preserved products.

Although the high quality of their seafood enables commercial fishers to compete with lower-cost imports, most fishers view imports as a problem, particularly when imported fish is smaller than legal size limits on fish captured in Puerto Rican waters. The issue of imported fish, however, is more complicated than their competition with local seafood. At especially busy times of the year, imports enable small, family-owned coastal restaurants to provide seafood to customers in the absence of a sufficient supply of fresh local seafood.

Policy Implication: Assisting fishers in promoting their seafood as superior in quality to imported seafood is a way of adding value to the catch, and value-adding strategies, as noted earlier, allow fishers to make more money from fewer fish. Hence, managers may wish to assist in seafood promotions. If it is possible, managers may also wish to examine current import practices, to assess whether or not legally undersized fish are indeed being imported.

2. The Occupational Legitimacy and Licensing of Fishing. Some commercial fishing in Puerto Rico is done as part of the informal or underground economy. All communities that sit directly on the coast in Puerto Rico have members who fish, but in some cases, fishers are reluctant to report earnings from fishing, fearing they will jeopardize their ability to receive social services or increase their tax bills. In some rural and isolated communities, the links between fishing, contraband trade, smuggling, and other uses of coastal environments continue to the present, undermining the extent to which fishing has been able to develop as a legitimate (i.e. officially recognized) occupation.

At the same time, fishers perceive current licensing requirements as costly, burdensome, and biased against older, experienced fishers who do not happen to keep accurate records or do not keep records in an officially recognized way. Some highly experienced fishers have been humiliated when they receive licenses that designate them as beginners, which other fishers perceive as a serious blow to their dignity and to the dignity of the noble, moral, and at times dangerous craft of fishing. DRNA officials believe that this could be resolved simply by changing the name of the license.

Policy Implication: Change the name of the license. With regard to reporting landings, earnings, and other data, managers need to assure fishers of confidentiality.

3. Regional Variations in Fisheries. Dependence on, and engagement with, Puerto Rican fisheries varies geographically, from rural to urban settings, and in tandem with trends in tourism and other leisure, aesthetic, or recreational uses of coastal, littoral, and sea environments. The most viable fisheries are those that have managed to take advantage of a combination of state resources and tourism revenues. The most fishery dependent regions of Puerto Rico are the Southwest, Northeast, and Northwest; the least fishery dependent region is the North coast. However, there are families dependent on fishing in all the coastal municipalities.

Fishing in Puerto Rico is intimately tied to trends in coastal gentrification, in both positive and negative ways. Relations between commercial fishers and the tourist industry are ambivalent: on the one hand,

some fishing groups have utilized coastal tourism to increase revenue streams, establishing seafood restaurants that cater to tourists, providing water taxi services, selling bait to recreational fishers, and so forth; on the other, particularly near luxury resorts, fishers become involved in disputes with tourist developers over the destruction of mangroves and other critical habitats, slip space and coastal access, and crowding and contamination from recreational boating traffic.

Fishers' reactions to coastal development/ construction are similarly mixed, with over 20% of the fishers interviewed in the survey believing that coastal development destroys mangrove forests and causes contamination that leads to the deaths of coral reefs and declining fishery resources. Other fishers, however, view coastal development positively, as a source of increased demand for seafood and tourist services that fishers can provide; in addition, coastal construction provides work for many fishers and their family members when they are not fishing, and in this sense subsidizes fishing operations.

Policy Implication: Restrictions on fishing will have different impacts in different regions. This report is a first step in understanding regional variation, but the fishery is constantly changing. Establishing a regular monitoring system for changes in Puerto Rican fishing, perhaps modeled after current efforts at Long Term Ecological Research, should be developed.

4. The Moral Economy of Fishing. Full-time Puerto Rican commercial fishers view fishing as a "moral" enterprise, even in the context of attempts to professionalize the fishery through the modernization of equipment and improvements in record keeping. This implies that they view fishing as a productive use of natural resources that provides some food or subsistence security and is directed toward socially beneficial outcomes, such as raising families and providing consumers high quality, fresh seafood. As such, they regard wasting fish, as occurs when they have to discard undersized species, as morally reprehensible.
Policy Implication: Managers should revisit the regulation on catching undersized species by: 1) examining the biological evidence regarding the health of stocks and the sizes of fish; and 2) considering the issue of waste.

5. Fisher Knowledge. Commercial fishers in Puerto Rico possess a great deal of local knowledge about the fishery resources of the region that could constitute a valuable cultural resource for fisheries management. Currently, it forms a basis from which fishers criticize current regulations. Their knowledge includes information on reproductive, schooling, feeding, and other habits of fish and shellfish; factors that lead to resource decline; threats to water quality and nursery grounds; conditions of coral reefs, grass beds, and other substrates; conditions of estuaries; relations between lunar cycles and marine life behavior; seasonal changes in fish stocks; migration patterns of fish and shellfish; spawning aggregation sites; the health of stocks of different species of fish and shellfish; and so forth.

Policy Implication: Fishers and scientists could benefit from cooperative research projects, with fishers framing hypotheses and scientists developing ways to test them. North Carolina's Fisheries Resource Grant Program, currently handled through the UNC Sea Grant College Program, could serve as a model for this work.

As noted above, this also reinforces the idea that fishers are already observing and monitoring the resource on a daily basis.

6. DNRA officials' knowledge. Commercial fishers routinely report that DRNA officials have not been properly trained in fish identification, and that they often attempt to fine fishers because the officials

misidentify a legal species for a protected species. This undermines the legitimacy of the DRNA as an agency that is knowledge about the resource and, hence, as an agency charged with responsibility for protecting the resource.

Policy Implication: Training of DRNA officials in fish identification would be advisable. Such training would be most effective if combined with additional training about the biological, social, economic, and management goals of marine resource protection.

VII.b. Participatory Co-Management: Benefits and Drawbacks

In a recent article comparing the Maine lobster industry with the New England groundfishing industry, James Acheson (2006) found that the former had developed effective and enforceable conservation measures that protected lobster stocks while the latter had been unable to protect groundfish from continued declines. His comparison focused on the historical participation of lobstermen vs. groundfishers in the regulatory process, and he attributes the success of lobster conservation measures to the active participation of lobstermen in development of regulations concerning lobster fishing. He argues that lobstermen historically pressed marine resource managers to adopt restrictions on lobstering, promoting regulation "from the ground up." Groundfishing, on the other hand, was regulated from the top down, with far less active participation on the part of groundfishers, and has resulted in not only less effective conservation measures but also what Acheson terms a "roving bandit" strategy: that is, illegal fishing.

Acheson's work reaffirms that fishers who are not consulted in the policy-making process often consider the regulations developed "from above" illegitimate and ineffective from a marine conservation perspective. While the Maine lobstermen policed themselves, exerting peer pressure to conform to regulations, the groundfishers actively resisted regulations by engaging in illegal fishing. Increasingly, marine resource managers have been cognizant of the fact that incorporating fishers into the management process, or participatory co-management, is necessary to establish legitimacy and to encourage fishers to follow existing fishery regulations.

Drawing fishers into management circles, however, has not been easy, in that often their methods of communication differ as much as their understandings of marine resource dynamics. At the same time, participatory co-management has not always been as successful as the Maine case and, indeed, may have unanticipated negative consequences. It may be that Maine's unique coastal ecology, combined with the highly specialized nature of lobstering and the close-knit nature of coastal fishing communities, predisposed the lobster industry toward effective management and conservation measures. It may also be the case that participatory co-management in Maine entailed pushing less compliant lobstermen out of the industry, privileging one group of lobstermen over another.

This points to one of the principal problems with participatory co-management: at times, involving fishers in policy-making may inadvertently create leaders in fishing communities that undermine leadership that has emerged more informally over long time periods. The question of developing leadership becomes even more complex when we consider that many fishing communities are highly localized, concerned with a narrow range of issues, and that internal divisions and conflicts often exist within commercial fisheries. In Puerto Rico, for example, the long-term mistrust between trap fishers and SCUBA divers is one such example.

Nevertheless, without the active participation of fishers in regulatory development, it is unlikely that fishers will perceive fishery regulations as legitimate. Without legitimacy, fishers may choose to engage in the kind of civil disobedience Acheson found in the groundfishing industry, and fishery regulations will not achieve their biological or social objectives. Thus, this section begins with a discussion of participatory co-management in Puerto Rico, followed by a discussion of methods to improve communication between fishers and fishery managers.

VII.b.1. Prospects for Participatory Co-management in Puerto Rico

Commercial fishers have made attempts to enter fisheries management in a number of ways. These include the formal participation of fishers on the Caribbean Fishery Management Council, attempts by Yabucoa fishers to address the legal underpinnings of DRNA regulations through appeals to political representatives, and the emphasis, among some fishing leaders, on reporting landings and keeping more accurate records as a step toward more effective management of marine resources. Added to these are past and current organized fisher challenges to developments that threaten marine resources, such as mangrove destruction in Río Grande, Naval bombing operations in Vieques, and marina development in Fajardo—challenges that reveal fishers' concerns for marine resources and that, at times, push agencies dedicated to the protection of marine resources in new and important directions. Finally, fishers opposition to and violation of marine protective measures they believe to be misguided may also be considered a form of participation, though negative, in fisheries management, expressing civil disobedience and risking punishment to continued practicing fishing behaviors they apparently consider dear to their ways of life.

These behaviors suggest that fishers are willing to participate in fisheries management in Puerto Rico, however much their lack of attendance at CFMC meetings, public hearings, workshops, and other regulatory development settings may suggest otherwise. We learned from both our ethnographic work and from the workshops held in June 2006 that the corporate or classroom settings of public hearings and other policy venues are often intimidating to fishers, who are familiar with more fluid and open communication. We also learned that some fishers have grown cynical about participating in government, based on the lack of results they have experienced with past participation.

As a result of these problems, fishers' potential as participants has not been fully developed. In this sense they constitute an untapped resource and, in so far as their lives are intertwined with the sea's, an untapped *marine* resource. The reasons that fishers have not been drawn into management in as great a capacity as they could have are multiple and complex, but surely two reasons are credentialism and communication. Fishery managers, most of whom are educated and fully invested in fishery science, often consider fishers' knowledge bases as flawed, biased, and anecdotal, unsupported by reproducible experimental techniques and not backed by the credentials of science. Dismissing experiential knowledge from this perspective simultaneously raises the value of scientific knowledge and diminishes the value of experiential knowledge, widening the gap between them. Yet more and more social scientific examinations of experiential knowledge have found it to be based on repeated observation and even at times experimental procedures, suggesting that its development and accumulation is not so very different from how scientific knowledge is developed and accumulated (Chibnik 1987; Berkes 1999). At the same time, over the three decades since the Magnuson-Stevens Act, there has been increasing criticism of

fishery science and many of the assumptions of fishery management (e.g. the tragedy of the commons), questioning the extent to which scientific knowledge is truly unbiased and reproducible.[42]

These developments recommend bringing both experiential and scientific knowledge to questions of marine resource management, a process whose principal barrier seems to be one of communication. Problems with communication derive from the difficulty fishers have deciphering the technical language of science as well as the difficulty fishery managers have in overcoming the bad reputations of their colleagues who treat fishers in condescending or aggressive ways. We learned during the survey work for this project that many fishers do not understand percentages, for example, and thus would likely find many of the calculations of fishery science daunting. While this may reflect a lack of formal education, it does not reflect ignorance.

We also learned during our ethnographic work that the principal management agency, the DRNA, has lost much of its credibility with the fishing populations of Puerto Rico and that their past performance has created an environment of conflict rather than cooperation. We do not believe that relations have deteriorated to the point where they are irreparable; however, we do suggest that DRNA officials need to work on their public relations skills. Based on our success in this project at eliciting the thoughts and opinions of fishers, we recommend that the DRNA adopt an ethnographic approach to communicating with fishers, similar to the methods we have used in this work (open-ended interviewing, structured interviewing, mapping, etc.).

One of the primary goals of ethnographic research is to establish rapport with those from whom you rely on for information through repeated visits, the building of cooperative and trusting relationships, and sustained communication. Often this process is facilitated by joining together fishery and coastal managers with fishers as well as with others whom fishers perceive as more neutral than regulatory personnel, such as Sea Grant marine advisory service personnel, university scientists (particularly social scientists), members of NGOs, and so forth. In the executive summary of this report, we noted that the Caribbean Fishery Management Council (CFMC) has developed a protocol for the incorporation of the fishers into management processes, based on data from the Coral Reef Ecosystems Studies project, and data from this community profile.[43] The protocol addresses many of the communication and trust matters that are reviewed in this report, and provides a blueprint for action.

VII.b.2. Seating Participatory Co-management Efforts in Fishing Communities: the Importance of Network-based Communities

When drawing on ethnographic research methods, fishery managers need to consider issues of sampling and the accurate representation of fishers' opinions, a process that entails understanding the distribution of fishers across place-based, network-based, and knowledge-based fishing communities. In our table raking fishing communities by dependence in Chapter V above, we provide some leads regarding the differences between place-based and network-based communities. However, as network-based and

[42] In a recent study, Griffith and his colleagues found that biologists asked to classify species of the Kotzebue Sound, Alaska on them, did not sort them according to Linnaean classification methods, but instead imposed their own idiosyncratic understandings on the classification.

[43] The protocol is available at: http://www.caribbeanfmc.com/pdfs/Vald%E9s%20Trumble%20Methodology%20and%20protocol%20for%20fishers%20partic%85.pdf

knowledge-based communities become more prevalent in Puerto Rican fisheries, it is important for fishery managers to understand ways in which they might benefit from them.

In the chapter on communities we pointed out that social scientists have been conducting a great deal of research on non-place based communities in the context of migration studies, focusing explicitly on transnational social fields. Sociologists and anthropologists have had to engage social network analysis[44] to discuss transnational social fields, recognizing that social networks—networks of friends and kin—constitute the principal social mechanism by which migrants access jobs, housing, health care centers, assistance with legal documents, and the support systems that migrants often require to negotiate new social settings. In the context of this and other research on networks and communities, social scientists have developed and elaborated the notion of *social capital*: or the notion of social relationships enabling members of social networks to influence the economic well-being of its members, or, in the words of Portes and Sensenbrenner (1993: 1353), "those expectations for action within a collectivity that affect the economic goals and goal-seeking behavior of its members, even if these expectations are not oriented toward the economic sphere."

Building on insights about gift exchange, reciprocity, solidarity, cooperative productive relations, and other social practices that marshal social relationships for productive or other, usually beneficial purposes, the sociologist Robert Putman made the concept of social capital famous in his popular work called Bowling Alone (2000). In this work, he told of a white man who offered a black man his kidney for a necessary transplant because, as part of the team, they had developed a relationship that transcended either of them and that was beneficial to the entire team. In Putnam's example, the team was a kind of community—their network ties created a social organism that benefited each of its members and whose benefit, moreover, reverberated through a wider set of social relations—other communities—in which the team was embedded. The team's most notable effect was to create ties between members of different ethnic communities in ways that expanded the trust and communication between them.

While Putnam considers social capital primarily in terms of how it benefits members of networks, communities, and other groups, others have also pointed out that social capital can have a "dark side" or can work against the well-being of group members and at times even the group itself (Schulman and Anderson 1999). In fisheries, for example, fish merchants can utilize their social network connections with fishers to encourage them to target certain species to the neglect of others. This may result in the overexploitation of highly valued species to the expense of those that may be less valuable commercially but important culturally, such as species that fishers routinely give away to community members as gifts. Another dimension of social capital is that it can lay dormant for a time, becoming important during a time of crisis, as when fishers mobilized against the marine sanctuary in Parguera in the 1980s (Valdés Pizzini 1989). Coleman has expressed this in terms of its fungibility, suggesting that social capital is not always fungible, or interchangeable, but fungible only under certain conditions: in the Parguera case, social capital in the form of solidarity, though useful in opposing the sanctuary, may not have been

[44] Social scientists are not in complete agreement about what they mean by social network analysis. Some have engaged in highly formal, mathematical modeling of networks, isolating attributes of network structure and formalizing network positions. While this work has been useful in understanding the functions of specific network positions such as "centrality," "structural equivalence," and "betweenness," it has been less successful in capturing the fluid nature of social networks, or how networks change through time, particularly those networks that may be changing rapidly under conditions of stress. Ethnographic approaches to social networks, considering the roles of trust and credibility, represent networks more accurately by considering them in terms of how they are embedded in their broader social and cultural contexts, rather than as abstract entities by themselves.

similarly useful in cases where fishers are trying to mobilize opposition to a new marina complex or other development.

In terms of fishery policy, it is important to understand that social networks tend to generate social capital, which can both enable or constrain behavior, and that both the enabling properties of networks and the constraining properties can assist fishery managers. With the increase in network-based fishing communities in Puerto Rico, we can expect a concomitant increase in social capital, and fishery managers need to be able to recognize where and when social capital may develop and how it may enable or constrain fisher behavior. An example of social capital enabling group members comes from the fishing association at La Guancha, the network-based fishing community in Ponce, where fishers have developed a vertically integrated fishery, adding value to their products by incorporating them into the brisk tourist traffic that visits the association grounds and its neighboring park, boardwalk, and beach. They not only add value to fish through processing for retail sales, they also sell fish to tourists to feed schools of tarpon and further process fish by cooking and serving them in their restaurant. At the same time, areas of their association that are off-limits to the general public reaffirm their membership in a significant social group: that is, in a network-based community.

An example of social capital constraining group members comes from Rincón, where fishers have, through word-of-mouth, exerted peer pressure among themselves to abide by the closures at Tourmaline and Tres Palmas. In this case, while constraining behavior may be detrimental to the incomes of the individual and group members, at least in the short term, the constraints on behavior benefit the resource. In as much as the resource's health is a part of the social network's health, such constraints are, at least indirectly, beneficial to the group.

As network-based communities become increasingly prominent in Puerto Rican fisheries' social landscapes, they are likely to become more and more intertwined with one another either for specific purposes, such as opposition to or support for specific fishery regulations, or in terms of more general and sustained purposes, as in educational or apprenticeship programs designed to educate Puerto Rican youth about marine resources. An increase in the elaboration of fisher networks will also involve the growth of knowledge-based communities of fishers across the islands—or networks of fishers based on knowledge about specific components of the marine ecosystem. This process that cannot help but involve university scientists, fishery biologists, marine advisory services personnel, fishery managers, and others who profess to possess vast amounts of information about the health of marine resources. As such, this development can only benefit fisheries management in the Caribbean. Through the elaboration of fisher networks, the continuing overlap of network-based communities with knowledge-based communities—fortified by the few place-based communities that continue to persist—may provide opportunities for fishery managers to become valuable and trusted members of fishers' social networks. One sure avenue toward this would be for fishery managers to join fishers in their objections to sources of marine resource degradation that come from coastal development, mangrove destruction, contamination, and other sources that have nothing to do with overfishing, or to take steps to curb fish imports of undersized and prohibited species. While in some cases fishery managers' hands may be tied politically to *officially* join protests or otherwise support fishers in their efforts to prevent such developments, fishery managers can, as private citizens, certainly lend their support to such fisher causes while working within their agencies to "push the envelope," so to speak, regarding their legal mandate to protect marine resources.

Another, less politically volatile issue that fishery managers could take up is to assist fishers in adding value to their catch. In the regional profiles we describe several instances of how fishers have done this themselves, but surely the state could have a role in enabling improved prices for seafood through various

kinds of further processing (e.g. in restaurant dishes, in seafood pastries, etc.). We point out that this has an historical precedent in Puerto Rico in Norman Jarvis's attempts to smoke, cure, and otherwise increase the amount of fish that made it safely to consumers.

Whether or not fishery managers and fishers can move toward shared causes and increased communication and assistance, however, is bound to be a difficult road. It will require the development of trust and rapport that is equal to overcoming poor relations from past performance. Above all, it can only occur if fishery managers approach network membership with the same sense of shared respect and concern for the well being of the group that fishers currently demonstrate toward one another.

VII.c. Additional Policy Recommendations

In addition to the policy implications of our findings above, we also list here a number of policy recommendations and suggestions for future research, again repeating many of them from the Executive Summary of this report.

VII.c.1. Regulatory Development Oriented Toward the Continued Viability of Fishing Communities

State efforts to protect marine species and stocks are relatively recent in Puerto Rico. Regardless of the qualms and complaints of the fishermen, local authorities (the DRNA and the CFMC) do make an effort to conserve species and protect the environment. More needs to be done, and that is almost unanimous in the voice of the fishers interviewed and visited for this study. One of the missing aspects of policy is the conservation and protection of fishing communities, through economic opportunities, cultural protection of their patrimony and architectural and cultural integrity. Change, development and gentrification are altering the landscape of coastal communities, and also restructuring labor and economic interest in those communities that served as the stewards of marine and coastal resources. Policies on conservation of habitats and species do not take into consideration the future integrity and well being of those communities, and the individuals. This report is the first step into the process of delineating a comprehensive plan for the protection of fishing communities.

VII.d.1. Communication Between Management and Fishers

Several of our policy implications and recommendations point to the importance of improving communication between policy makers and fishers, as well as between enforcement personnel and fishers. We noted above that the use of ethnographic methods may benefit marine resource managers, a recommendation that derives from the fact that relations between managers and fishers suffer from a lack of trust. This influences the quality and quantity of communication in several ways, suggesting the following recommendations.

1. Reporting Landings Data. Due to the events associated with the development and implementation of fishing regulations by the DRNA, local fishers are boycotting the process of data gathering on fish landings. An essential component of the information used for the management of species and stocks, the situation threatens to harm the management process and increase the gap in communication and understanding between managers and fishers. Fishers are far removed from the process and few understand it. Government officials, researchers, and extension agents must make an effort to explain the social, biological, economic and management importance of providing landings data. They, however,

must also be incorporated into the process of designing methods and procedures for the acquisition of that data, and other relevant information for the process.

2. Need for New Models of Incorporating Fishers into the Management Proces. One of the key complaints of the fishermen visited and interviewed for this project was the government's failure to incorporate their opinions effectively into the policy process. This resulted in the perceived fiasco of the fishing regulations, and the constant fracas with the DRNA. There is an urgent need for a well thought process to incorporate the fishers' knowledge, data on species, perceptions and opinions into the fisheries management process. Such a process must go beyond the present *Junta Pesquera*, or Fisheries Board with representatives from different sectors.

3. Understanding Qualitative Appreciation of Marine Resources. Secondary source data, such as landings data and the fisher census, sometimes do not correspond to the views of fishers regarding their most important species, based on ethnographic interviews. For example, while both the landings data and the ethnographic interviews agree that lobster and yellowtail snapper are two of the most important species, most fishers also mentioned *sierra*, or king mackerel, as a highly prized, important species to them, as well as other, similar pelagic fish. However, the landings data indicate that king mackerel accounted for only around 3% of the total landings from 1999 to 2003 (the last five years for which we have landings data). On the other hand, some species that show up in the landings data as frequently landed fish, such as white grunt, are mentioned far more rarely than king mackerel as important species.

VII.c. Recommendations for Future Research

We reiterate here the suggestions for future research that we noted in the Executive Summary, which derive from the findings presented in the previous chapters and in the regional profiles in Volumes II and III. In repeating them here, we have taken this opportunity to discuss some of them in slightly more detail than in the earlier section.

1. Detailed multidisciplinary research is necessary in Puerto Rico, combining economics and sociological or anthropological approaches to an analysis of the specific linkages among fishing, tourism, and coastal development, focusing on transfers of human and social capital among economic sectors and their implications for fishing effort, investment in fishing, wage structures, returns to labor and capital, and other economic factors. Such analyses should also address the multiplier effects of the recreational fisheries of Puerto Rico and the ways in which the commercial catch enhances local restaurants, markets, and other coastal businesses. An additional goal of this work could be to develop a protocol for monitoring changes in fishing communities and practices over long time periods.

2. Multidisciplinary research comparing fishers' knowledge with scientific knowledge about the fisheries of Puerto Rico would determine where the two knowledge bases correspond to or conflict with one another, establish a basis for consensus and areas in need of additional research and education, and enhance current baseline studies in biology and anthropology that have collected data on fishers' knowledge and on the biology of Caribbean marine resources. This work might also enable managers to determine where fishers' knowledge bases could be relied on to inform management decisions. These studies could also serve as a basis for cooperative research, with fishers and scientists framing and testing hypotheses together.

3. Fishing as a productive process is well understood, and there are technical and ethnographic descriptions of fishing with gillnets, reel-lines and traps, among others. However, there has been very little research on the activities of the SCUBA divers, including their life histories and their lifestyles. Divers bring a new dimension to fishing, and they appear to be a group with socio-demographic characteristics different from the rest of the fishers. They are perceived as a threat to conservation, having a faulty conservation ethic, prone to trap theft, and belonging to the underclass of coastal communities. Shifts in gear, from traps to hand lines and to gillnets, is attributed to their success in fishing. SCUBA is at the present time the most important gear, responsible for most of the landings. This merits an effort to understand them in a social and economic context. An outreach component of this research could be to educate divers about the hazards of fishing.

4. The distribution of fish, its circulation as a commodity, its cultural significance, dietary and nutritional impact, and the local restaurant market remain ill understood aspects of fishing despite a handful of studies. This is the weakest link in management. The market usually remains untouched when regulations and prohibitions are in place, as long there is a paper-trail documenting catch and transactions of the species. As stated by Valdés Pizzini (1985) and others, fresh fish in coastal communities is a hook to entice customers to the local restaurants, where frozen and imported fish and shellfish are served as local. Puerto Rican fishermen have always complained on the frailty of the market as they felt victims to dumping by longliners, cheap fish imported by fish dealers during Lent (and other times of the year as well), and stringent regulations by the management agencies. Yet, it is in the circulation of fish, as presents, foodstuffs and commodities, that fishing acquires its true values in coastal communities. Fish for subsistence, as part of the local system of reciprocity, as a special item for the restaurant market, as food for local communities, and as a priceless delicacy for the tourist and visitors, the circulation of fish continues to add value to coastal communities, and sense to an activity in a difficult situation.

5. Research on the relationship between recreational boating/ diving and recreational fishing, including practices that some currently believe to be harmful to coral reefs and to seafood markets, would increase our ability to predict the scope, character, and impact of recreational fishing in Puerto Rico based on existing licensing records and other indicators or boating traffic.

6. Research on two fishing practices that are currently poorly understood: 1) fishing for aquarium fish, including its prevalence, regional variation, and its market; and 2) research on bait fish, including the relationships between recreational and commercial sectors that derive from the sale of bait fish. Aquarium fishing is particularly important in that it usually removes undersized and juvenile fish from the resource.

7. Outbreaks of *ciguatera*, a marine toxin that bio-accumulates in certain species of fish (e.g. barracuda) and is prevalent in some reef-feeding species, have unnecessarily negatively affected fish markets in Puerto Rico, with consumers rejecting fish after news coverage of a harmful algae bloom or other toxic marine event. Research into the perceptions of Puerto Rican consumers toward seafood, and their relationship to various sources of information, could be used to design more effective educational campaigns to inform consumers, perhaps through the public schools, which species of fish are susceptible to *ciguatera* poisoning and which are not. This work could be directed toward improving consumers' overall "seafood literacy," or their appreciation of the benefits and drawbacks of consuming various species of fish.

8. Research on current systems of folk management of resources, including where and how fishers have protected coral reefs, mangroves, and other important marine resources, would increase DRNA's abilities to utilize practices already in place to protect marine resources. Included in this study would be cases of where the political organization of fishers has resulted directly from efforts to protect resources.

9. An oral history project on the history of specific components of the marine ecosystem, as understood by elder fishers who have interacted with different components of the marine environment throughout their lives.

10. Research on the cultural significance of fishing to non-fishing Puerto Ricans would enable an understanding of the subtle ways that the loss of fishing may diminish the ambiance of coastal landscapes for more than fishers and their families. An important theoretical component of this work could be to investigate how the notion of *quality* assumes an importance in fishers' lives that challenges attempts to dismiss their collective economic contribution due to their small numbers. Their emphasis o quality is most evident in their insistence that they "defend themselves with fresh fish," yet an investigation into the notion of quality could engage long-running debates between qualitative and quantitative data collection and analysis in the sciences.

A way of life as interesting and complex as the multi-species, multi-gear fisheries of Puerto Rico is difficult, if not impossible, to understand with in a single research agenda or even a set of research issues, such as those above. As such, these suggestions constitute only a handful of the many that could be developed to address the problems facing fishers and marine resource managers in Puerto Rico. In the regional profiles that follow, we have been able to capture at least a part of the complexity of this way of life and the problems its protagonists face. These regional profiles need to be read, however, as a living document: one that is cognizant of the fact that Puerto Rican fisheries change through time, often in subtle yet important ways, and that continued monitoring of the fisheries will be necessary as managers continue to attempt to protect the marine resources of the Caribbean.

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Southern Rural Region I:

Guayama

We place Guayama into its own region because it is unique among its neighbors for being home to some of the most successful and knowledgeable fishers in Puerto Rico and to one of the most fishery dependent place-based communities, that of Pozuelo. Pozuelo is also unique for its status as a place where fishers specialize in trap fishing to a degree that is uncommon in the islands' fisheries, given the recent change from trap fishing to SCUBA diving seen in the Puerto Rican fisher census materials.

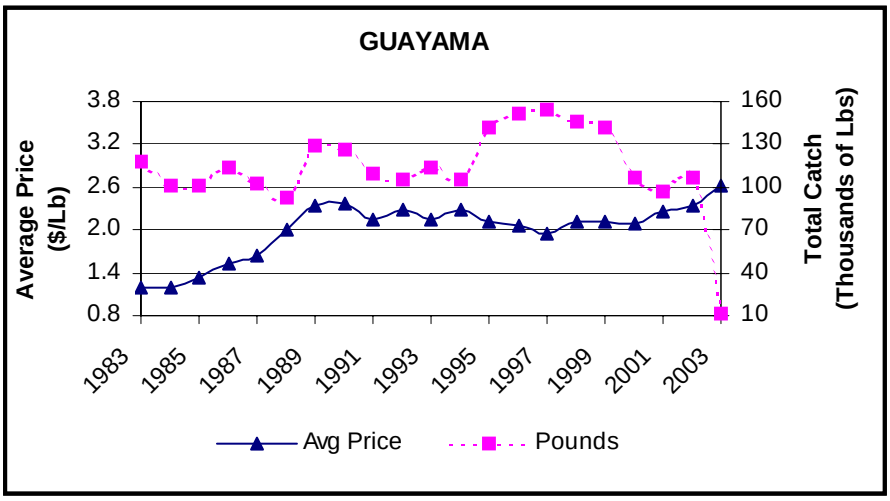
Table SR.1. Guayama Census Data

GUAYAMA	1950	1960	1970	1980	1990	2000
Population Characteristics						
Population [1]	32,807	33,678	36,249	40,183	41,588	44,301
Civilian Labor Force (CLF) [2]	8,599	7,952	8,161	9,843	12,679	12,266
CLF - Employed	8,154	7,412	7,737	7,250	8,688	8,897
CLF - Unemployed	445	540	424	2,593	3,991	3,369
Percent of unemployed persons	5.18	6.79	5.20	26.34	31.48	27.47
Industry of employed persons [3]						
Agriculture, forestry, fishing and mining [4]		2,212	867	339	246	90
Construction		424	1,103	526	672	800
Manufacturing		1,464	1,991	1,521	1,752	1,553
Retail trade		864	1,138	919	1,354	1,060
Socioeconomic Characteristics						
Mean travel time to work (minutes) [5]		N/A	N/A	23.9	19.8	23.6
Persons who work in area of residence [6]		6,136	5,831	5,254	7,263	6,565
Per capita Income (dollars) [7]			838	1,685	3,207	7,326
Median Household Income (dollars) [8]		950	2,459	4,451	7,122	12,112
Individuals below poverty level [9]			25,162	29,038	27,913	22,569
Percent of Individuals below poverty level			69.41	72.26	67.12	50.94

Census data from Guayama show that its economic situation improved slightly from 1990 to 2000, although fully half of its people remain below the poverty line and over a quarter of those seeking employment are unemployed. This is in line with many other parts of Puerto Rico, of course, although perhaps it should not be. Guayama has experienced a great deal of development over the past few decades as a center for energy, pharmaceuticals, and medical supply production, shifting its economic profile from one based primarily on agriculture and commercial trade to manufacturing.

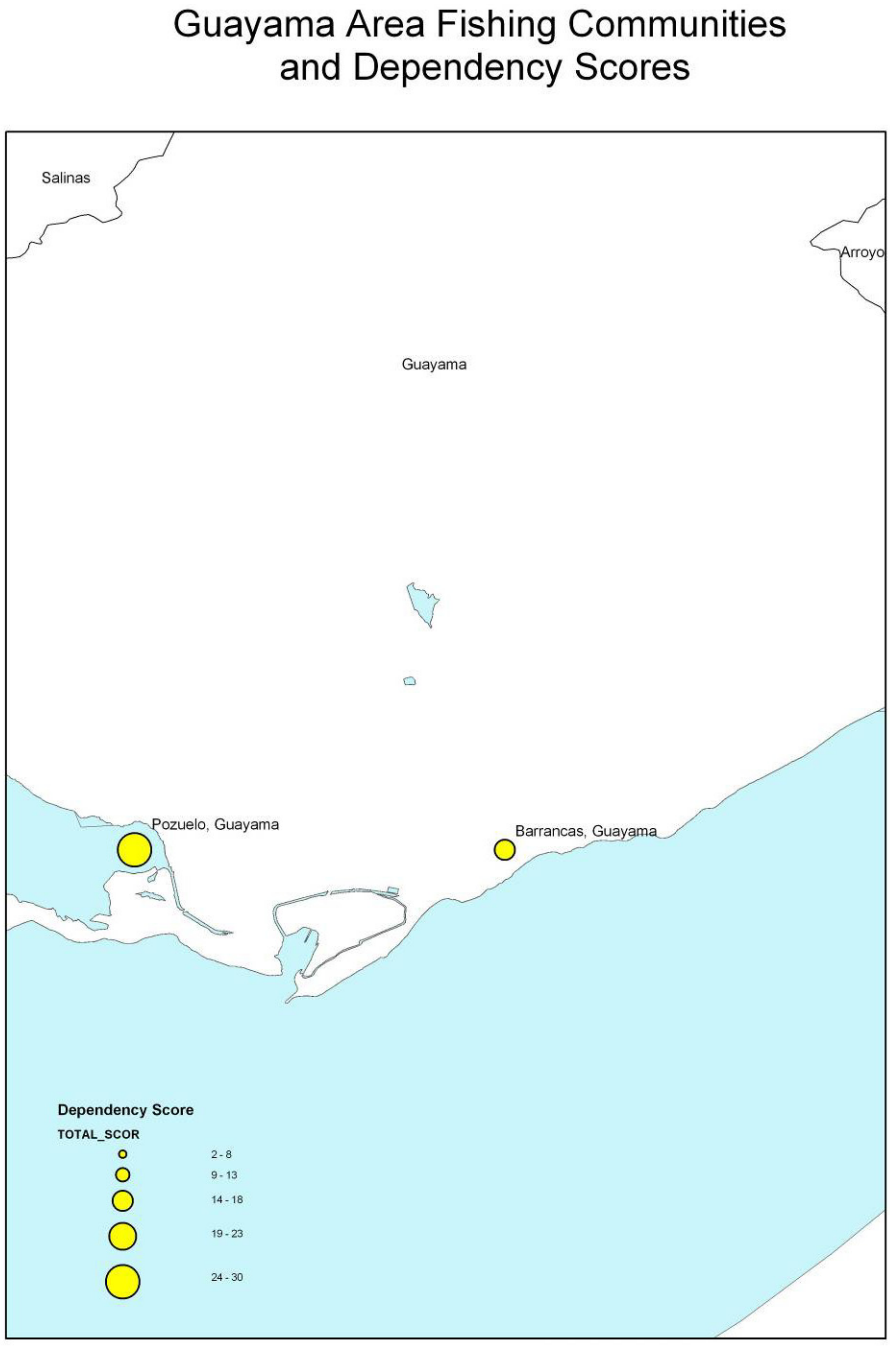
Landings in Guayama, although dropping to below 12,000 pounds from nearly ten times that during the last two years for which we have data, have placed Guayama 11th in the landings data, just below Ponce and above San Juan. Of its three landing centers, Jobos has consistently supplied the least amount of data (and, we assume, fish), Pozuelo the most, and Barrancas in between; non fishers from Jobos participated in the census and fishing there has dropped to casual employment levels.

Figure SR.1. Guayama Landings Data, 1983-2003



During the years from 1999-2002, landings in Guayama are on par with those of Rincón or Juana Díaz. Even with the drop in landings, 5-year revenues topped one million, generating $200,000 annually for the estimated 50 to 60 serious commercial fishers fishing from the municipality. Prices rose steadily through the last half of the 1990s and into the 21st century, though not in tandem with supply (correlation coefficient = -.1435).

Map SR.1. Southern Rural Region



Guayama History

Guayama is among the longest settled municipalities in Puerto Rico. Archaeological evidence suggests that native Caribbean peoples inhabited the region for several centuries prior to the colonial period and was named after a cacique called Guamaní (Torres Sugrañes 1995: 163). The Spanish continued the tradition of lengthy settlement, by founding the earliest city on the southeast coast here in 1736. Over the

next forty years the pueblo grew to over 4,500 inhabitants whose more than 200 houses surrounded a large, cleared plaza that eventually became a recreational center for the community.

Like most of Puerto Rico's municipalities, Guayama experienced various connections and disconnections with surrounding municipalities. Originally including neighboring Arroyo and Patillas, it lost the latter in 1811 and the former in 1855 as they became incorporated as their own municipalities. For a time during the early 19th century, as its territory was being cut, Guayama was under the administrative authority of Humacao. By this time its population had grown to over 10,000, about 20% of whom were slaves.

The slave population, in concert with the resident free citizens of Guayama, developed what was to become one of Guayama's principal claims to fame: following a devastating fire in 1822, the main city of the pueblo was rebuilt so well that it came to be known as one of the most beautiful colonial cities in the Caribbean. At the same time, of course, the slaves and free citizen developed agriculture and a brisk commercial trade. Shipping from Guayama was busy as early as 1830, when its port received 202 ships from more than a dozen countries, exporting livestock, coffee, tobacco, grain, root crops, vegetables, and of course sugar and rum. Here again sugar marginalized many of the other crops along the coast, remaining a principal force in the economy until the 1960s.

Since then, the petrochemical, pharmaceutical, and medical supply industries have established 16 manufacturing plants in Guayama, rearranging much of the coast and assisting, as sugar did earlier, in marginalizing fishing as a way of life. This has been particularly true of energy production in Guayama. Fishers from Barrancas had to relocate their lauching and landing facilities when the large petrochemical plant was built.

Fishing in Guayama

We noted earlier that several fishers in Pozuelo, Guayama specialize in trap fishing. This is not well reflected in the fishery census data for the total muncipality, which shows that only about half those participating in the census use fish pots. However, the lack of SCUBA divers in the region might reflect the trap fishing specialty. During our ethnographic work we heard a story of a young fisher who preferred diving to trap fishing but that his father and uncles—fishers all—pressured him to give up diving because of the historical rifts between divers and fishers across Puerto Rico. Census figures also suggest that most fishing is done on the continental shelf, which would be in line with trap fishing, and that the targeting of pelagics is low in this area as well.

Table SR.2. Fishing Locations and Styles, Guayama (n= 31)

Variable	Percent
Shore	9.7
Continental Shelf	96.8
Shelf Edge	3.2
Oceanic	12.9
Reef Fishes	100
SCUBA Diving	0
Skin Diving	22.6
Pelagic	16.1
Bait	41.9
Deep Water Snappers	12.9

Source: Puerto Rican Census of Fishers, 2002
Totals do not add up to 100% because fishers typically fish multiple locations

Pozuelo, Guayama was among the principal sites where Griffith and Valdés Pizzini conducted field work for their book (2002: Chapter 5). In that text, they report on a dispute within the community that led to the founding of an independent fisher association (which may sound like an oxymoron). This dispute emerged over the issue of access to association facilities, slip space, and control over the market. As with most disputes within fishing populations, the control over the market was particularly troubling, Despite that this alternative association still exists, along with the other, only a little more than one-third of the fishers reported that they belonged to the association, and only around one in five report selling to an association. When examining only the Pozuelo respondents, the figure rise to just over half—still low in comparison with other communities.

Table SR.3. Selected Guayama Fisher Characteristics (n=31)

Variable	Response
Association Member	35.5
Hours used for Fishing	
< 20 hours	29
20 – 30 hours	45.2
31 – 39 hours	6.5
40 hours	19.4
> 40 hours	0
Mean hours	24.55
Standard Deviation	11.144
Minimum hours	0
Maximum hours	40

Source: Puerto Rican Census of Fishers, 2002

Table SR.4. Gear Used by Guayama Fishers (n=31)

Variable	Percent
Beach Seine	6.5
Trammel Net	0
Long Line	9.7
Troll Line	41.9
Fish Trap	48.4
Gill Net	77.4
Cast Net	74.2
Hand Line	90.3
Rod and Reel	41.9
Lobster trap	12.9
Snapper Reel	0
Winch	6.5
Skin	0
Spear	19.4
Lace	0
SCUBA	0
Gaff	93.5
Basket	0

Part of this may be due to the problems with associations in general in Pozuelo, reflected in the dispute mentioned in Griffith and Valdés Pizzini's (2002). Yet it may be attributed, too, to the many, many alternative markets in Pozuelo—the many seafood restaurants and private fish merchants that line the roads of the town. In addition, the community is well-known enough that people routinely visit the community when they want to buy seafood.

Table SR.5. Guayama Fishers' Marketing Behaviors

Marketing Behaviors	Percent Reporting
Fish dealer/ buyer	22.6
Private	0
Association	0
Street vending	64.5
Restaurant	12.9
None	6.5
Sell fish gutted	67.7
Keep fish on ice	80.6

Source: Puerto Rican Census of Fishers, 2002.

It is not surprising that, of the two-thirds of Guayama fishers who believe that fishery resources are worse today than before, most cite pollution as the cause. Certainly thermal pollution from the energy plant pictured above has threatened water quality. This threat has been all the more directly felt by the fishers of Barrancas.

Table SR.6. Opinions of Guayama Fishers about Fishery Resources

Opinion	Percent reporting
Status of Fishery Resources	
Better	0
The same	32.3
Worse	64.5
Reasons for problems in fisheries	
Pollution	48.4
Habitat Destruction	19.4
Overfishing	6.5
Laws, regulations, and licensing	3.2
Crowding	6.4
Seasonal factors	0

Source: Puerto Rican Census of Fishers, 2002

Barrancas

This community, a parcela of around 180 households, contains several fishers who fish part-time with their own boats and equipment and a handful of *proeles* (crew). As noted earlier, the community—and especially its fishers—has been marginalized to some degree by the large-scale industrial development that has taken place nearby. Even the road to Barrancas is currently in a state of disrepair, at one point a single lane dirt road over a river/creek where bulldozers are moving earth either to build up the bridge or as a temporary measure.

There is no formal association, and one fisher interviewed reported that most fish independently, and no one who responded to the census here reported belonging to any association in another community. The fishers need to trailer their vessels to a distant location to launch them, which seems to have cut into the lifestyle. The launching location is beyond the large petro-chemical (Chevron)/pharmaceutical (Wyeth) complex, over 5 km away, down a run-down, rutted, muddy road that would be difficult to traverse after a heavy rain.

Yet there is no doubt that Barrancas is a fishing community, being coastal barrio consisting of six streets lined with houses, located on the water to the east of the Phillips petroleum refinery, which dominates the landscape. Fishers here fish with traps primarily and secondarily with gill nets, targeting species close to

shore along the continental shelf. When one drives around Barrancas one can see commercial yolas and lanchas in trailers, and the community is dotted with small fishermen workshops: a shed, sometimes just a palm frond roof, a few tools, a workbench, and fishing traps, in various states of construction or restoration. There are two local restaurants, two pescaderias (Brisas and Los Veteranos), and a small beach from which some small yolas take to the water; the beach has high surf, however, and larger vessels cannot leave from there.

From the layout of Barrancas' streets its obvious that this was planned residential community , but the houses more resemble 'barrio' houses rather than 'urbanization' houses. This is because Barrancas, in fact, is a barrio that was made to fit into a couple of streets of shoreside property. The original coastal community was then called 'Las Mareas', and it was divided into two sectors: Matuyas and Barrancas. Matuyas residents were forced to relocate because developers decided that the area where Matuyas people lived was the ideal place to build a big monster of a Petroleum Refinery, the Phillips/Sun Oil complex. Matuyas was a fishing/sugarcane laboring community located in the mangrove tidal flats, and it had arisen there, in part, because the mangrove-protected inlet was a good place to launch and tie fishing boats. Barrancas was the beach, high surf area.

After the Phillips development, assisted by the local government, expropriated the low-lying tidal flat areas in Matuyas, the whole community had to move to prefab houses where Barrancas is presently located. People in Barrancas are still bitter by this move, which happened 20 years ago, especially fishers, because not only they got uprooted and moved away, but also they got moved from a mangrove-protected inlet to the high-surf zone, where the larger yolas cannot be launched without considerable danger to property and body alike. Because of this move, a community of fishers that used to be able to go from the landing area to their homes fairly easily, and could almost always leave their boats in the water, now have to trailer their boats one mile over rough terrain to the mangroves, where they can launch their boats. Every night they have to bring their boats back home, for fear of burglary and vandalism. Their workdays are much longer, expensive, and difficult now. A fisher from Barrancas had this to say about the move:

> "I was born where the Phillips' big ships dock now. Where the big ships come to deliver and take oil. There was a 'barrio' there. Its name was 'Matuyas' and 'Las Mareas'. That is where we lived. When the Phillips came, they expropriated us and sent us over here. They swore that they were going to build a breakwater for us, that they were going to condition the beach area for us, but it was all empty promises. Before, we had our boats near to where now the tugboats are kept. They got us out of there and now we have to go to this far away place. So, that's where they harmed us fishermen, where they did us an evil, you understand? The Phillips promised a breakwater, and they never did it. Poor people, the poor are always the ones who suffer in these things! Then, we were far away, but at least we had a dry land passage without saltwater and we could take our trailers there. But then the Coal plant (the Coal Electric Plant) came and bam! they closed that road too. They sued to say, yes, we will keep the roads open, we will maintain them so you can get to the water, they said yes to everything until they got the permits. Then they just went back on their word. Then, one day, I'm going with my trailer, my boat, all loaded with 'nasas', and when I make my turn into the road, there it is, a fence and a closed gate. I had to turn around. This is all private now, and any day they will also close the area where we launch our boats now, and then we wont be able to fish anymore. The road we have to take now has salty water and that damages our vehicles. But any day they'll close that road too. And we just can't launch from Barrancas, because it is dangerous and our boats are big. They also promised, the Phillips would employ the people of Barrancas. But that also was not true. The Phillips employees come from all over the place. "

In short, even though when the Matuyas fishers were relocated they got new prefab houses, and land, they were left at a disadvantage. Whereas before they lived where they fished, now they have to spend an extra hour each way everyday just trailing and launching their boats when they leave, and getting their boats

back to the trailer and trailing it back home when they come back. This means investment in trailers, gasoline, increased wear and tear in vehicles and equipment, and a general feeling of displacement. Also, according to two fishermen, by the destruction of mangrove flats as well as with the relocation, the people of Matuyas lost access to land crabs, which where an important source of protein as well as an occasional source of supplementary income.

Where Barrancas is located now is vulnerable to flashfloods from the creek that separates the community form the main road, and during our fieldwork storms washed away the bridge twice. Barrancas and the neighboring community of Pozuelo are the center for *nasa* (fish trap) activity in the southeast. Of the 13 fishers in Puerto Rico that are registered as having more than 100 traps, 6 come from Guayama and 3 from Barrancas. Many others have between 40 and 100 traps. The boats trailed at Barranca homes are sturdy fiberglass and wood yolas, as well as some imported lanchas, all obviously designed and built for hauling fish traps, and most equipped with electric winches for bringing the traps aboard. Barrancas and Pozuelo are similar in their approach to fishing, and they also have close social ties. Many fishers from Barrrancas visit Pozuelo frequently and vice versa. Fishers from both communities repeatedly said that "*Pozuelo and Barrancas are friends*"

One fisher, Luis (pseudonym), the son of sugarcane laborers/fishers and a sugarcane laborer/fisher himself for many years, described his family's long relationship with trap fishing as follows:

> "I started fishing since when I was a little kid. Because, my old man raised us by fishing, he raised 16 children from the sea. There are 12 alive, still. We kept ourselves alive through fishing. Since I was 10, 12 years old I would go out to sea with him, to fish, but that fishing was completely different fishing. Now one needs a lot of traps. Back in those days, I would go out and fish 10-12 traps and I would catch 60,70 pounds of fish, fishing very near, one mile offshore. And it was enough to live. My old man also worked in the sugarcane, but he was a fisherman"

According to Luis and other Barrancas fishers, there are 15-20 boat owners who fish in Barrancas, and about the same number of 'proeles' or 'ayudantes.' The families of these fishermen also work selling fish or helping out with cleaning and marketing. The two pescaderias buy fish from fishers in Barrancas, but, as noted earlier, there is no association. Most fishermen also market their catch themselves, to restaurants and to private buyers. A conservative estimate would be that 100 people in Barrancas (about a fourth of the population) depend at least partially on fishing as a source of income.

Some Barrancas' fishermen land quite a lot of fish. According to Luis, "In Barrancas fishers are independent people, we are similar to Pozuelo in that, too." Two of the fishermen I talked to in Barrancas said that the indiscriminate licensing of fishermen by the Department of Agriculture really hurts trap fishermen like the ones in Barrancas the most, because whenever there is compensation for lost equipment due to a hurricane or storm, all the non-fishers who have licenses come out of the woodwork and make bogus claims of lost equipment, diluting the funds available for those who actually lost equipment during the storm. According to a Barrancas trap fisherman, "In *that* we need more regulation, but all they do is give us tickets for not having the lifejackets and flares?"

Pozuelo

The same cannot be said of Pozuelo. Distinct from Barrancas, Pozuelo is Guayama's best known fishing community as well as Guayama's best know maritime-oriented community. At least 10 full-time restaurants, all dedicated to seafood and representing all types, operate in the area, among at least the same amount on more temporary seafood-vending facilities. There are also two fishing associations (Asociacion de Pescadores de Barrio Pozuelo and Asociaciond de Pescadores Independiented de Barrio Pozuelo), which have, according the local informants, at least 50 fishermen between the two.

Pozuelo is also a focus of recreational fishing and boating (of the luxury boat sort), since the Club Nautico de Guayama is located on territory stolen from the mangroves in Pozuelo. Pozuelo also has Guayama's premier surfing beach and only good place to take a swim (even though the waters on Pozuelo's seaward coast it is notorious for drowning unsuspecting visitors). The maritime police and the FURA (Fuerzas Unidas de Rapida Accion, Puerto Rican police's elite anti drug-smuggling unit, equipped with high-speed motor boats and helicopters) are also located in Pozuelo, near the Club Nautico.

It is obvious that life in Pozuelo revolves around ocean-related activities. Its status as a fishing community is apparent form the number of nets, fish traps in various stages of construction, *yolas* in backyards and in the water (from 20-25 on any given visit to the area). Yet it is also a fishing community that is heavily involved with recreational water activities and where vacation homes are a considerable part of the landscape.

Pozuelo is actually located on a peninsula that stretches into the sea from the Bay of Jobos (the maritime sector is known as Boca Sabater, the mangrove sector is known as Las Mareas). Boating and fish landing facilities, along with several private docks, line the calm bay side of the peninsula. On the seaward side are the '*balneario*' (public beach) and the surfing beaches. Although mired by problems related to pollution, mangrove destruction, and dramatic socioeconomic differences between full-time, traditional residents, and those who own marina boats/vacation homes, Pozuelo is a truly beautiful spot on the southeastern coast of Puerto Rico.

Figure SR.2. Boats Tied to Mangroves, Pozuelo, Guayama

The most obvious link between fishing and other economic activities in Pozuelo is the restaurant business, with seafood restaurants ranging from small to large (>200 seats) and from humble to very luxurious and pricey. A partial list of the restaurants located in Pozuelo (gathered during various visits) is:

- Costa Brava
- El Arcoiris
- El Nuevo Trapiche
- La Casa de los Pastelillos
- EL Sabor de Mi Tierra
- El Surfing
- El Oasis
- El Puerto
- El Mofongo
- Esquina Familiar
- El Playero

One of the fishing associations, too, sells cooked seafood. However, according to informants, many of the most luxurious restaurants on this list don't belong to Pozuelo natives, but the smaller ones do belong to locals.

The Asociacion de Pescadores Independientes de Pozuelo formed after disagreement with the larger Association over the use of resources and boats belonging to the association, just discussed. Along with its two associations and numerous seafood restaurants and markets, several other physical remnants of a vibrant fishing history dot the streets. At least three to four large fishing boats, of the type used for multi-day deepwater trap fishing trips, have been abandoned in the community; they look to have been abandoned for quite a while. According to local informants, those boats are a good example of a communal or association activity gone wrong: in this case, people wanted to use them, but nobody wanted to maintain or repair them. As such, they exist as the remains of another failed attempt at modernizing Puerto Rico's fisheries (Pérez 2005). The focus of the association that broke away from the Department of Agriculture-sanctioned one lies in the word 'Independientes' (independent): specifically, they are loosely associated and they don't own communal boats or gear. Some fishermen, especially the 'naseros' (trap fishers), prefer it that way. There are two yola docking facilities in Pozuelo, one used by the Independientes, the other used by the Villa Pesquera. Other fishers tie their yolas to mangroves in the channels or trailer them. However, the Independientes dock doesn't appear to have strict ownership, and most Pozuelo fishers can use the dock and the fish-cleaning table there during the day, but docking overnight is more restricted.

Figure SR.3. Independent Pozuelo Association Dock

In repeated visits to the home Fernando Esperanza (*pseudonym*), of one of the most respected fishers in Pozuelo who owns his own fish market, we had the opportunity to see his whole family (wife, kids, son-in-law, nephew, who is also his proel) involved in the fish cleaning/preparing/vending and 'nasa' building/repairing. A productive family, not only Fernando but his family work nearly round the clock. Fernando and his nephew, together, using an assembly line like process, can construct 7 to 10 fish traps at a time.

It should come as no surprise, then, that the first thing Fernando ever told us about fishing was that it requires dedication. "There are fish in the sea," he said, "but this is hard work and requires a lot of dedication." Fernando, at 56, has been fishing all his life. He claims to have learned to fish 'por herencia' (by heritage) and when asked: 'From your parents?" he replied "Yes, but also by the heritage of being from Pozuelo." He later said that older fishermen besides his father were also very important in his education as a fisher, adding that, "Fishing is a job and a therapy. One has a good time and one makes money. And you meet a lot of people because a lot of people want to meet you, if you are a good fisherman. So you get to meet many interesting characters."

Fernando said that his parents, as well as most fishers in Pozuleo, were sugarcane workers and that they were mostly *invernazo* fishers, fishing during dead time in the cane. "Everybody around here that fished did it that way," he said. He was one of the few ones that transitioned to a full-time fisher and since 1975 (after working abroad for a while, including a term in the military), he became a full-time fisherman and has been doing that since.

When asked about fishing regulations, Fernando said that lobster fishermen—those with '*respeto*' (respect), the 'true ones'—have been engaging in lobster conservation measures since long before the DRNA and NOAA implemented any measures. These local conservation measures were explicitly geared towards allowing the lobster to reproduce, and that the rules they followed had mainly to do with the treatment of gravid lobsters (lobsters with eggs). According to Fernando, the practice he learned was always that the gravid lobster remains in the trap, so that it can release the eggs with out being eaten (it is not released from the boat because they believe that surely a predatory fish will eat it on the way down the water column). Only after releasing the eggs they would get it out of the trap and eat it.

Until recently, much lobster was consumed locally because it wasn't a high priced species until after refrigeration became common. In Fernando's words "A pregnant lobster has millions of eggs. If you leave it in the trap, in the water, one-fourth of them will become small lobsters. If you take it out, nothing survives." He also said that another advantage of doing this is this way that if you left the gravid female in the trap, that would in turn attract more lobsters for the next time. Also, lobsters left in a trap will spend time 'cleaning' the trap with their small claws while eating algae and small barnacles, so they provide the extra service of trap maintenance.

Such practices, Fernando believes, should be sifted into the regulations. He says that he knows many DRNA people, and that while he believes they mean well, they sometimes do more wrong than harm. He added that most of the problem derives from the fact that the 'true fishermen, the commercial fishermen' are excluded from the management process:

> "Only the true fisherman, the commercial fisherman, protects the fishery resources. But they don't recognize that, they regulate *us*. But, tell me something: whenever there is a oil or gasoline spill, here, (from the Phillips), or when somebody fills up the mangroves: who are the first ones to cry out? *We* are! But, they regulate us!
>
> "Then, they say they want us to participate… they invite me to meetings, but they are always in San Juan, in a hotel, or In St. Croix, or St. Thomas. And these meetings are '*convenciones*,' (conventions) that last 3-4 days. I would go, but what about my job? Who is going to go lift my traps?"

Fernando also reports that he has, at one time or another, used all kinds of fishing gear, but that now traps occupy all his time—in part due to the problems with the resource. He used to own a beach seine, for example, but he says, "That was a long time ago. Now there are no fish that close to the beach, after the Phillips (petrochemical) got here."

Fernando reported to be a supporter of the fishery statistics program, adding that those fishermen that oppose it they miss out on benefits such as the tax exemptions, etc. He attributes this to the distrust that exists between fishermen and the government. He says, that he has tried to educate other fishermen about participating and filling out landing reports, but that many of them think that that will be used against them some day, so many, many fishers don't ever report catches or report them inaccurately on purpose. Because of this, based on his experience, he believes the landings data are suspect, however much he tries to educate his fellows that it is in their own best economic interests to complete them accurately.

Southern Rural Region II:

Guánica, Guayanilla, Yauco, Peñuelas

Regional History

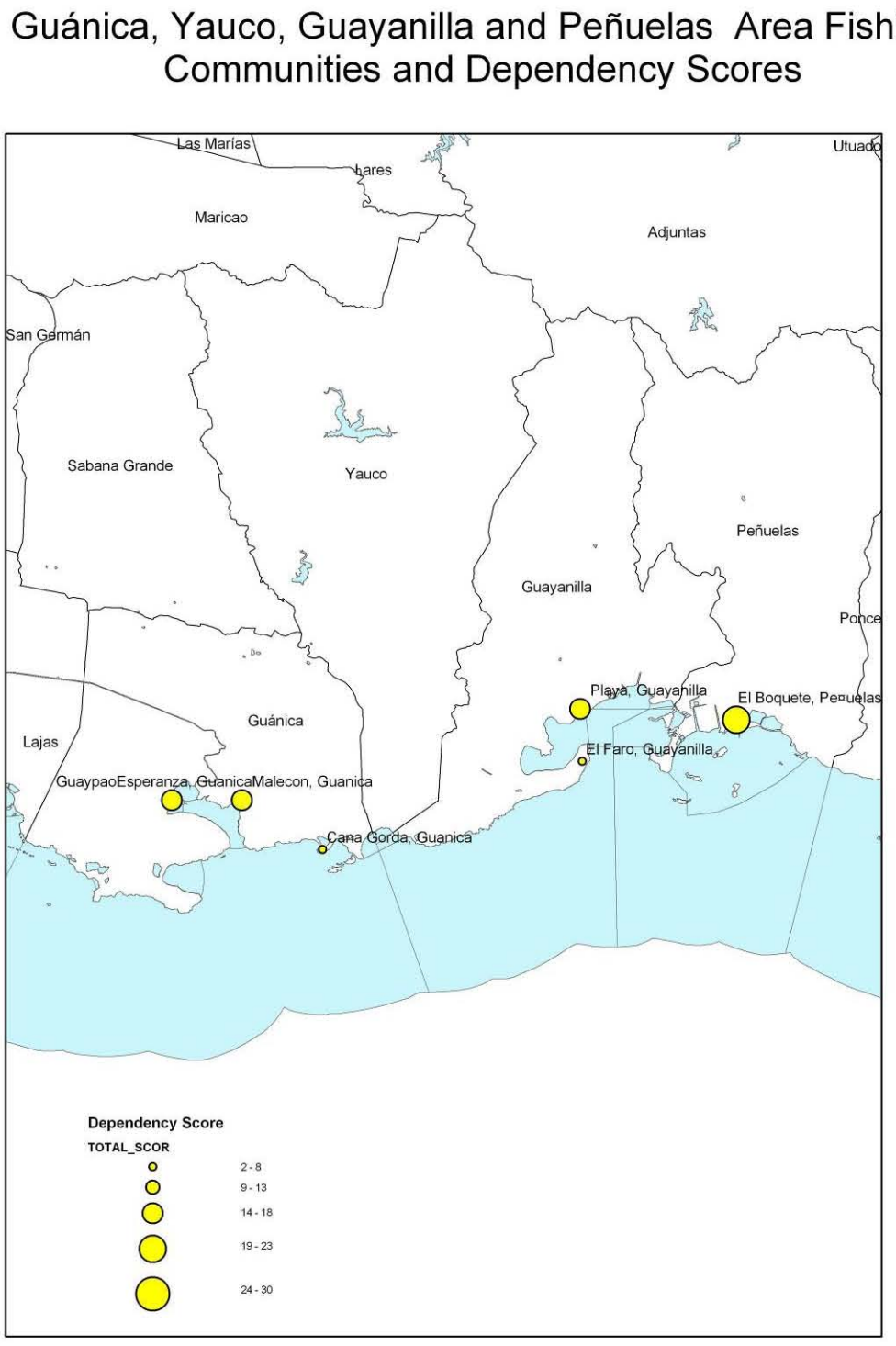
Sugar dominated the economy of this region of the coast through much of its colonial history, though this is not unique to this region. Ponce de Leon landed here, in Guánica, in 1508, after hundreds of years of Taíno control. Close to San German, it was under its jurisdiction through the early years of European settlement. Guánica, which was later home to a large sugar mill prior to the decline of Puerto Rican sugar production, served as an important port for San German during early years of European settlement, when Caribs and Tainos routinely attacked from the north. Guánica didn't separate from San German until 1875, at which time it was affiliated with Yauco, not achieving municipality status until 1914. Guayanilla was the place where the cacique Agüeybaná lived when Ponce de Leon landed and, like Guánica, was a part of first San German and then Yauco, splitting from the former in 1833 and the latter in 1875, when it received authorization to allow foreign vessels into its port. Peñuelas, too, had a port, Tallaboa, which was important as early as the 18th century.

This region's ports made it an early target for attacks from pirates and privateers, as well as a region where contraband trade and smuggling flourished. Like Ponce and other southern ports, it was an early target during the Spanish-American war. The region has also suffered great economic setbacks from hurricanes and other coastal hazards, including some that have so debilitated one or another of the municipalities that it had to be annexed by another.

Clearly, however, the most powerful force shaping its economic and social profile during the 19th and much of the 20th century was sugar production. With several mills across the region and a wealth of port facilities, company towns sprung up across its coastal plain to house the sugar workers. Material remnants of the industry are scattered throughout the region today.

While several attempts have been made to increase tourism in the region after the demise of sugar, they have met with marginal success. Some of this has been due to the industrial development that has taken place along this region's coast, particularly the petrochemical plants in Guayanilla. Despite this, the fishing site and community profiles that follow show that the tourism in the region, now at least thirty years old, remains in an incipient state of development.

Map SRII.1. Southern Rural Region II



Map SRII.2. Guánica's Large, Sheltered Bays

Legend

Census Tracts

Median Income

- 7868.00
- 7868.01 - 8566.00
- 8566.01 - 9425.00
- 9425.01 - 9702.00
- 9702.01 - 12699.00

Guánica

Situated on the south coast of Puerto Rico, Guánica includes fishing and recreational sites that create active waterfronts, especially on weekends. This is important, in that the local economic picture has not been positive in recent decades. Despite its history, sugar production accounts for virtually no employment in the municipality, and the decline in workers engaged in agriculture, forestry, fishing, and mining from 664 in 1960 to 117 in 2000 probably reflects an increasing ratio of fishers in Guánica to agricultural workers.

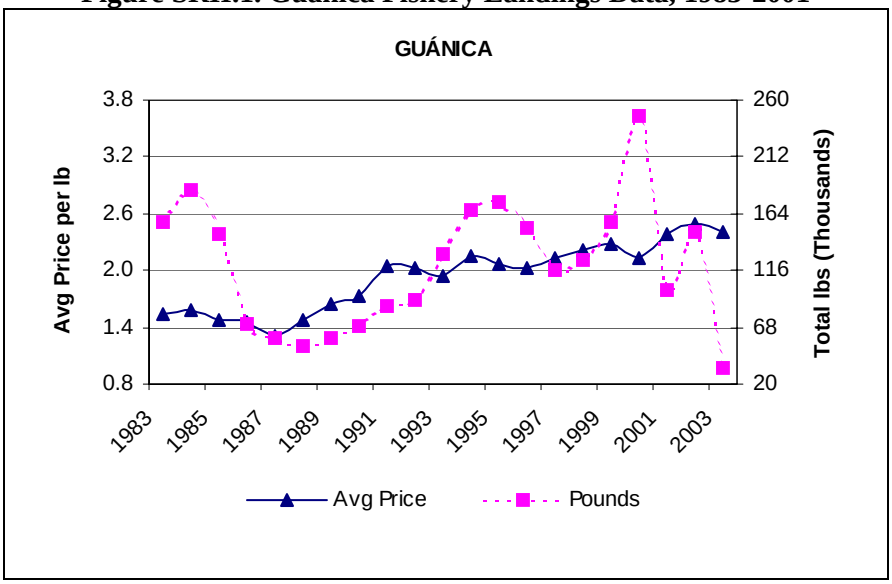
Table SRII.1. Guánica Demographic Data

GUÁNICA	1950	1960	1970	1980	1990	2000
Population Characteristics						
Population [1]	15,630	13,767	14,889	18,799	19,984	21,888
Civilian Labor Force (CLF) [2]	3,514	3,056	3,626	4,407	5,826	6,076
CLF - Employed	3,379	2,836	3,487	3,849	3,592	3,909
CLF - Unemployed	135	220	139	558	2,234	2,167
Percent of unemployed persons	3.84	7.20	3.83	12.66	38.35	35.66
Industry of employed persons [3]						
Agriculture, forestry, fishing and mining [4]		664	390	247	189	117
Construction		252	871	429	375	619
Manufacturing		940	1,034	1,200	606	710
Retail trade		248	280	357	594	454
Socioeconomic Characteristics						
Mean travel time to work (minutes) [5]		N/A	N/A	N/A	20.1	29.2
Persons who work in area of residence [6]		2,436	1,905	2,055	1,934	1,832
Per capita Income (dollars) [7]			745	1,293	2,575	5,204
Median Household Income (dollars) [8]		938	2,107	3,216	6,379	9,721
Individuals below poverty level [9]			10,789	14,049	15,087	13,897
Percent of Individuals below poverty level			72.46	74.73	75.50	63.49

With the exception of construction and slight gains in manufacturing, employment in Guánica has fallen. As a result, Guánica's 2000 unemployment rate, though down slightly from 1990, is the highest of all the coastal municipalities, as is its percentage of people below the poverty line. Per capita incomes are lower than most of the coastal municipalities we focus on in this report, on par with some of the inland municipalities that have not benefited as heavily as coastal municipalities from tourism and construction.

Fishing from 1999 to 2003 in Guánica ranked 5th of all the municipalities, slightly below Aguadilla in landings yet higher in revenue, indicating that the fishers here land more highly valued species. The census counted only 32 fishers here, fewer than what emerged from our ethnographic interviews, which placed the number of fishers at more than twice that, estimated at between 70 and 80. Many of those, however, are part-time fishers, and the full-time fishers may be closer to around 40 or 50.

Figure SRII.1. Guánica Fishery Landings Data, 1983-2001



Prices for fish have risen gradually in Guánica, despite some sharp fluctuations in landings (correlation coefficient = .2244). This seems to be common in municipalities where there the mix of fishers includes a number of casual and part-time fishers along with full-time fishers. Fishers in Guánica have access to several sheltered locations to store and launch vessels, and these have given rise to fishing associations as well as opportunities for commercial fishing and leisure capital interests to converge.

On the edge of the main town of Guánica is a Villa Pesquera, El Malecon, one of at least four significant sites where fishers gather. Others are in or near Playa Santa/ Ensenada, and Guaypao/ Esperanza, west of the main town, and Bahía Ballena, to the east. Two of these areas—Playa Santa and Ballena—combine commercial fishing with providing services to recreational visitors, while the others are primarily commercial fishing locations. The commercial fishing location in Bahía Ballena, which is off the beaten track, has a restaurant and a sightseeing/ pleasure vessel that takes tourists to outlying islands and to other nearby locations, including the phosphorescent bay in neighboring Lajas. In Playa Santa, a large condominium complex, built primarily for government employees to enjoy the beach, sits across from a fishing association where one of the fishers operates a tour boat for visitors to the beach. These connections are somewhat distinct from relations between commercial fishers and the tourist/ recreational sector in other parts of the island, where problems have arisen over slip space and coastal development or the relations are indirect (as in seafood dealers linking commercial fishers with tourist restaurants). Instead, they seem more symbiotic in nature, representing one model in which fishers may look to as they consider ways to enhance their incomes.

El Malecon, Villa Pesquera de Guánica

Sitting directly on Guánica Bay on the edge of the town's waterfront, this association fishers includes a pier, an area for boat repairs, and other facilities associated with a *Villa Pesquera.* At least 37 fishing vessels moor in the small bay near shore and attached to the muelle, and the facility has the standard pescaderia, small cleaning station, and 28 storage lockers. There isn't a Department of Agriculture sign on the facility, however, and one of the administrators said of the association, "We are incorporated as an association but we aren't functioning" [*"Tenemos una asociación incorporada pero n está funcionando."]*.

Figure SRII.2. Malecon, Guanica with Commercial Vessels (discharge pipes in background)

Reports of numbers of members ranged from 22 and 30, but only half that many fish full time, and they have experienced problems agreeing on the ways to use the facility, particularly in terms of what is one of an association's most important features: its market. The association is comprised of divers, net fishers, and trap fishers—primarily divers, everyone agreed, but during the time of year that *sierra* (kingfish, or king mackerel) run, many of the divers switch to hand lines to target them. Although all the vessels look to be in good condition, one of the divers' boats was wider and longer than the others (perhaps 25' instead of 18') and in slightly better, newer condition. Still, all the boats are in good condition and obviously working vessels. Three-fourths of the fishers who fish out of here use fiberglass vessels. A boat repair facility adjoins the main area of lockers and the pescadería, and they have running water (for cleaning fish) as well as light.

The pescaderia takes up less space than Crash Boat, in Aguadilla: around the same size as the pescaderia in Aguada. What these fishers have going for them is an extremely sheltered location with easy access to the southern and western waters and a ready market in the seafood restaurants lining the road along the waterfront. At the end of the road beyond the association is a small ramp. There is also a state facility at the end of that road.

The problems in the association, according to the administrator, derive from the divers' attitude toward the market. Their catch—primarily lobster, conch, snapper, and grouper—is in high demand and hence they are able to sell directly to restaurants rather than to the association. The market will, however, always buy all the fish from the members if they want to sell there, but they cannot offer competitive prices, saying that, "Fish run in groups," and that when the supplies are high they are high throughout Puerto Rico and they end up having to store too many of the same kind of fish in their freezers for too long, which depresses fish quality. Occasionally their freezers fill up with kingfish, which the restaurants desire less than mahi mahi and other species, creating an opportunity cost. As with the seafood dealers from Puerto Real, the administrator claimed that the only way they could compete with other areas, imports, and other markets is to focus on a quality product: "*Podemos cometir por la diferencia en calidad.*" ["We can compete by the difference in quality."] The most highly prized species they sell are mahi mahi, lobster, conch, trunkfish, and snapper. Other fishers here, however, agreed that *sierra* were the most important species for the fishers of Guánica, despite that they are less highly prized than other species.

They catch most of these species between 4 and 15 miles from shore, sailing as far away as Cabo Rojo, but the administrator said that no one here fishes either Bajo de Sico or around Boya 6. They have been negatively impacted, however, by the close season for conch, a closure the administrator questioned, saying that they was no scientific information proving they their populations were declining and that no one knows exactly what time of year they reproduce. Another fisher reported that those who fish with handlines generally fish to the west, between Guánica and La Parguera, while others fish around the small nearby keys in the region.

Their seasons vary both by species they catch and by the difficulty they have selling fish. During the fall months, from September to November, seafood sales are off, but they pick up during the Christmas season. During the Spring, in part thanks to Lent, seafood sales tend to be robust, and during the summer is when they sell the most lobster and other first class species (e.g. snapper).

Through the market they are tied into an island-wide network, selling to local restaurants and fish buyers as well as dealers as far away as Vieques (off the east coast of the main island), Fajardo and San Juan (also in eastern Puerto Rico), and Aguadilla, Quebradillas, and Rincón. Nearby municipalities they sell to include Yauco and Ponce. They mentioned specifically selling to 12 restaurants and 5 fish dealers in these locations. Because the market is robust, the fishery has been attracting new recruits lately. This is part due to the fact that one can make money relatively quickly, on a daily basis, from fishing, even though it is hard work. It is also due, of course, to the high rate of unemployment in Guánica.

One of the most pressing issues facing the association today is the municipality's threat to displace them from their current location, moving them further away from the bay and further from their homes. This would be devastating, they believe, because their current location gives them a great deal of exposure to the public, especially on weekends. They are in full view of a large parking area that often fills during the weekends, and they feel that the move would undercut their market. The move would also make them less secure, they believe, and they wouldn't be able to keep any gear in their lockers. The municipality has attempted this twice before, but both times the fishers were able to rally against this.

Guaypao-Esperanza

"As one approaches Guanica going on route 16 from east to west, towards Guaypao/Canna Gorda, one can see the abandoned remains of the old Central Azucarera (sugar mill) right between the road and the coast. The main building looks like a cross between a old hangar and an oversized barn. There are some smaller replicas of that building besides it and two large chimney towers a little farther towards the coast. Right on the coast there are two large docks, now abandoned. One is your regular large, low-lying cement dock, the kind of dock used for embarking or disembarking miscellaneous goods or people. The other dock doesn't have a low-lying cement platform, but a scaffolding-like construction consisting of aerial ramps, conveyor belts, and tubes used to fill the holds of outgoing vessels with sugar…. All this is now abandoned, but when you look around it you see coastal settlements where people now live. When you approach one of these settlements you start to see the unequivocal signs of a community that is dependent on fishing to some degree: <u>yolas</u> (on the water or in the yards of houses), nets or fish traps piled up on a driveway, 'hay pescado' signs, etc.

"The above description is taken from fieldnotes detailing observations of the landscape that I made as I approached Canna Gorda in Guanica for an interview; but in reality the exact same description of landscape features could be used to describe an approach leading to many coastal communities through the east, south, and west coasts of Puerto Rico. These communities are relics of settlements that used to depend on a seasonal mix of salaried sugarcane labor and fishing and that after the gradual but brutal collapse of the Puerto Rican sugarcane industry were basically left

> *to fend for themselves and have struggled to find other sources of income. While reviewing some early notes, I found a quote calling Aguirre (in Salinas) an example of a community which was historically dependent on "pesca de invernazo" ("invernazo fishing"), or fishing that mostly took place during the 'winter closures' of sugarcane central operations." (Carlos García-Quijano field notes, 2004).*

Sidney Mintz's chapter in The People of Puerto Rico noted the phenomenon of *invernazo* fishing that García-Quijano, here, places into its material context for Guánica. It points to a well-documented practice of Puerto Rican fishers: moving among different occupations during different times of the year (Griffith and Valdés Pizzini 2002). Yet it also raises the question of the importance of fishing in municipalities, such as Guánica, where sugar was once so dominant a part of the coastal landscape. According to informants in Guaypao, fishing, once primarily a supplemental source of income and protein, today is extremely important to the local economy. According to one informant, in addition to fishing, now, the most common other jobs/economic opportunities in the area are carpentry, construction work, or masonry (mostly *chiripas*, or odd jobs):

> "Twenty-five years ago," he added, "everybody around here worked in the Sugar Central (Central Guanica). Since the Central closed this is a dead town. I worked in the Central 27 years, and would fish the 'invernazo.' The closure of the Central sent everybody to the sea (to fishing) and affected the fishing resource. Before, one would catch 80 pounds of octopus in a couple of hours. Very big lobsters, you could catch them just walking along the reefs at low tide, at night with a resin torch (*jacho*)".

Guaypao is a small community outside of the capitol city of Guánica, on the road to Playa Santa and Ensenada. The part of the neighborhood facing its small sheltered bay forms a semi-circle facing the bay. At least two piers provide space for the vessels of around 15 independent fishers, 5 to 6 of whom fish as far away as Cabo Rojo. In addition to these fishers, all of whom own vessels, there are additional members of the communities who sign on as crew; crew, however, in the words of a local fisher, "come and go." This same fisher distinguished between the bona fide fishers of Guaypao and those who are learning to fish just for sport or recreational purposes.

Figure SRII.3. Celebratory Fishing Vessel in Guaypao

The above photograph forms part of the evidence that fishers in Guaypao consider themselves an occupational community, distinct in their craft. One of the fishers from the community said that, if he were taking photos of important symbols of fishing in Guaypao, this would be the first photograph he would take. One of the in-depth interviews we conducted was with a fisher who had fished in the area for 47 years, a man we refer to as Alfredo; as such, he had detailed information on changes in fishing practices, in the resource, and in other dimensions of life in Guaypao, offering suggestions for better management of the resource.

Currently, fishers from this region fish primarily for *sama* (mutton snapper) and *sierra* (king mackerel or kingfish), using primarily long lines and other hook and line rigs. They also fish for bait with gill nets, and the search for baitfish has become one of the key issues facing Guaypao fishers. Formerly they used more traps, including deepwater traps and the wooden lobster traps, but with the increase in divers in the region, trap theft and theft of fish from traps has increased, and many fishers have switched to alternative gear.

> Alfredo's comments concerning kingfish were interesting in light of the comments by fishers/ fish dealers in the association near downtown Guánica, where fishers claimed that filling freezers with kingfish at times prevented them from landing more highly desired species, such as Dorado. Instead of considering kingfish an opportunity cost, he reported that sierras were the single most important species for Guaypao fishers. Fishers in neighboring Malecon targeted sierras heavily as well, yet in Playa Santa, also in Guánica, sierras were not listed among important species.

These distinctions may reflect larger trends brought on by market forces. Others in Guaypao, along with this fisher, mentioned that fishers had been shifting from second to first class species over time, and that new entrants to the fishery, young men who were mostly divers, were targeting the highly prized first class species such as lobster, conch, snappers, and octopus. Other first class fish listed were yellowtail snapper, mutton snapper, grouper, and sierras. "Before," Alfredo said, "they would go for second class fish. Not anymore." He added that driftnets for parrotfish used to be commonplace, but have declined.

Most fishers in Guaypao market their fish themselves, either directly from their homes or to restaurants in the areas, if the catch is first class. There are many species of fish, however, that fishers viewed as important to household consumption and as food fish in the community: gray triggerfish, for example, and a few species of jacks, which are not in high demand in the market.

Certain gear types, coming from outside the community of Guaypao, have caused conflicts between local residents and outsiders. For example, fishers using beach seines used to come to Guánica from as far away as San Juan and Aguada and engage in what locals considered extremely destructive fishing practices. They were coming primarily for baitfish, but they would drag the bottom, taking everything, and the fish they didn't keep they would leave to waste. Guaypao and Malecon fishers united against them, engaging in a number of tactics to prevent further destruction. They planted hangs of various types in the areas where they fished (e.g. barbed wire traps), as well as confronted them directly and told them to leave. Evidently, as reported in three similar accounts, these tactics were successful.

Recently, however, another destructive fishing practice has emerged, this one particularly destructive, Guaypao fishers believe, to coral reefs: *filetitos*, or little gill nets, which are short gill nets that fishers drag over as opposed to alongside coral reefs. Alfredo said that these damage the reefs and catch small fish and shellfish that hide near the reef crest area, adding, "The *filetitos* are a problem because they are cast just on top of the reef. It is people from outside using these *filetitos*, people who are not true pescadores, that do not fish for a living"

A more recent problem has been with jet-skis. Previously, the bay in Guaypao used to be a prime spot for catching baitfish (e.g. *mijua/ anchoa hepsetus; arencon or herring*), but jet-skis and other recreational vessels, according to local fishers, have led to declines in baitfish in Guánica: "Jet-skiers," Alfredo said, "they like to speed a lot, and they scare baitfish away from the coast and the bays. At the whole island-level, wherever there are jet-skiers and fishermen there is the same problem. They make the fishermen have to go farther and farther away to catch baitfish to be able to fish larger game. They have scared all the baitfish away from these bays (Guanica, Guaypao), now we have to go to remote bays for baitfish." This, of course, is the negative dimension to the problem of tourist development in close proximity with commercial fishers, despite the opportunities such development sometimes provides. The bay in Gauypao, only 10 feet deep from the mangrove line to the shore, dropping to 18 feet beyond the mangroves, was a particularly productive nursery and baitfish location prior to the growth of the jet-skiiing and other recreational boating population.

Other problems derive from pollution. Living near the bay, Alfredo and his son have noticed that, following flooding, the bay becomes rancid with runoff water, smelling for days. They added that this was a recent problem. It may be related to the phenomenon noted earlier, in Aguada, where the decline of the sugar industry led to a concomitant decline in maintenance of irrigation systems, altering the character and quality of surface groundwater.

Given their deep attachment to marine resources, fishers in Guaypao reported being for closures. However, they did suggest revisions to these regulations based on their own knowledge of the resource, a knowledge that they add to and revise daily. Fishers in Guaypao offered similar recommendations for revisions to the area and seasonal closures: closing fishing during only during part of the aggregation period, and relying on fishers' knowledge about which areas to close and closing areas on a rotating basis. In both cases, fishers could continue to fish (during a part of the aggregation or in some open areas, where they knew stocks were healthy), but fish would also be protected. Again, in Alfredo's words:

> "If they are going to close areas, areas of mutton snappers, red hind, etc., they should leave one month for the fishermen, two months for the fish. We (the fishermen) know that *samas* aggregate for three moths of each year, so if for one month of those we could go and fish, take advantage, then two months could be for the fish to reproduce. *Samas* and red hinds, they have their 'places' (aggregation locations), and we know them, or some of them."

Currently, fishermen are reluctant to cooperate with DRNA personnel, however, because they believe that their knowledge might be used against them. That is, they could point out aggregation locations of which the DRNA were unaware, and the DRNA might then close those areas in ways that didn't mesh with fishers' understandings of resource dynamics. Alfredo believed that the conch closures had been effective, and in fact advocated for shorter closures for octopus and lobster, while his son advocated for rotating management areas for octopus.

Jacinto/Gulligan's Island

In 1988, as part of an inventory of marine recreational infrastructure, researchers visited this place and were struck by, among other things, the number of mangy dogs roaming around the property. Today, the dogs are less mangy than in 1988, and Jacinto/Gulligan's Island has changed in other ways as well. Researchers in 1988 called it a nascent recreational site, but now it has become more elaborate, cleaner, and is interesting because it combines commercial fishing with water-based recreational activities (taking a guide boat to Gulligan's Island, off the coast of Guánica). As such, it is a location that is both a fishing center (although not, apparently, an association) and a link to the tourist sector.

The fishers who fish out of here fish with nasas, said the man who drives the guide boat, and they land primarily lobster during the winter months. He lamented the poor lobster, saying that everything is preying on them now: octopus, several species of fish, fishers. Evidently, however, the lobster is plentiful, he said, because the restaurants have stopped buying them and the pescaderías' freezers are filling up.

Figure SRII.4. Jacinto Association, Guanica

Figure SRII.5. Jacinto Association, Showing Tour Boat at the End of the Dock

Playa Santa & Ensenada

These are fascinating, out-of-the-way places where fishers currently primarily sell seafood out of their homes. This was once one of the most popular beach locations on the island, and now has a large clientele for recreational activities, which the commercial fishers are taking advantage of. A commercial fisherman owns the small tour boat in the photo below, for example:

Figure SRII.6. Pinos Tour Boat, Playa Santa, Guanica

Figure SRII.7. Playa Santa Association Muelle, Showing the Beach and Big Government Condominium in the Background, as well as the New Government Boats

The condominium building depicted in the above photo was built by the government and state employees have first crack at renting it by the weekend, the week, or the month. After that, members of the general public can rent it. Though it has been supplanted by other places now, Playa Santa remains popular, particularly among internal, Puerto Rican tourists.

Table SRII.2. Association Membership and Hours Spent Fishing, Guánica (n=32)

Variable	Response
Percent Affiliated to Association	46.9
Hours engaged in fishing activity	
0 – 20	18.8
21 – 30	21.8
31 – 39	6.3
40	40.6
> 40	12.5
Mean hours	33.81 (sd = 11.78)
Minimum	0
Maximum	63

Sea Grant officials reported that the new boats may be part of the season of political campaigning, and that the whole association may have benefited from their timing. These are new facilities, though still used by some older fishers and older vessels. Other informants in Playa Santa said that the facilities were built simply as a way of garnering funds from the government, and that the association organized for this purpose alone, disbanding after the association facilities were completed. Our information on Playa Santa and Ensenada, however, is second hand, and should be considered in light of the other information from Guánica. Table SRII.2 presents the statistics from the census on Guánica fishers.

One of the interesting details about Guánica fishers is that they fish, on average, about as much as the professional fishers of Cabo Rojo, with more fishers clustered around the average. These figures indicate

a dedicated fishing population in Guánica, corresponding to our respondents' views that fishing is, indeed, important to the local economy of this former sugar municipality. Table SRII.3 shows the distribution of fishers over territories and types of fishing, showing the importance of baitfish in this region.

Table SRII.3. Fishing Locations and Styles, Guanica (n=32)

Variable	Value
Shore	3.1
Continental Shelf	93.8
Shelf Edge	34.4
Oceanic	21.9
Reef Fishes	93.8
SCUBA Diving	34.4
Skin Diving	31.3
Pelagic	37.5
Bait	40.6
Deep Water Snappers	18.8

Table SRII.4. Gear Utilized in Guanica (n=32)

Variable	Percent
Beach Seine	3.1
Trammel Net	6.2
Long Line	3.1
Troll Line	25.0
Fish Trap	9.3
Gill Net	21.9
Cast Net	78.1
Hand Line	75.0
Rod and Reel	53.1
Lobster trap	0.0
Snapper Reel	3.1
Winch	12.5
Spear	41.9
Lace	40.6
SCUBA	31.2
Gaff	87.5
Basket	0.0

As with table SRII.4, these figures support our ethnographic observations, which suggest that divers make up an important part of the Guánica fishery, followed by fishing with lines and, for bait, with nets (primarily cast nets). One of the fishers we interviewed at Malecon was a specialized net fisher, somewhat of a throwback to an earlier era, fishing for parrotfish with a trammel net. He may account for most of the 6.2% in table SRII.4.

Finally, regarding fish marketing, the following table illustrates the importance of a range of marketing outlets in Guánica. It resonates, too, with the complaint of the administer of Malecon who said that often the divers didn't sell to the association, instead selling directly to restaurants. That over forty percent reported being affiliated to an association, yet only 34.4% reported selling to an association, may reflect this complaint.

Table SRII.5. Marketing Behaviors in Guanica (n=32)

Variable	Percent
Private	0.0
Fish Buyer	28.1
Association	34.4
Walking	15.6
Restaurant	12.5
Own Business	12.5
Gutted	50.0
Ice	40.6
None	28.1

Table SRII.6. Opinions of Guánica Fishers (n=32)

Variable	Percent
Status of Fishery Resources	
Better	12.4
The same	31.3
Worse	56.3
Reasons for problems in fisheries	
Pollution	15.6
Habitat Destruction	6.3
Overfishing	28.1
A lot of vessels/boats/fishers	9.4
Laws and restrictions	3.1
Jet Skis/ noise	12.4
Currents	3.1

Guayanilla

"Fishing holds together the lives of the fishermen in southern Puerto Rico as nothing else could."
—Ricardo Pérez (2000)

Pérez's observations about the glue of commercial fishing derive from several months of field work in Guayanilla, Puerto Rico, during the last years of the 20th century. Guayanilla, like its neighbors to the east (Ponce) and west (Peñuelas, Guánica, and Lajas), was once a significant sugar producing area in which fishing provided a critical buffer against hunger and idleness during periods of seasonal unemployment. During the time of sugar, official statistics suggest, unemployment was low while poverty was extremely high. We see a similar inverse correlation occurring today, with significantly higher unemployment figures associated with declining (though still high) levels of poverty.

Table SRII.7. Guayanilla Demographic Data

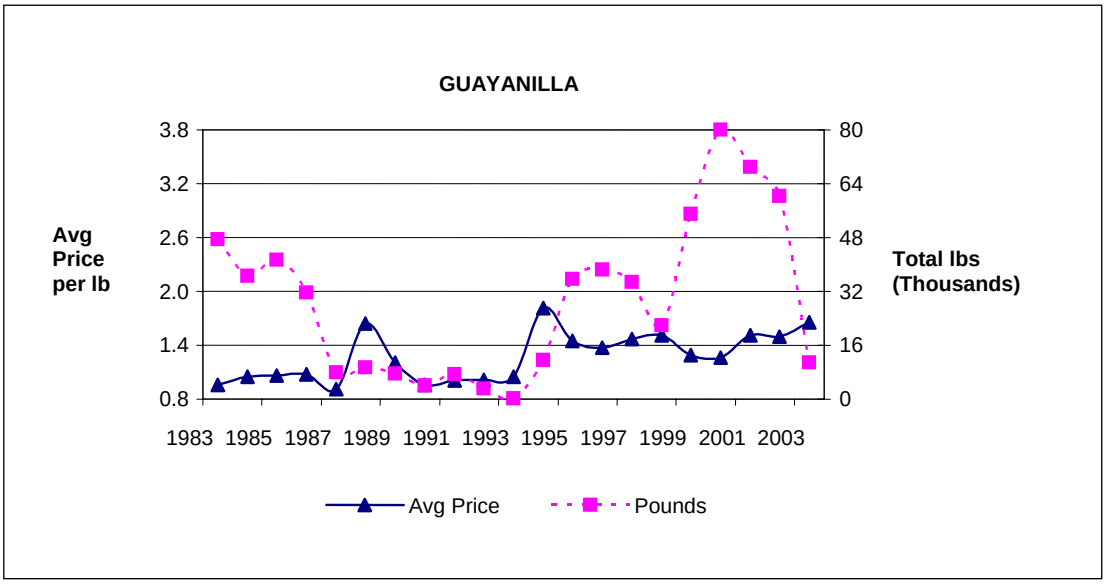
GUAYANILLA	1950	1960	1970	1980	1990	2000
Population Characteristics						
Population [1]	17,402	17,396	18,144	21,050	21,581	23,072
Civilian Labor Force (CLF) [2]	4,339	3,780	3,949	5,281	6,221	5,817
CLF - Employed	4,234	3,604	3,744	4,186	4,444	4,230
CLF - Unemployed	105	176	205	1,095	1,777	1,587
Percent of unemployed persons	2.42	4.66	5.19	20.73	28.56	27.28
Industry of employed persons [3]						
Agriculture, forestry, fishing and mining [4]		1,548	449	232	197	123
Construction		140	1,022	433	513	613
Manufacturing		720	801	889	541	476
Retail trade		372	407	544	639	406
Socioeconomic Characteristics						
Mean travel time to work (minutes) [5]		N/A	N/A	N/A	24.8	31.3
Persons who work in area of residence [6]		2,924	1,630	1,941	2,005	1,479
Per capita Income (dollars) [7]			731	1,548	2,711	5,954
Median Household Income (dollars) [8]		636	2,303	4,014	7,017	11,361
Individuals below poverty level [9]			12,720	15,229	14,965	13,137
Percent of Individuals below poverty level			70.11	72.35	69.34	56.94

During the 1960s and 1970s, like much of the southern coast, as sugar production declined, Guayanilla experienced the development of an expansive petrochemical sector that reshaped much of the coast. Currently fluctuating between complete disuse and limited production capacity, the petrochemical plants that dot Puerto Rico's southern coast continue to cause problems for fishing families and recreational visitors to Guayanilla. The development of the petrochemical industry is what accounts for the spike in construction employment during the 1970s in Guayanilla, an employment opportunity that fishers in the municipality no doubt took advantage of, just as an earlier generation of fishers combined field work in sugar with fishing. Despite whatever short-term prosperity these constructions jobs, the long term problems the petrochemical industry brought to Puerto Rico's south coast—thermal pollution, displacement of fishers' houses and neighborhoods, destruction of wetlands, and reduced access to fishery resources—far outweigh the employment opportunities of thirty to forty years ago.

Though fishing provides a much needed source of income and employment in Guayanilla, Pérez reports that the most successful fishers there discourage their children from entering the fishery: "While fishing is the only activity Don Luis has mastered, he also stressed the fact that fishing involves too much suffering. The fact that approximately half the fishermen I interviewed argued that they would not like their sons to become fishermen clearly indicates their ambivalence about fishing as an occupation" (2000: 5). Only one of the three fishing centers in the municipality seems to be a robust, thriving fishing community, while the others seem to be traveling along the path forged by the wishes of men like Don Luis.

The ambivalence toward fishing may be associated with the high fluctuations in landings in Guayanilla that are reflected in the official statistics. Like nearby Guánica, Guayanilla's landings data shows similar sharp increases during the middle 1990s after a period of relative stability, and from 1998 to 2000, followed by steep recent declines. Also like its neighbor, prices have not responded to supplies predictably (correlation coefficient = .1517). Guayanilla ranked 18th for 1999-2003, although during the late 1990s and early 2000s its catches were nearly as high as some of the most productive landing centers.

Figure SRII.8. Guayanilla Fishery Landings Data



As noted above, Guayanilla has three fishing centers, though they differ radically in terms of their fishers' attachments to fishing: El Faro, a small peninsula, almost an island, south east of the municipio; Playa de Guayanilla, the beach in front of the main town, near the road to the refineries; and Encarnación, the only functioning Villa Pesquera, to the east of Playa de Guayanilla.

El Faro

An interesting barrio, El Faro sits on a spit of land away from the main part of Guayanilla, with no Faro (lighthouse) anywhere in sight. Nevertheless, this is a relatively enclosed community where around 15 to 20 households may engage in fishing, though Pérez reports that the fishers of El Faro are dependent on other sources of income, principally retirement income and social security, rather than fishing. It would seem that this is more of a "fishery engaged" community, with only a handful of families making part of their living from the sea, primarily supplementing other income.

An old man we interviewed was working on three boats, and these were three of only around 15 on the beach. He was applying a grainy, fiberglass-like material to the seams of a vessel that he had just painted with fiberglass paint. He said that most of the fishers here sell to the association in Guayanilla, Encarnación, or a fish dealer in Playa de Guayanilla. They also have their own freezers when the association or merchant won't buy their seafood. Along Guayanilla's bay are several large, pricey seafood restaurants, and a number of smaller places that sell *empanadillas* and other seafood items. Even this far off the beaten track, however, there are a few *colmados* (small grocery stores) and a waterfront bar, where fishers may sell their catch.

The old man we interviewed uses a *chinchorro* (beach seine), fishing close to the shore like most of the other fishers in El Faro. According to Pérez, most of the fishers there are elderly, retired, and fish the near-shore waters from small wooden-and-fiberglass vessels. The most common gear types are hand lines and traps, although traps seem to be in decline and used only sporadically among the fishers of El Faro and Playa de Guayanilla.

Although perhaps only marginally related to fishing, two other things distinguished this community from others, indicated in the two photographs below, showing two dimensions of Puerto Rico one sees predominantly in fairly isolated settings like El Faro: the one of parakeets in cages, which suggest a cottage industry of selling exotic birds, and the other of the Santa Maria alter, with the head of Chucky (the doll from the horror movies) and another, African-American doll on a pile of wood (symbolizing burning at the stake) in front of a mirror: a Santa Maria altar.

Figure SRII.9. El Faro Parakeets

Figure SRII.10. El Faro Santa Maria Altar

Considering place-based and non-place-based communities, too, El Faro is a case, perhaps, of a link between the two. On the one hand, fishers based in the actual place, El Faro, the parcelas, contribute to the welfare of the community through their fish landings, supporting local restaurants, providing a few *proele* (crew) positions, etc. (obviously enough to provide the old man repairing the vessel with some employment). On the other hand, the fishers of El Faro are linked to an association in Guayanilla, if loosely; through them, they are tied into to a broader coalition of fishers across the municipality and the island.

Playa de Guayanilla

Looming to the east of the Playa de Guayanilla are the highly industrialized petrochemical facilities, lending the shallow waters of the bay a kind of wasteland appearance. The first time we visited the area, it was dead quiet. A man lay in his hammock behind the closed pescaderia in the photo. He reported that most of the fishers who fish out of this area are independent divers who dive for *langosta* (lobster) and grunts along the bay. This information conforms to Pérez's information about Guayanilla, but not this area of the municipality. Instead, he reports that the fishers of Playa de Guayanilla fish primarily with hand lines and more casually than the fishers of Encarnación. Like the fishers of El Faro, a few own traps and most fish the near shore waters of the bay, the neighboring mangrove forests, and other near-shore environments. Pérez reports that some of the more destitute fishers in this region set traps for land crabs, and that most of the fishers here rely on government assistance to supplement their fishing.

He also reports that the fishers here used to have an association, but it has since been disbanded. The facilities are no longer in use and fishers now sell to a variety of markets, including seafood dealers/ private fish markets, to people directly from their houses and along the streets, and to local restaurants. Pérez documented 11 different marketing outlets in use by fishers of this area, with the most common being selling from one's house, street vending, selling to a fish house, and selling to the association.

Of both El Faro and Playa de Guayanilla, he reports that they "exploit more than one fising location, the most important being the mangrove forests nets to Punta Verraco, coral reefs, and various sandy cays such as Cayo María Langa, Cayo Caribe, Cayo La Mata, and Cayo Palomas. These as well as smaller cays and islets are located a short distance from the coasts along Guayanilla, Peñuelas, and Ponce and can be easily reached using small wooden vessels" (2004: 195).

Since the decline of the fishing association in Playa de Guayanilla, the fishers no longer keep their gear in association lockers, a development that has led to a somewhat unique practice in the municipality: the use of wooden carts to carry gear and catch between fishers houses and the beach where they moor their vessels. Along with the high number of seafood restaurants (some famous across Puerto Rico), bars, and smaller establishments that sell *empanadillas* and *pinchos*, the practice of carting gear and fish into and out of the parcelas of Guayanilla lends the municipality's waterfront an interesting cultural dimension that reflects the community's engagement with the sea.

Encarnación

This is the fishing association in Guayanilla and the part of the fishery that is most dependent on fishing, most productive, and comprised of younger fishers who are primarily divers. Unlike the other two groups of fishers in Guayanilla, these fishers have larger, more powerful vessels, their own SCUBA equipment, snorkels, masks, harpoons, and spears, and they fish as far off-shore as Caja de Muerto, an island surrounded by rich fishing grounds off the coast of Ponce. This area is a favorite among recreational fishers of Ponce as well. Encarnación fishers primary target species are lobster, queen conch, grouper, and snapper—all 1st class species that sell for top dollar.

These are the most successful fishers of Guayanilla and the least likely to combine fishing with government assistance, as in the other areas. They have been successful in receiving government aid in the form of an association that is fully functional. This not only provides a ready market for members' catch, it also provides Christmas bonuses and some financial assistance to cover fishers when they are ill.

Summary

Only 20 fishers responded to the Puerto Rican census of fishers. This is less than half the number of fishing households included in Pérez's study (n=50), and Pérez's work was a sample drawn from a larger universe, although he doesn't venture an estimate of the total. From these data, Guayanilla appears to be principally a part-time fishers' municipality, with nearly two-thirds of those included in the census fishing fewer than 40 hours and none fishing more than 40 hours.

Table SRII.8. Selected Fisher Characteristics, Guayanilla (n=20)

Variable	Response
Association Member	70%
Hours used for Fishing	
< 20 hours	20%
20 – 30 hours	35%
31 – 39 hours	10%
40 hours	35%
> 40 hours	0
Mean hours	28.95
Standard Deviation	11.958
Minimum hours	0
Maximum hours	40

Source: Puerto Rican Census of Fishers, 2002

Tables SRII.9 and SRII.10 show fishing locations, styles, and gear, supporting the contention that many of the fishers there fish the near-shore environments and that hand lines are the most common gear, followed by gill nets. This is in line with areas that have high ratios of subsistence or casual fishers to full-time commercial fishers, and the 50% of those in the census who reported having no marketing strategy (table SRII.11) suggest a high proportion of subsistence fishers. It is interesting that no fishers included in the census reported selling to the association, in that Pérez reports (and our interviews in the area found) that there is an effective fishing association in the area, and that 70% reported begin affiliated with an association. This could indicate, of course, a flawed sampling approach in the census.

Table SRII.9. Fishing Territories and Styles in Guayanilla (n=20)

Variable	Percent
Shore	10.0
Continental Shelf	75.0
Shelf Edge	25.0
Oceanic	30.0
Reef Fishes	75.0
SCUBA Diving	5.0
Skin Diving	10.0
Pelagic	15.0
Bait	30.0
Deep Water Snappers	45.0

Table SRII.10. Gear utilized in Guayanilla (n=20)

Variable	Percent
Beach Seine	0.0
Trammel Net	10.0
Long Line	20.0
Troll Line	10.0
Fish Trap	30.0
Gill Net	60.0
Cast Net	55.0
Hand Line	65.0
Rod and Reel	20.0
Lobster trap	10.0
Snapper Reel	0.0
Winch	5.0
Skin	0.0
Spear	10.0
Lace	0.0
SCUBA	5.0
Gaff	60.0
Basket	0.0

Table SRII.11. Marketing Behaviors in Guayanilla (n=20)

Variable	Percent
Private	0.0
Fish Buyer	35.0
Association	0.0
Walking	60.0
Restaurant	0.0
Own Business	0.0
Gutted	35.0
Ice	50.0
None	50.0

While the fishers of Encarnación may have been adversely affected by the marine protective measures, their reports of fishing to the east and south of Guayanilla, towards Ponce, instead of toward the east, suggest that they the impacts of these measures have been minimal in this municipality. The fishers of El Faro and the Guayanilla waterfront tend to fish close to shore and thus also are unlikely to have been adversely affected. Table SRII.12. shows the opinions of Guayanilla fishers regarding the problems with the resource, which reinforce the view, commonly given in the area, that pollution from petrochemical plants is most responsible for problems with the fisheries. By contrast, under half of those who see pollution as a problem cite regulations as a problem.

Table SRII.12. Guayanilla Fishers' Opinions of Fishery Resources (n=20)

Variable	Percent
Status of the Fishery Resources: same	20.0
Status of the Fishery Resources: worse	80.0
Pollution	45.0
Habitat Destruction	20.0
Overfishing	10.0
Regulations	20.0
Jet skis	15.0
Weather	10.0

Peñuelas

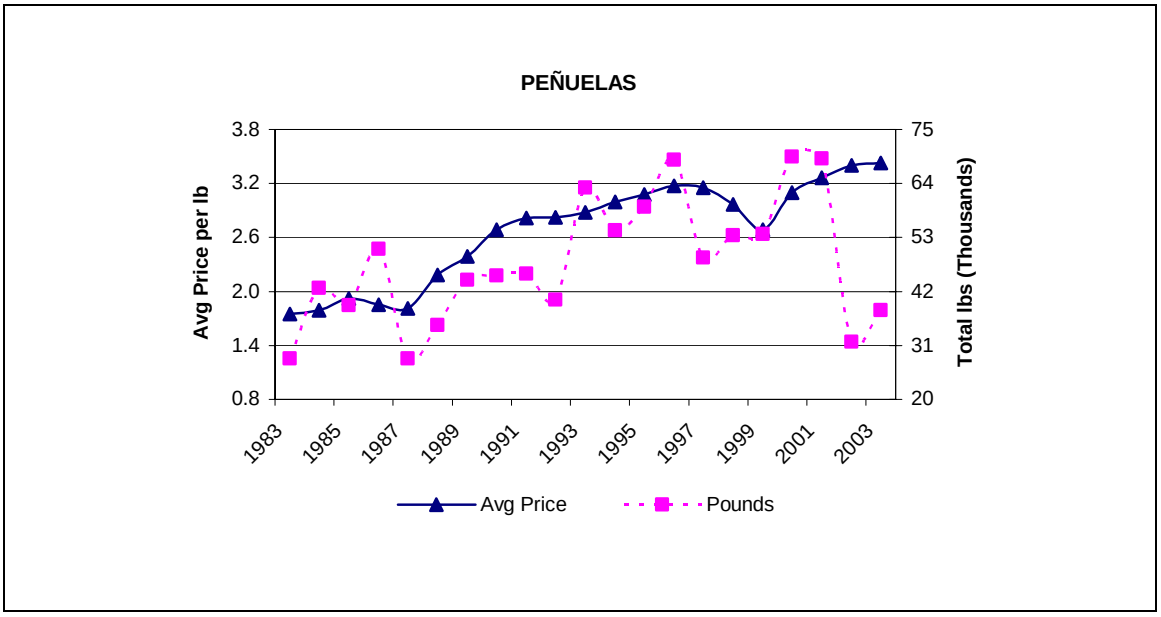
Peñuelas, a small coastal municipality, is Yauco's neighbor and serves as a fishing center for residents of both municipalities, in part because Yauco has but a few hundred feet of shoreline and lacks a landing center. Like its neighbors, Peñuelas was formerly a predominantly agricultural municipality, but suffered from the decline of sugar production. Those employed in agriculture, fisheries, and forestry/ mining have declined nearly 17 fold in the past forty years, and most of the 82 who remain are very likely either small farmers or fishers.

Table SRII.13. Peñuelas Demographic Data

PEÑUELAS	1950	1960	1970	1980	1990	2000
Population Characteristics						
Population [1]	14,931	14,887	15,973	19,116	22,515	26,719
Civilian Labor Force (CLF) [2]	3,534	3,076	2,597	3,974	6,275	7,051
CLF - Employed	3,359	2,892	2,455	3,238	4,591	5,196
CLF - Unemployed	175	184	142	736	1,684	1,855
Percent of unemployed persons	4.95	5.98	5.47	18.52	26.84	26.31
Industry of employed persons [3]						
Agriculture, forestry, fishing and mining [4]		1,376	249	130	137	82
Construction		152	663	431	529	863
Manufacturing		448	531	760	991	701
Retail trade		260	311	446	395	547
Socioeconomic Characteristics						
Mean travel time to work (minutes) [5]		N/A	N/A	N/A	24.6	31.1
Persons who work in area of residence [6]		2,260	1,589	2,118	2,271	2,125
Per capita Income (dollars) [7]			534	1,255	2,669	5,096
Median Household Income (dollars) [8]		810	1,361	4,220	8,020	12,194
Individuals below poverty level [9]			12,349	15,002	16,121	15,951
Percent of Individuals below poverty level			77.31	78.48	71.60	59.70

Peñuelas's rates of unemployment and poverty are in line with other former sugar municipalities, the former rising and the latter falling. Fishing plays a modest role in the economy, generating an estimated $131,000 in income (out of a total of more that $136,000,000), yet its landings rank just above Guanica's, or 8th out of 15. At the same time, Peñuelas fishers receive somewhat higher prices for the fish they catch than other municipalities, though prices do not reflect supplies here any more than they do in many other municipalities (correlation coefficient = .5106). In 2003, for example, their average price of $3.34 per pound was the highest received in the west, with the next highest average just over $2.94 per pound in Añasco. This may derive from the Peñuelas fishing being dominated by divers, who are often highly selective in their fishing, landing only species that they know will bring top dollar. It may be their ability to sell high value fish that led one of the fishery managers we interviewed to place Peñuelas among the top three associations on the island in terms of its organization, although he may have been referring to an earlier time period. The municipality's one functioning association, El Boquete, was recently reconstituted, after suffering an corruption scandal in the 1990s. In addition, Peñuelas used to have an additional fishing center and association, located in the Sector Playita Alegre, west of Tallaboa (where the current functioning association is located), but this association is closed. According to one of the informants in El Boquete, a Japanese person or company bought the operation or the rights to administer the association in the 90's, but then closed it permanently.

Figure SRII.11. Peñuelas Fishery Landings Data, 1983-2001



El Boquete/ Tallaboa

The one active association in Peñuelas is officially called Association de Pescadores de El Boquete. According to members our field team interviewed, this association is member-maintained and administered. They emphasize avoiding centralization, which stems directly from a corruption scandal in which the former association (with the same physical facilities but with a different constituency) was involved in the late 90's.

Figure SRII.12. Inside the Association, Peñuelas

This association has 20 full-time members, and they are young, compared to the membership of other associations. Divers predominate, though as is common in other associations, all types of gear are used. The fisherman currently in charge of accounting reported that the most important species are Red hind (*Epinephelus guttatus*), parrotfishes (*Sparidae* family, *Sparisoma* and *Scarus* sp.), spanish hogfish (*Lachnolaimus maximus*), octopus , and queen conch. Altough strong ties to tourism are not as readily observable as for example in La Guancha, Ponce, or La Parguera, there is a designated "Manatee Watching Area" and three restaurants located right in the vicinity of the association, including one directly across the small street that leads to the water. There are close relationships between the three seafood restaurants in the vicinity, and the association's administrator said that the restaurants buy their fish on a regular basis and that they are preferred costumers. There is also a marine and commercial fishing equipment dealer (Franchesi Marine) located near the association, with close ties as well to the members.

One feature of this association is that it is composed of people from Peñuelas and the nearby municipalities of Ponce, Guayanilla, and Yauco. The mixed crowd derives from their practice of giving the opportunity to come and fish to anyone that wants to do it. This is in part because under the current administration it is very new, and might be trying to boost membership to be able to compete as a marketing center.

From the interviews with Boquete fishers, one acquires the sense that its members find the association particularly strong for mutual benefit, cooperation, the pooling together of resources, and the creation of a communal space for fishing-related activities. Their facilities include storage areas for fishing equipment, docking space, ramp access, repair and maintenance services with communally-owned shop tools (specially an expensive acetylene torch and an electric soldering machine), and a communal freezer for catch storage and marketing. As would seem to be logical following a corruption scandal, they might be trying to avoid too much concentration of financial/administrative power to keep the organization flexible. In terms of its "fishing community," while physically centralized in an association, the geographic origin of members is wider and that, at least for now, there is a premium on independence and voluntary cooperation rather than on exclusivity and compulsory duties.

According to one of the informants, who also volunteers as a fireman at the local fire station, the members of this association might be young, but they live "100% exclusively from fishing" and the majority come from families that have been fishing for several generations. According to both of the informants, the majority of the fishing is conducted in the vast shallow grounds between Ponce and Caja de Muertos. They constrasted their type of fishing with the fishing done in other areas of the island, such as the east, where the shelf-edge is very close to shore. From the information of members of other, more affluent associations, that also relative affluence of the fishers might play a part in whether they spend more fuel and go farther out to the shelf edge or stay in the shallows. Of course, gear (divers tend to stay closer), personal preferences, and historical territoriality/ territorial resource patterns of the different fishing communities might play a large part in this as well.

Unfortunately, no fishers from Peñuelas were included in the fishery census, perhaps due to the period of disorientation within the fishery; hence, we have no census data to report here.

Northern Metropolitan Region:

San Juan, Cataño, Toa Baja

The northern metropolitan region requires little introduction, as it has long been the seat of power in Puerto Rico and a center for tourism, shipping, commerce, and, less visible, commercial and recreational fishing. We include three municipalities in the northern metropolitan region primarily because they all surround San Juan harbor. As such, their fishing facilities are part of Puerto Rico's most active port and most densely populated area.

Regional History

San Juan is an historical city, with many of its most heavily visited tourist attractions highlighting the colonial period, and its has long dominated all of the municipalities surrounding San Juan Harbor, including Cataño and Toa Baja. The entire western coastal area of the metropolis, from the Condado Lagoon to the point, is known as Old San Juan—a region whose colonial architecture dates to the early 16th century. Ponce de Leon founded a city called Caparra, southeast of San Juan Harbor, in 1508, and priests from this region began moving to San Juan in 1519, after Ponce de Leon left for Florida. The Padres Jerónimos founded the municipality in 1521, with 200 residents living in around 80 houses, most of which were of wood. Original plans for the city followed those common throughout the Spanish empire, with the city center devoted to a church and king's house and the rest of the city gradually assuming the character of a fortified enclosure.

During its first 50 years of existence, San Juan's population increased five times, and by 1586 they had experienced assaults from Caribs[1] and other Europeans that they applied to the crown for funding for fortifications. This was to be a massive public works project, funded with gold and silver from Mexico and Peru, resulting in the construction of fortifications around and throughout the city. Security and commerce seem to have continued attracting people. During the first decades of the 17th century the population increased by another 60%, reaching 1,600 inhabitants by 1644. Historical accounts of the city at this time suggest that already San Juan had developed a marginalized sector, or an underclass—one of the enduring legacies of urban life. Nearly 1,000 blacks, either slaves or freed slaves, weren't counted in the 1644 census, and the roster of housing included 120 huts or shacks (Toro Sugrañes 1995: 358). Many of these, no doubt, exploited the vast fishing and land crab resources of the San Juan Harbor.

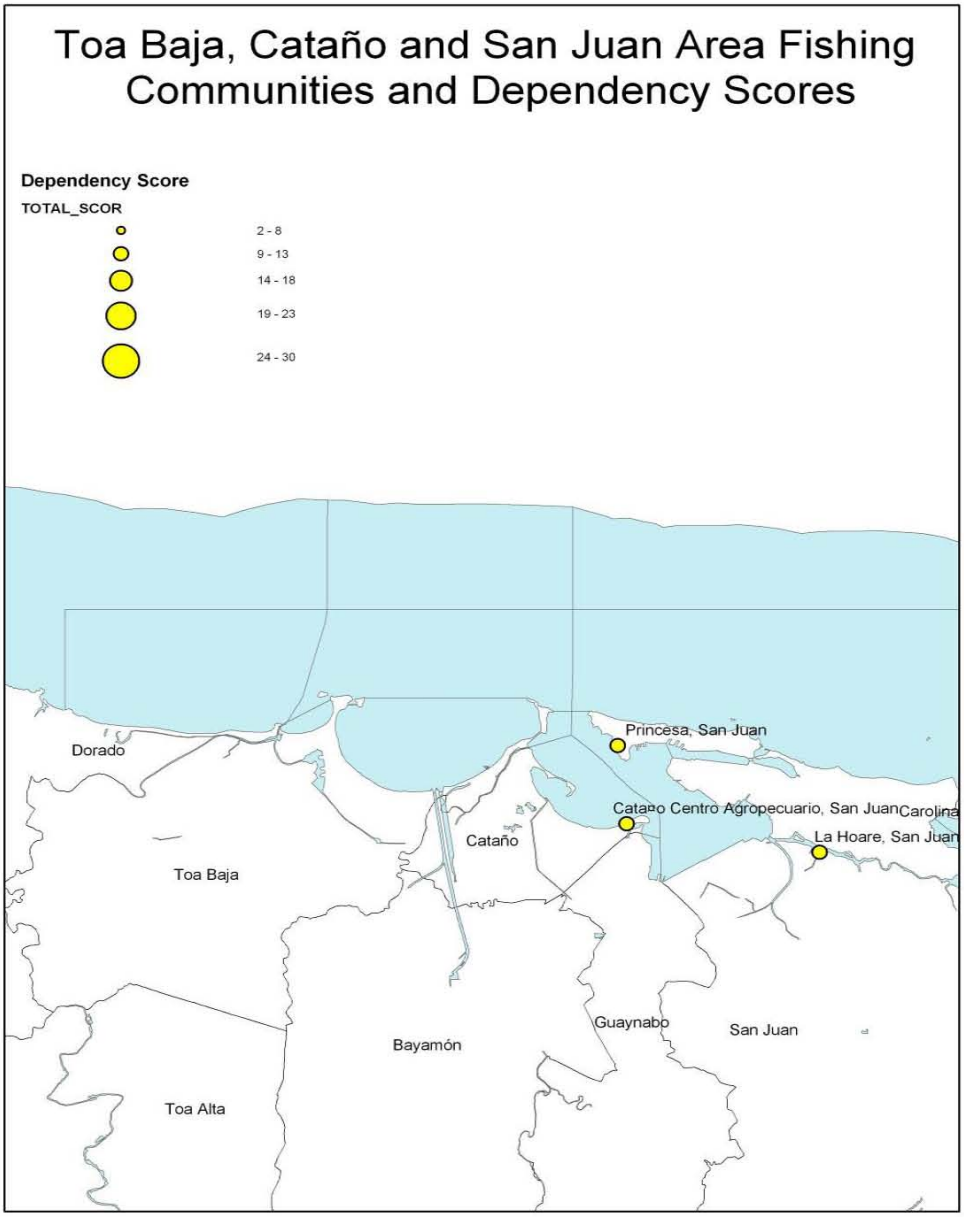
In addition to fishing, San Juan harbor and neighboring waters have their own brisk tourist trade of historical sites, cruise ships, and casinos and hotels that have influenced the quality and quantity of habitat within the confines of the metropolitan area. To the east, the metropolis joins the highly developed tourist region of Isla Verde, in Carolina, near the principal airport. To the west, across the mouth of San Juan Harbor from Old San Juan, stand much of the city's industry, including the Barcadi rum plant and the large power plant.

Important fisheries habitat within the city are the MPA Condado Lagoon, which adjoins San Juan's active tourist district, San Juan Bay, Ensenada de Bocal Viejo (just west of the mouth of San Juan harbor), Los Corozos Lagoon, San José Lagoon, and the Martin Peña canal, connecting the Condado and San José

[1] The distinction between Carib and Taino natives of the Caribbean has been a point of dispute in Caribbean ethnohistory. Some scholars claim that any hostile natives were labeled Carib, while those that were complicit with Spanish policy were labeled Taino, claiming that rather than being distinct ethnic groups they were simply more or less resistant members of the same group.

Lagoons. Generally, these bodies of water separate the tourist and shipping centers of the city from the more commercial, educational, and financial districts of Hato Rey, Río Piedras, and other areas.

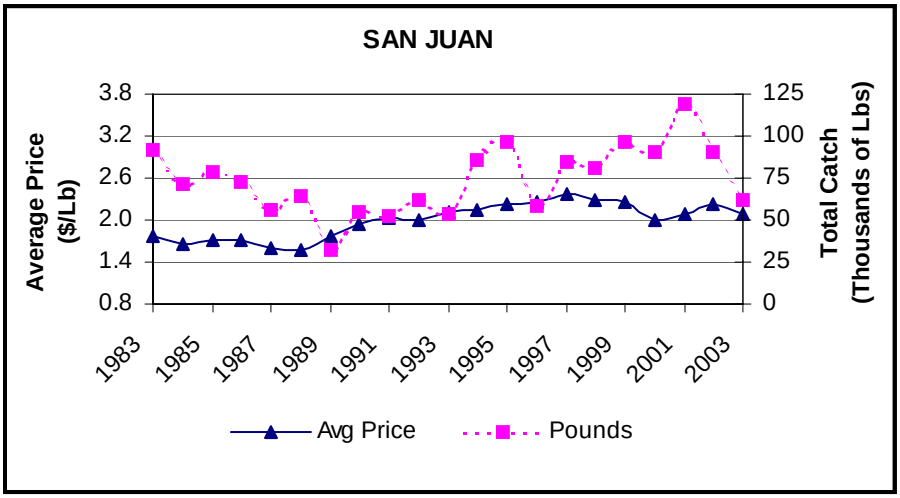
Map NM.1. Northern Metropolitan Region



San Juan

Puerto Rico's most metropolitan municipality is by no means a fishing community. Its two principal *Villa Pesqueras*—La Princesa and La Hoare—both suffer from problems associated with fishing from an urban environment and have been, over time, marginalized in favor of more politically powerful interests such as cruise lines and cargo ships. Nevertheless, their ability to hang on to coastal property in the midst of urban growth, as well as to land as many thousands of pounds of fish as they have, testifies to the resilience of these urban-based fishers. In terms of landings data, over the 1999 - 2003 period, San Juan fishers ranked 12th out of 41 municipalities reporting. This was true even after three years of declining catches, as the figure NM.1 shows.

Figure NM.1. San Juan Landings Data, 1983 - 2003



San Juan's robust, diverse economy services not only the metropolitan area's residents but also a continual influx of business travelers from around the islands and tourists from the mainland and other parts of Latin America. Unemployment here, though high by North American standards, is low for Puerto Rico, more than half the rate of unemployment in many of the other coastal municipalities. This presents fishers and their family members in the area with opportunities to move between fishing and other work as well as with opportunities to provide fresh fish to a dynamic population. Although many of the luxury tourist hotels rely on imported seafood, fishers in San Juan have little difficulty finding a market for their catch.

Table NM.1. San Juan Census Data

SAN JUAN	1950	1960	1970	1980	1990	2000
Population Characteristics						
Population [1]	368,756	451,658	463,242	434,849	437,745	434,374
Civilian Labor Force (CLF) [2]	113,584	137,840	140,677	137,736	160,485	150,180
CLF - Employed	103,574	129,984	133,768	122,367	135,664	129,630
CLF – Unemployed	10010	7856	6,909	15,369	24,821	20,550
Percent of unemployed persons	8.81	5.70	4.91	11.16	15.47	13.68
Industry of employed persons [3]						
Agriculture, forestry, fishing and mining [4]		1,884	1,092	795	1,180	398
Construction		12,196	11,850	6,331	8,155	9,949
Manufacturing		18,120	15,978	10,843	8,756	6,500
Retail trade		21,900	23,757	20,103	21,977	12,925
Socioeconomic Characteristics						
Mean travel time to work (minutes) [5]		N/A	N/A	25.1	25.9	26.7
Persons who work in area of residence [6]		114,224	93,417	76,822	107,839	94,890
Per capita Income (dollars) [7]			1,593	3,383	6,383	12,437
Median Household Income (dollars) [8]		1,990	3,469	6,838	10,539	17,367
Individuals below poverty level [9]			219,646	203,384	208,319	173,528
Percent of Individuals below poverty level			47.41	46.77	47.59	39.95

Fishing from San Juan

The landings data and the fisher census data agree that line rigs—targeting both pelagic and deep water species—are the most common among fishers in San Juan. Some additions to this are noted in the following narrative, but line rigs remain the most common. Other data from the census indicate high levels of association membership with over half fishing 40 hours per week or more, indicating a mix of those who are dedicated to fishing full-time and those who combine fishing with other pursuits. In the two associations we visited in the San Juan area, we did find varying levels of commitment to fishing, with one association dominated by part-time fishers and the other having a balance between full-time, bona fide fishers and part-timers.

Table NM.2. Fishing Locations and Styles, San Juan (n= 41)

Variable	Percent
Shore	0
Continental Shelf	84
Shelf Edge	0
Oceanic	73.2
Reef Fishes	80.5
SCUBA Diving	7.3
Skin Diving	7.3
Pelagic	56.1
Bait	61
Deep Water Snappers	68.3

Source: Puerto Rican Census of Fishers, 2002
Totals do not add up to 100% because fishers typically fish multiple locations

Table NM. 3. Selected San Juan Fisher Characteristics

Variable	Response
Association Member	97.6
Hours used for Fishing	
< 20 hours	4.9
20 – 30 hours	31.7
31 – 39 hours	9.8
40 hours	39
> 40 hours	14.6
Mean hours	34.8
Standard Deviation	10.3
Minimum hours	0
Maximum hours	54

Source: Puerto Rican Census of Fishers, 2002.

Table NM.4. Gear Used by San Juan Fishers

Variable	Percent
Beach Seine	0
Trammel Net	0
Long Line	24.4
Troll Line	26.8
Fish Trap	9.8
Gill Net	17.1
Cast Net	85.4
Hand Line	92.7
Rod and Reel	56.1
Lobster trap	2.4
Snapper Reel	4.9
Winch	14.6
Skin	0
Spear	9.8
Lace	2.4
SCUBA	4.9
Gaff	87.8
Basket	0

While association membership is high in this region, they engage in a high degree of street vending, perhaps responding to the brisk urban traffic along the streets. Norman Jarvis would be pleased to see that, today, in contrast to the 1930s, use of ice is nearly universal among these fishers. The relatively low level of private marketing outlets, including restaurants, conflicts slightly with the ethnographic interviews. Again, however, the urban location may allow for buyers from restaurants and other seafood locations to buy directly from the association.

Table NM.5. Marketing Behaviors of San Juan Fishers

Marketing Behaviors	Percent Reporting
Fish dealer/ buyer	9.8
Private	0
Association	73.2
Street vending	39
Restaurant	0
None	2.4
Sell fish gutted	9.8
Keep fish on ice	92.7

Source: Puerto Rican Census of Fishers, 2002

Finally, in terms of their views of marine resources, the importance of pollution as a source of problem is not surprising, given the high levels of shipping traffic passing through San Juan Harbor. What is surprising, for the same reason, is the low frequency with which crowding was listed as a problem. In the following section, in which we present information on two sites in San Juan, fishers report experiencing changes in catch and sources of pollution, but also report that some mangrove forests and other critical fish and shellfish habitats remain in the face of steady urbanization.

Table NM.6. Opinions of San Juan Fishers Regarding Marine Resources

Opinion	Percent reporting
Status of Fishery Resources	
Better	0
The same	36.6
Worse	61
Reasons for problems in fisheries	
Pollution	48.8
Habitat Destruction	12.2
Overfishing	7.3
Laws, regulations, and licensing	2.4
Crowding	0
Seasonal factors	4.8

Princesa-Puntilla

Known as both the Villa Pesquera La Princesa and the Villa Pesquera La Puntilla, this landing center sits in the heart of Old San Juan, very nearly in the shadows of the U.S. Coast Guard Station, the *Compania de Turismo,* and the dock where the cruise ships embark and disembark. Of between 35 and 45 fishers who fish from this location, between 20 and 30 of them are part-time fishers; 15 are full-time fishers in the bona fide program. Those interviewed said that they are passing fishing along in their families, and that it is a family enterprise. We encountered women and children assisting fishers at the facility. As is

evident from the photograph below, the facilities are long and narrow, squeezed in between the organizations listed above and cluttered with gear and equipment.

Figure NM.2. La Puntilla *Villa Pesquera,* Old San Juan

Despite that fish pots were not listed among the top three gear types in the landings data, the fishers interviewed here during the ethnographic phase of the research listed fish pots, nets, and *palangre* (hook-and-line rigs) as their three most important gear varieties. They claim that today the principal species they catch are several varieties of snapper (in line with the landings data), which they catch usually around two miles off shore. Previously they caught conch, but because of the seasonal closure and declines in the conch population, now those still target conch have to travel to Fajardo: "There is no conch," one fisher said. "It is prohibited, it is scarce, and to get to it you have to travel to Fajardo." Before, he went on, fishers from La Princesa used to fill 14' vessels with conch at a place they called "The Conch Hotel," a nearby location where conch congregated. Similarly, he said, "Twenty five years ago, we used to catch up to 185 pounds of king mackerel in 23 fathoms (138 feet) of water. But now at the same depth we catch only three to four pounds."

Table NM.2 shows that more than half of San Juan fishers still target pelagic species like *sierra,* despite lower catches, but that reef and deep water species still make up the majority of the catch. Another statistic on the above table that coincides with the ethnographic work is the relative lack of divers in San Juan. Those interviewed at La Princesa mentioned that diving used to be more common; perhaps it has fallen in popularity with the perceived decline in conch populations.

Despite their urban location, fishers here do not have larger vessels than those in other parts of the island. To reach these species they travel in vessels ranging from 18' to 22', often plying waters next to

commercial shipping and tourist traffic. The *Villa Pesquera's* pier faces one of the main shipping channels in San Juan harbor, as the photograph below shows.

Figure NM.3. Near the La Princesa Pier, the Vessel "Therapy" Faces a Passing Cargo Ship[2]

La Princesa fishers sell their catch not only to locals in the municipality, each fisher maintaining their own freezer, but also to the Tourism Agency, the Municipality of San Juan, and to government employees that work around their facilities. Demand from these sectors is primarily for snapper and grouper species. Most of these species they catch with live bait, claiming that lures do not work. They fish for bait nearby their facility, mentioning that many of the mangrove forests are still healthy in Cataño, Hato Rey, and near the Bacardí rum plant.

La Princesa fishers, though small in number, are hanging on to artisanal fishing techniques in the midst of the most highly developed waters of Puerto Rico and the Caribbean. This is not merely quaint, but constitutes an interesting incidence of resistance against several forces that have been working against them. It also speaks to their importance to the many powerful agencies that surround them.

Centro Pesquero La Hoare

The municipality owns the land on which this *Villa Pesquera* is located. Six years ago, in 1999, La Hoare fishers moved here from a location nearer to the Club Nautico de San Juan and the San Juan Bay Marina after bridge construction. The facility adjoins a recreational complex known as Parque Central, and its south-southwest side has access to the Bay of San Juan. It is a well-secured facility with substantial concrete dock space for mooring vessels, indoor lockers, and, now under construction, a large combination market and seafood restaurant. Combined with the fact that many of the members received

[2] This fishing vessel's name is interesting, given the extended theoretical discussion in Griffith and Valdés Pizzini regarding the importance of fishing as therapy to occupational injury from other jobs (2002).

their vessels from a government program, the appearance of this association implies that among its membership are those with important political connections and the ability to use those connections for material ends. The vessels provided through the program are not of the low, *yola* type of vessel that the boat builders of Crashboat, in Aguadilla, build, but more like recreational fishing vessels—20' to 23' in length and made of fiberglass in factories, with 75hp motors. One vessel, which fishes as far away as St. Thomas, is 30' long and equipped with a diesel engine.

Of the 25 to 30 fishers at La Hoare, only 5 are full-time, bona fide fishers. The others fish part time. In addition, this is an aging fishing association, with its youngest members in their 40s and most over 50. Youth in San Juan, members say, have little incentive to become involved in fisheries, in that the volume of the catch has dropped by around one third, on average, over the past few years. Landings data concur that landings have declined recently, though this trend followed one of increased landings through most of the 1990s. They point to several sources of pollution responsible, in part, for the decline:

1. Discharge from water treatment plants into rivers feeding into the sea along the north coast, including the Río Dorado (to the west) and Río Loíza (to the east).
2. Sewage treatment at Isla de Cabra and Miramar, which contaminates the Condado Lagoon (and at times smells of human excrement).
3. The dredging of the bay and the dumping of dredge waste fewer than three miles off shore.
4. Run-off from construction around the Bay.
5. Run-off from agricultural pesticides.
6. A municipal dump, El Vertedero, leaking into nearby waters.

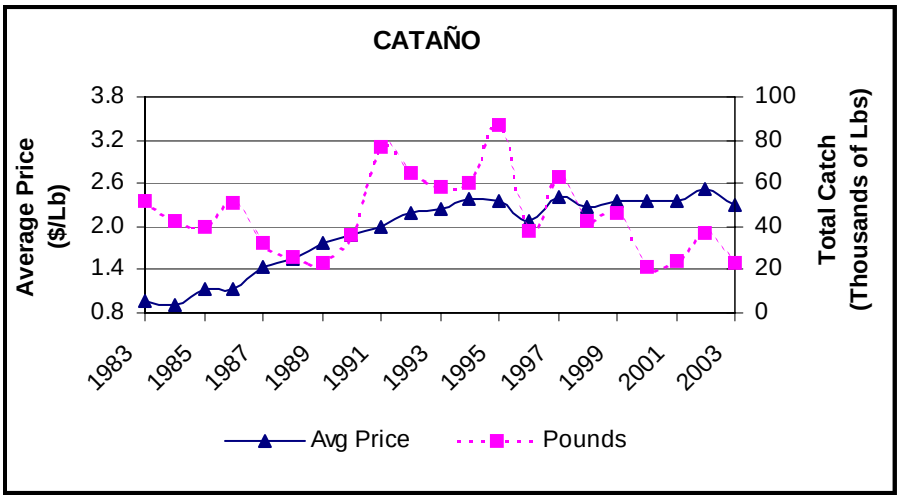
Fishers at La Hoare have phased back to part-time fishing, despite their evident strong political connections with those who can provide them support. They continue to expand the facility, with the restaurant already underway along with a second project: getting a fuel dispensing facility on the pier. They have an ice machine for use by members, and they claim that the ice this produces is superior to that you can buy elsewhere. In addition, they have freezers and do a fairly brisk business in seafood sales. The association buys most of the catch, allowing members to keep some for themselves for their own home consumption; however, because their seafood sales are so brisk, they press members to sell as much as possible through the association. They are situated on the outskirts of Old San Juan, where many of those leaving the old city at the end of the day pass and stop to buy seafood. Around 90% of their catch is sold directly from the on-site market; at times of high demand, such as Lent, they import frozen fish from other *Villas Pesqueras* around the island.

They fish primarily up and down the north coast, from Dorado to Río Grande, with one fisher fishing as far away as St. Thomas. These territories suggest that most of them have not been adversely affected by the MPAs and spawning aggregation closures off the east coast of the main island (Culebra, St. Thomas, etc.), however much they may disagree with other regulations. Like fishers elsewhere, the fishers from La Hoare do not like the size limits on deep water snapper, observing, like their fellows, that fish pulled from the deep die from the lack of pressure. They catch red snapper, for example, at depths of around 200 fathoms, which makes it impossible not to waste fish.

Cataño

Part of the San Juan metropolitan area, most of Cataño's fishing activity takes place along a strip of land across the harbor from the La Princesa in San Juan. An active *Villa Pesquera* and a less active Club Nautico stand near one another near a public park and the municipality's municipal offices, including its police and fire stations and a few public schools. Landings data from Cataño show fluctuating landings accompanied by a slow, steady rise in prices through the 1980s but remaining more or less level through the 1990s and into the 21st century. In comparison with other municipalities, Cataño is 28th out of the 41 municipalities reporting landings—a ranking that one might find strange in light of the sophisticated look of the fishing facilities here, which appear highly developed.

Figure NM.4. Cataño Landings Data, 1983-2003



Proximity to seats of power, however, does not carry privileges for everyone. Cataño's fishing facilities may be apparently well funded, but census data show that Cataño benefits less from being within the metropolitan area than does San Juan, with a higher unemployment rate and nearly half its people below the poverty line. It is a small municipality in terms of territory, resulting in a high population density (Toro Sugrañes 1995: 99). Despite that this is a heavily urbanized area, those lucky enough to have jobs still travel an average of a little over 30 minutes to get to work. Employment in all the economic sectors usually relevant to fishers has been falling in Cataño, indicating a less than robust local economy.

Table NM.7. Cataño Census Data

CATAÑO	1950	1960	1970	1980	1990	2000
Population Characteristics						
Population [1]	19,865	25,208	26,459	26,243	34,587	30,071
Civilian Labor Force (CLF) [2]	4,850	6,196	6,242	6,992	10,587	8,134
CLF - Employed	4,299	5,768	5,825	5,583	8,707	6,432
CLF - Unemployed	551	428	417	1,409	1,880	1,702
Percent of unemployed persons	11.36	6.91	6.68	20.15	17.76	20.92
Industry of employed persons [3]						
Agriculture, forestry, fishing and mining [4]		172	68	11	63	65
Construction		820	786	424	685	490
Manufacturing		1,444	1,431	963	1,026	559
Retail trade		816	798	718	1,268	795
Socioeconomic Characteristics						
Mean travel time to work (minutes) [5]		N/A	N/A	29.4	29.4	31.0
Persons who work in area of residence [6]		1,784	1,544	1,411	1,613	1,545
Per capita Income (dollars) [7]			740	1,664	4,644	8,369
Median Household Income (dollars) [8]		1,490	2,404	4,348	8,212	12,852
Individuals below poverty level [9]			18,668	18,174	20,160	15,030
Percent of Individuals below poverty level			70.55	69.25	58.29	49.98

Cataño History

Formerly a part of neighboring Bayamón, early on Cataño earned a reputation as a municipality that people pass through, embarking and disembarking first from ships and later from railroads other connecting infrastructure. During the 1880s, Cataño was known principally as a port for unloading cargo and people, with thick stands of mangrove forests along much of its coast and, among these, fishing villages whose fishers supplied the growing metropolis of San Juan. In 1883, when the railroad was extended from San Juan to Bayamón, Cataño's commercial traffic benefited and more and more people began settling in the area. By 1890 there were between 2,700 and 3,000 people living in Cataño.

In the 1920s, the people of the municipality (which was still part of Bayamón) embarked on a major effort to develop the economy beyond a mere transfer point for shipping for Bayamón, finally achieving political autonomy in 1927. After breaking from Bayamón, population increased through the 20th century and Cataño began attracting industry, including the large Bacardi rum plant along with 40 other manufacturing plants; its port continued to witness brisk traffic.

One important dimension of its economic growth has been tourism. The municipality has constructed a pyramid that, like Seattle's space needle, was constructed primarily as a tourist attraction; Toro Sugrañes reports that it is heavily visited (1995: 100). "*La Pirámide*," as it is called, actually sits beside the fishing area that includes the (currently defunct) Club Nautico and the *Villa Pesquera de Cataño.* Annually the Bacardi rum plant has thousands of visitors, and its Christmas festival is one of the most well known and widely attended in Puerto Rico. The Cataño tourist trade has highlighted its ties to the sea, with several restaurants specializing in Puerto Rican cuisine in which seafood plays the central role. These developments have had advantages and disadvantages for fishers, of course, providing a market for their catch while altering their access to the sea and contaminating the waters in which they fish and work.

Fishing in Cataño

Centro Agropecuario de Cataño

We mentioned earlier that the Cataño *Villa Pesquera* seems to benefit from its proximity to San Juan. Its facilities are modern and some of its vessels have been provided by the state for its use. The association has occupied the same site for 40 years, but in the past three have renovated and remodeled the facility to make it into the new, complex structure one sees there today. In addition to the typical facilities one finds at *Villas Pesqueras* (storage lockers, freezers, piers, etc.), Cataño fishers maintain 4 kiosks for selling seafood to those who work in the municipal offices, enhancing their ties to the local government.

Thirty fishers belong to the facility, but slightly more than half fish only part time or are more or less inactive, with 14 fishing full-time. Like the fishers of La Hoare, in San Juan, this is an aging membership, with the youngest members in their early 30s and the oldest nearly 60. They share their facilities with a private fish market known as *Pescadería Cundá,* with whom they compete.

Figure NM.5. Cataño Fishing Association

The above photo, taken from a tourists' walkway out over the harbor, shows not only the new condition of the facility but, on the pier, what the landings data suggest is one of the most commonly used gear by the fishers of Cataño: the gill net. Members combine gill nets with hook-and-line rigs and with SCUBA diving. While they have freezers to provide ice for fishers, they have no on-site location to fill tanks, perhaps because only three of the 14 full-timers specialize in SCUBA.

Figure NM.6. Sea Hawks Provided by the State to Cataño Fishers

Their vessels are not large, only 18 to 20 feet, with even the Sea Hawks that the state provides them being only 20 feet in length. There are six of these and they sit inside the facility grounds, protected by its security. They were acquired through joint funding from the municipality of Cataño, the Puerto Rican Legislature, and the Department of Agriculture, indicating strong ties to the state. They do not build boats on the grounds, and most of their gear (as well as the air for tanks) is purchased in San Juan.

Recently, the price of gas has eaten into their profits. This has cut into the distance they travel, which confines their fishing to the waters just to the east and west along the north coast—only as far west as Dorado and east to Luquillo. They occasionally fish the waters off Culebra, primarily for conch, but the rise in gas prices combined with the MPA in Culebra and the seasonal closures for conch have stemmed much fishing in this territory. The table below shows that, in 2002, most of the fishing was done for reef fish and off the continental shelf, which coincides with what fishers told us in interviews.

Table NM.8. Fishing Locations and Styles, Cataño (n= 25)

Variable	Percent
Shore	28
Continental Shelf	64
Shelf Edge	40
Oceanic	56
Reef Fishes	88
SCUBA Diving	28
Skin Diving	20
Pelagic	24
Bait	68
Deep Water Snappers	56

Source: Puerto Rican Census of Fishers, 2002
Totals do not add up to 100% because fishers typically fish multiple locations

Evidently, by the fishing census data, the association, although powerful, does not dominate the municipality's fishery entirely, with around three-fourths belonging. Belonging to the association involves a commitment to its market. They reported allowing fishers to keep only 1% to 2% of their catch, but there are obviously (e.g. *Pescaderia Cundá*) alternative markets for fishers who wish to sell

their catch by alternative means. While over 75% interviewed in the census reported belonging to the association, 15% fewer reported selling to the association.

Table NM.9. Selected Cataño Fisher Characteristics

Variable	Response
Association Member	76
Hours used for Fishing	
< 20 hours	20
20 – 30 hours	44
31 – 39 hours	16
40 hours	4
> 40 hours	16
Mean hours	30.16
Standard Deviation	15.99
Minimum hours	0
Maximum hours	72

Source: Puerto Rican Census of Fishers, 2002

Census data also agree somewhat with our ethnographic interviews in terms of the ratio of full-time to part-time fishers. From both sources we understand that part-time fishers outnumber full-time, but the census data show that 80% are part-time, while ethnographic interviews suggest that between 60 and 65% are part-time.

Table NM.10. Gear Used by Cataño Fishers

Variable	Percent
Beach Seine	4
Trammel Net	4
Long Line	32
Troll Line	32
Fish Trap	44
Gill Net	56
Cast Net	64
Hand Line	79.2
Rod and Reel	56
Lobster trap	0
Snapper Reel	16
Winch	8
Skin	0
Spear	28
Lace	32
SCUBA	24
Gaff	20
Basket	0

Table NM.11. Marketing Behaviors of Cataño Fishers

Marketing Behaviors	Percent Reporting
Fish dealer/ buyer	20
Private	4
Association	60
Street vending	44
Restaurant	4
None	12
Sell fish gutted	16
Keep fish on ice	68

Source: Puerto Rican Census of Fishers, 2002

Table NM.12. Cataño Fishers' Opinions of Marine Resources

Opinion	Percent reporting
Status of Fishery Resources	
Better	36
The same	12
Worse	44
Reasons for problems in fisheries	
Pollution	40
Habitat Destruction	16
Overfishing	20
Laws, regulations, and licensing	0
Crowding	0
Seasonal factors	0

Like San Juan fishers, many Cataño fishers view pollution as a major problem for marine resources, yet nearly the same proportion view the resource as improving. While we cannot know exactly what kind of time frame fishers use to respond to a question about improvements in fisheries, we have heard from other fishers in the east that the fisheries have improved in recent years from five to ten years ago because Hurricane Hugo, in 1999, hit eastern Puerto Rico particularly hard, causing problems with fisheries that have recovered since. Clearly, not all Cataño fishers share the view that the resource has been improving. Specific complaints include discharge from a supermarket into the bay and dredging.

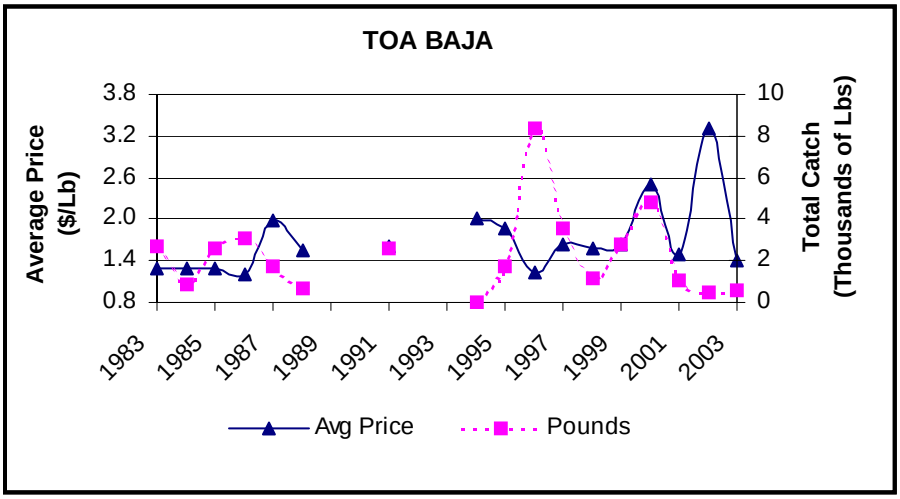
The latter is particularly important to this report because fishers claim that dredging activity has deposited sludge atop coral reefs, suffocating them. They claim the coral reefs where the dredging work deposited its waste have been dead for between 12 and 15 years, and that when they attempted to wipe away the sludge to allow the coral to breathe, they experienced a strange, itching sensation on their skin.

Cataño fishers recognize that there are important nursery grounds within the San Juan bay area that are being threatened by pollution from a variety of sources. They listed four species that used to be in the bay but are now absent from it: El Frances, La Vieja, El Barbú, and Sardina Española (a sardine they used to use for bait). Despite perceived problems with the resource, fishers in Cataño are somewhat optimistic regarding the future of fisheries. This is evident in an outreach program that they are planning to put in place: educating youth about the opportunities and importance of fishing and marine resources in the neighboring schools.

Toa Baja

Two pieces of evidence underlie the lack of importance of fisheries to Toa Baja. First, landings data show that fishing has declined to nearly zero since 2000, placing them 41st out of 41 municipalities reporting landings. Second, no fishers from Toa Baja responded to the fisher census. Repeated visits to the municipality yielded no interviews with commercial fishers, despite that association facilities neighbor an active strip of well-known seafood restaurants—some of them famous throughout the metropolitan area.

Figure NM.7. Toa Baja Landings Data, 1983-2003



The relatively low unemployment rate (compared to Cataño) may explain the recent decline in fisheries. Construction employment remained relatively stable through the 1990s, and this, combined with the data on travel time and the construction employment figures from neighboring Dorado (which increased slightly from 1990 to 2000), may account for some of the drop in landings. We deduce this based on observations, interviews, and other work that suggests that construction booms often draw fishers from fishing temporarily, in line with the typical fisher behavior of moving between fishing and wage work on and off during the course of one's life (Griffith and Valdés Pizzini 2002). Our observations in Dorado suggest that construction has not slowed in Dorado since 2000. Visits there revealed several new developments that are pictured in the Dorado municipality study.

Table NM.13. Toa Baja Census Data

TOA BAJA	1950	1960	1970	1980	1990	2000
Population Characteristics						
Population [1]	15,761	19,698	46,384	78,246	89,454	94,085
Civilian Labor Force (CLF) [2]	4,014	5,036	11,440	22,957	32,485	30,722
CLF - Employed	3,815	4,700	10,921	19,729	27,881	26,094
CLF - Unemployed	199	336	519	3,228	4,604	4,628
Percent of unemployed persons	4.96	6.67	4.54	14.06	14.17	15.06
Industry of employed persons [3]						
Agriculture, forestry, fishing and mining [4]		1,020	266	165	270	74
Construction		636	1,655	1,533	2,165	2,024
Manufacturing		1,024	2,229	3,325	2,838	2,309
Retail trade		460	1,558	2,603	4,285	3,135
Socioeconomic Characteristics						
Mean travel time to work (minutes) [5]		N/A	N/A	31.1	30.9	35.2
Persons who work in area of residence [6]		2,412	2,986	4,053	6,420	6,484
Per capita Income (dollars) [7]			1,098	2,273	4,293	8,666
Median Household Income (dollars) [8]		1,537	3,524	6,822	11,086	18,331
Individuals below poverty level [9]			25,992	41,944	44,487	37,091
Percent of Individuals below poverty level			56.04	53.61	49.73	39.42

Fishing in Toa Baja

Toa Baja does have an active *Villa Pesquera*, as the photograph below shows, but it was closed every time we visited. Instead, we interviewed people at the nearby Alero Boat Yard, which is a recreational boat storage and fishing site with some links to seafood sales. The owner of the boat yard reported that fishing in Toa Baja has declined because, like the fishers of San Juan and Cataño, many commercial fishers in the municipality have become too old.

Alero Boat Yard

Sitting on the same road as the Toa Baja *Villa Pesquera*, among a string of restaurants, the Alero Boat Yard has seen stable business over the past six years, since 1999, when it was founded, and the owner expects business to continue that way in the future. They have very little turnover in their boat storage, reflecting the high value of properties for storing vessels in the metropolitan area.

Alero currently stores 22 vessels and their trailers, with the vessels ranging from 15 to 27 feet in length. Between two-thirds and three-fourths of the vessels stored there are used for recreational fishing; the owner reported that those who fish consume all their own catch. These fishers live in Toa Baja and the nearby municipalities of San Juan, Bayamón, Corozal, Naranjito, and Vega Baja.

Figure NM.8. Toa Baja Fishing Association

They tend to fish in fairly distant waters typically, unless they are targeting big game fish, traveling as far away as Salinas and Parguera (on the southwest coast) to fish, as well as to Culebra. In these waters they fish for red and yellowtail snapper and other food fish. When they target big game fish such as Marlin they fish the deep trench off the north coast. Despite that none of the recreational fishers sell their catch, the boat yard is involved in retail sales of frozen and prepared (cooked) fish. The boat yard runs a cafeteria that employs one person, and they sell fish from their freezers to people passing.

While the owner did say that many of the older fishers in Toa Baja had grown too old for fishing, he also reported that many young people, aged 10 to 20, fish from the shore in Toa Baja (something we witnessed ourselves). He also said that there were a handful of youth, from 10 to 15, who were learning from the elderly commercial fishing the arts of fishing, suggesting that there is an effort, as in Cataño, to reproduce the fishery.

Postscript: Northern Metro's Aging Fishing Population

In three of the four fishing sites reported on in this region, those interviewed reported that the commercial fishers who used the facilities were growing old, yet in two of these three sites they also noted that there were active efforts to recruit new, young fishers to the fishery. On the one hand, this is a simple sign that fishers perceive the value of their labor in the sea, reaffirming the sense that it is a moral effort that *should* be passed on to younger members of society. On the other, these efforts suggest that young members of fishers' families are not entering the fishery, perhaps familiar with the difficult work of this occupation and less sanguine about its morality as a productive activity.

While sentiments probably lie somewhere between these two extremes, that young audience exists for the learning of the "arts" of fishing indicates a wider appreciation of fishing in a heavily urbanized environment. The continued investment of municipality and state funds in fishing infrastructure in this region would support this wider appreciation as well. A cynic might view such investment as merely

another instance of funding local ways of life in return for political patronage (a common exchange in Puerto Rico), yet municipality leaders must still establish the legitimacy of such investment in Puerto Rico's most important political and economic center, and the reproduction of a core of fishers in the San Juan metropolitan area provides one support for that legitimacy.

It is interesting that the *Villas Pesqueras* of the metropolitan area have not become tourist attractions or mere sentimental facades for an earlier, more traditional way of life, but remain components of working waterfronts that continue to provide high quality seafood to the city's residents. They also continue to remind residents that sound alternatives to wage work and other common urban pursuits exist—alternatives, as well, to drug dealing, crime, and the less desirable pastimes that youth often migrate toward. In this sense, apprenticing youth to fishing reproduces the social value of fishing against a background that often falls short of fulfilling the hopes and dreams of youth.

Southern Rural Region III:

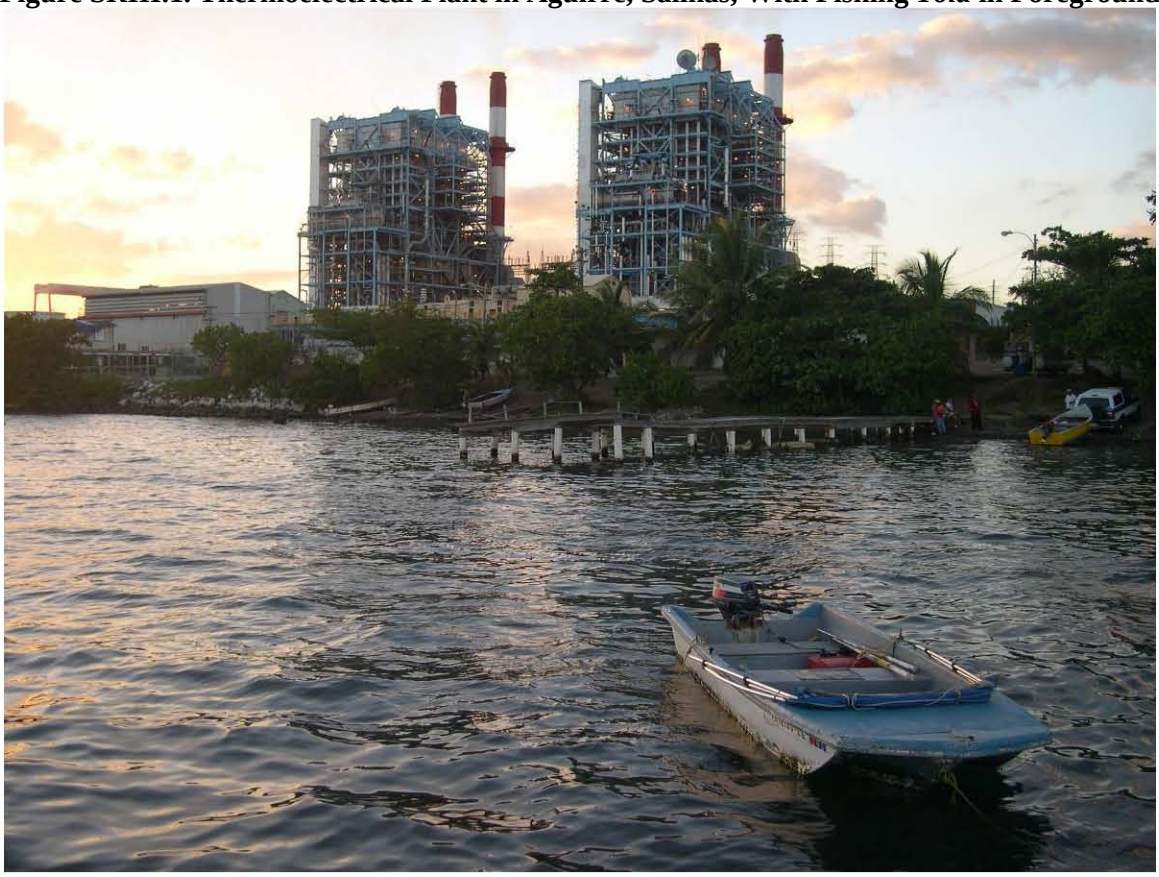
Santa Isabel & Salinas

Regional History

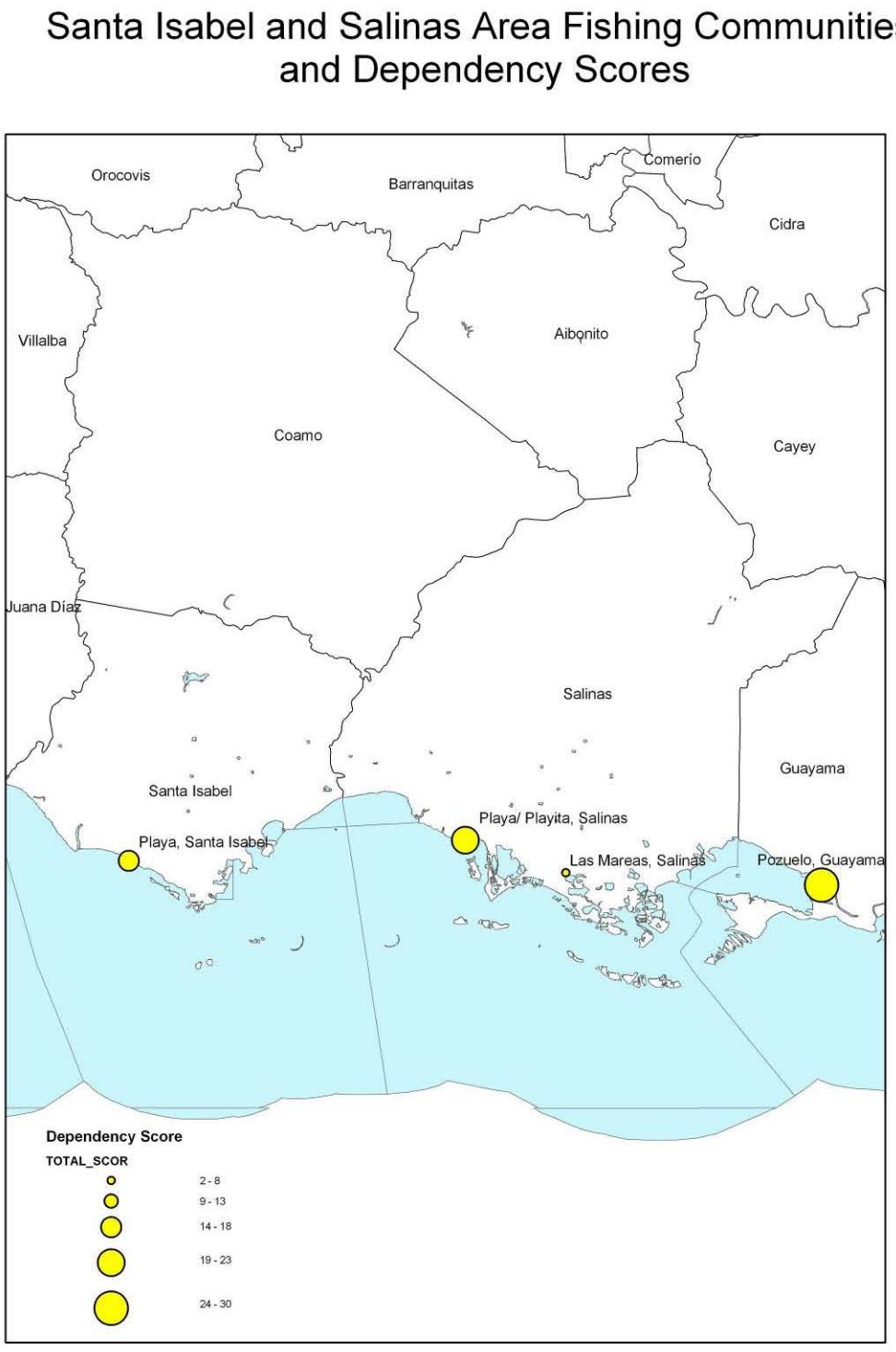
Among anthropologists, this region of Puerto Rico's coast is best known as the site of Sidney Mintz's classic work on sugar production, including a community profile of a sugar plantation given the fictitious name of Cañemelar (1952) and the life history of a sugar worker, Worker in the Cane (1957). In both of those works, we learn of the dominance of the sugar corporation over the lives of the rural populations of the southern coast during the middle part of the 20th century, as well as the highly seasonal nature of work in the cane. As we noted in the historical section and with others elsewhere (Griffith and Valdés Pizzini 2002; Guitsi 1994; Pérez 2005), the seasonal dimension to sugar cane encouraged part-time fishing during the months that work in the cane was scarce (usually beginning in mid-summer and lasting through the fall). In his profile of Cañemelar, Mintz mentions that there were at least a half dozen professional fishers, adding that their efforts were well rewarded in the community for providing high quality protein to otherwise marginally nourished rural workers.

One legacy of the sugar era is a coastal company town that bears the same name as the Central Mill, Aguirre, whose houses resemble those of plantation managers and workers across the tropics, wooden with corrugated roofs, painted dark red, presumably to cut down the glare of the sun. The ghost mill dominates the town's coastline—closed in 1962, its rusted, crumbling infrastructure matches, despair for despair, the tangles of former sugar fields now left largely uncultivated. Not all of the land is fallow. Bananas and papaya still grow in large acreages once dominated by sugar, and new concrete suburbs are growing along highway #3, which parallels the coastal southern plain from Maunabo to Salinas. In place of the mill, Aguirre now has a large thermoelectrical plant dominating its shoreline, which the local fishers accuse of polluting the local waters.

Figure SRIII.1. Thermoelectrical Plant in Aguirre, Salinas, With Fishing *Yola* in Foreground



Map SRIII.1. Southern Rural Region III



Santa Isabel

Although it experiences high rates of poverty and unemployment, Santa Isabel lost significant employment in one only sector from 1990 to 2000: agriculture, forestry and fisheries. About half of the employed labor force works in the municipality, and the rest, very likely, commute to Ponce or other larger towns along the south coast. In this environment, fishing has not emerged as a sector that absorbs many individuals, although it is nonetheless important in specific local areas.

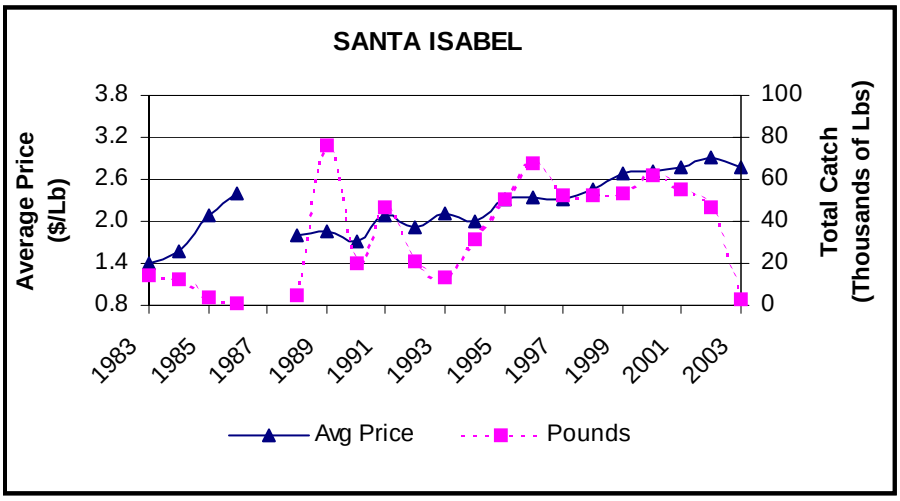
Table SRIII.1. Santa Isabel Census Data

SANTA ISABEL	1950	1960	1970	1980	1990	2000
Population Characteristics						
Population [1]	13,478	14,542	16,056	19,854	19,318	21,665
Civilian Labor Force (CLF) [2]	3,152	3,224	3,802	4,744	5,574	6,084
CLF - Employed	3,086	3,040	3,562	3,895	4,180	4,628
CLF - Unemployed	66	184	240	849	1,394	1,456
Percent of unemployed persons	2.09	5.71	6.31	17.90	25.01	23.93
Industry of employed persons [3]						
Agriculture, forestry, fishing and mining [4]		1,540	998	491	553	371
Construction		108	364	221	262	335
Manufacturing		508	891	966	748	1,014
Retail trade		216	289	384	387	382
Socioeconomic Characteristics						
Mean travel time to work (minutes) [5]		N/A	N/A	23.9	21.0	27.3
Persons who work in area of residence [6]		2,464	2,175	2,276	2,653	2,395
Per capita Income (dollars) [7]			674	1,357	2,602	5,903
Median Household Income (dollars) [8]		775	2,176	4,250	6,765	11,895
Individuals below poverty level [9]			11,430	15,358	13,789	12,395
Percent of Individuals below poverty level			71.19	77.35	71.38	57.21

Fishing in Santa Isabel

Of the two municipalities in this region, Santa Isabel lands fewer pounds of fish, on average, than Salinas, and ranks 20th among the 41 coastal municipalities, although they have seen a gradual increase in price through the 1990s, perhaps due to increasing catches of high value species such as lobster.

Figure SRIII.2. Santa Isabel Landings Data, 1983-2003



Most commonly, according to census data, fishers from Santa Isabel fish the continental shelf and its reefs off the south coast, leaving from the fishing association at La Playa and a few other locations. We will see, however, that at times the census data, landings data, and our ethnographic work do not exactly coincide.

Table SRIII.2. Fishing Locations and Styles, Santa Isabel (n= 32)

Variable	Percent
Shore	9.4
Continental Shelf	100
Shelf Edge	0
Oceanic	37.5
Reef Fishes	100
SCUBA Diving	18.8
Skin Diving	28.1
Pelagic	34.4
Bait	3.1
Deep Water Snappers	34.4

Source: Puerto Rican Census of Fishers, 2002
Totals do not add up to 100% because fishers typically fish multiple locations

While the majority of fishers who responded to the census were members of the association, and the association does seem to be a powerful force in the community and across the southern region, our ethnographic work revealed that some of the most highly regarded fishers in this region do not belong to the association. This may be due to the ambivalent relationship between the principal *Villa Pesquera* in La Playa and a powerful *pescadería* there, which share the same building and many of the same concerns about fishing and marine resources. We discuss this further below.

Table SRIII.3. Selected Santa Isabel Fisher Characteristics

Variable	Response
Association Member	93.8
Hours used for Fishing	
< 20 hours	3.1
20 – 30 hours	53.1
31 – 39 hours	3.1
40 hours	34.4
> 40 hours	6.3
Mean hours	30.53
Standard Deviation	10.299
Minimum hours	8
Maximum hours	50

Source: Puerto Rican Census of Fishers, 2002

Line-based fishing seems to dominate the fishery in Santa Isabel, despite that the landings data suggested that fish pots were more extensively used than lines. The high use of gill nets reported in the census, however, coincides with landings data.

Table SRIII.4. Gear Used by Santa Isabel Fishers

Variable	Percent
Beach Seine	6.3
Trammel Net	3.1
Long Line	46.9
Troll Line	34.4
Fish Trap	12.5
Gill Net	75
Cast Net	50
Hand Line	84.4
Rod and Reel	31.3
Lobster trap	3.1
Snapper Reel	0
Winch	0
Skin	0
Spear	21.9
Lace	6.3
SCUBA	18.8
Gaff	87.5
Basket	0

We will see below that one of the more interesting aspects of the Santa Isabel region is the central role that the Association and Pescadería that share the main fishers' building play in mobilizing political activity. In the light of this, it is interesting that so many fishers interviewed in the census use neither a fish dealer/ pescaderia, nor the association as a marketing outlet, instead selling fish themselves.

Table SRIII.5. Marketing Behaviors of Santa Isabel Fishers

Marketing Behaviors	Percent Reporting
Fish dealer/ buyer	3.1
Private	3.1
Association	0
Street vending	93.8
Restaurant	0
None	37.5
Sell fish gutted	0
Keep fish on ice	62.5

Source: Puerto Rican Census of Fishers, 2002.

Table SRIII.6. Opinions of Santa Isabel Fishers Regarding Marine Resources

Opinion	Percent reporting
Status of Fishery Resources	
Better	0
The same	21.9
Worse	78.1
Reasons for problems in fisheries	
Pollution	75
Habitat Destruction	65.6
Overfishing	3.1
Laws, regulations, and licensing	3.1
Crowding	0
Seasonal factors	3.1

The census data regarding opinions of fishers about marine resources are not dissimilar from others living along the southern coast. Pollution and habitat destruction have been major forces in the region with industrial development by the petrochemical and pharmaceutical industries. These industries have reorganized coastlines and caused problems relating to water quality throughout the region. In addition, the decline of the sugar industry has altered the local ecology by reducing the amount of flushing that occurred when the sugar fields were planted and the mills operational. This is because the sugar industry used to maintain irrigation systems that would send fresh water into the sea regularly. As the irrigation canals become clogged, it alters local habitat.

Playa y Malecon

The center of fishing activity in Santa Isabel is the Pueblo-Playa-Malecon area (it is called by all these names). Geographically, it would be better explained as the inhabited coastline to the west of the Club Nautico de Santa Isabel and south of the Santa Isabel Town Center. The main fishers association and pescaderia grounds (Asociacion de Pescadores Jose “Cheo” Tejero and Pescaderia Sotomayor) are located there.

Figure SRIII.3. La Playa Facilities, Santa Isabel

Approaching the Asociacion-Pescaderia (see photo), the first thing one is likely to notice is how large the building is, yet how underused it seems, calling to mind Ricardo Pérez' work on modernization and how state investment in fisheries without follow-up can leave behind these big, underused buildings. The two-story building had about 20 lockers for fishermen, of which 10 seemed to be currently used. A rather large gas-pumping station, no longer in use, stands by the water, near a solid-looking t-shaped cement dock that could easily dock a 50-foot vessel. A large workshop area for boat building and three smaller wooden docks complete the facility. Interviews here revealed that the three docks are semi-communal: technically, they belonged to a couple of private fishermen who lived on the coastline right next to the pescaderia, but they as a rule allowed other fishers to use their docks by virtue of belonging to the same association, being friends, or merely being fellow labor group members.

Figure SRIII.4. Association's Concrete Dock (important octopus grounds are just beyond)

The impression that the facility is underused, however, is exactly that: an impression from casual observation. Repeated visits to the association and interviews with members reveal that the fishing activity from this association is considerable, with about 35 active fishermen using the installations to various degrees on a regular basis. In line with the landings data, which show long-lines to be one of the most commonly used gear, many of them are longliners (*palangreros*); this is arguably the most labor intensive and time-at-sea intensive of the fishing arts practiced in the region, and it means that the fishers spent a lot of time at sea.

Cultural Significance of Fishers' Space in Santa Isabel

Besides setting the stage for fishing and marketing, other activity goes on at the association as well. The workshop-boatyard area is an important center of activity, where *yolas*, fiberglass boats, and *chalana* sailboats are being constructed or repaired. The building is evidently the center of social and 'political' activity related to fisheries in Santa Isabel. As we noted in our work on Puerto Rican fishing communities, as fishing communities become less and less place based, some specific coastal locations begin to assume more importance in the lives of fishers. Sometimes place-based communities within regions that also include several network-based communities become centers for the exchange of fishing knowledge and information and for other forms of interaction and expression.

La Playa, Santa Isabel, is a place-based fishing community, where several fishing families live together near the coast and fish out of the same association. Yet it is something more as well: the association's building and its surrounding environs provide an important cultural space for the expression of occupational identity. Any sort of meeting that involves fishers from two or more fishing centers of Santa Isabel is likely to take place at this building. This building is where one can meet most of the fishers from Santa Isabel, regardless of the community, and it is a shared space between fishing communities. The largest population of fishing families living close to one another lives in La Playa, yet fishers from Cortada and the area east of the Club Nautico also spent quite some time there. The building is also a center of fish marketing. Even fishers who have their own freezers sell surplus fish, as well as buying ballyhoo and sardines for bait. Finally, and significantly for the changes taking place in fishing today, the building, and docks area around it, is also a communal recreational space, with kids and families diving and swimming from the cement dock and older fishers teaching young children how to fish.

Figure SRIII.5. Private Docks Used by Recreational Fishers with Commercial Longlining Vessel in Foreground, Santa Isabel

The association also operates a restaurant, mostly on weekends, and it evidently forms part of a trio of weekend coastal recreation places (the other two being private restaurant/nightclubs); the three businesses benefit by sharing and attracting costumers. While not nearly as active as La Guancha, in Ponce (see Southern Metro Region Report), this region does suggest that an incipient La Guancha-like phenomenon may be forming there. As in many areas, the activity varies by days of the week. During the week, La Playa gives the impression of a sleepy coastal village with a couple of semi-empty seaside restaurants. On weekends, you would get a festive recreational activity locus, especially at night. As in La Guancha, the administrators of the *pescaderia* have recognized the business potential of being close to a center of weekend recreational activity, and they have been trying very hard to take advantage of it.

Figure SRIII.6. Sign Honoring Accomplished Fisher on Side of Association, Santa Isabel

The association and its environs in Santa Isabel are all the more interesting because they serve multiple purposes, addressing the needs of commercial and recreational fishers—or, more generally, of work and leisure—and in the process the area has become a somewhat contested space. Santa Isabel is a very good example of how a constructed physical space (the building) is shared, but also appropriated and contested by different social institutions for different purposes. In Santa Isabel-Playa it is particularly striking because when one gets there, and looks at the building from the parking lot, on two opposite sides of the same wall there are two signs that show two different names for the same structure.

One of them shows the name of the 'Pescaderia'—named after the family that manages the building's fish selling, processing, and restaurant activities. The sign on the opposing side of the 'Pescaderia' sign shows the name of the Fishing Association itself, Pescaderia Jose 'Cheo' Tejero. The fisher portrayed in the portrait in this other sign is a well-known fisher in the region, with vast ecological knowledge of the waters between Santa Isabel and Caja de Muertos and the deep water banks beyond. The caption below this fisher's portrait reads *"Obrero del Mar"* ("Laborer of the Sea"). The title *"Obrero del Mar"* points out that this well known fisher embodies the dedicated, serious, blue collar working class spirit of fishing in the area, where most fishers have also been real 'obreros' in the strictly proletarian sense as cane workers (Mintz 1957). This particular fisher is a recognized teacher of other fishers and one of the most widely regarded expert fishermen, not only in Santa Isabel, but from Salinas to Juana Diaz. Ironically, this particular fisher is not is not a currently a member if the association, despite that it is named after him. When asked about this, he said: "In business dealings, you can only trust your family."

The Pescaderia and Association are two separate institutions that share the same building and that also share some of their functions. Until recently, the same man was the acting president-administrator of the association and the administrator of the Pescaderia. This was a symbiotic relationship: a percentage of the proceeds of the Pescaderia would ultimately go to the Association and the Pescaderia benefited by having

the opportunity to market catch from there as well as to use the second floor as a weekend seafood vending area. The Pescadería pays rent to the association for the space and sells mostly the catch from association members. The Pescaderia administration seemed to be in charge of maintaining the building as a communal space, hosting fisher meetings and political events related to discussing and ultimately resisting the new fishing regulations; they also resisted meetings called by well-meaning DRNA field officials who wanted to discuss the regulations.

Regarding the relationship between the Pescadería and Association, one fisher said:"*Not everybody is happy with this but, above all, we know that what we don't use will be taken by the Mayor and being given to somebody who isn't related to fishing and that would be a loss for everybody*."

Salinas

The economic picture that Salinas faces is somewhat less heartening than its sister municipality in this region, but on the whole the two municipalities are similar. Salinas has seen a drop in its unemployment rate from 1990 to 2000, as well as a dramatic reduction in its poverty, but it has still lost employment in all of the industrial sectors listed here. This may indicate that, as opposed to working in the formal economy, formerly unemployed individuals have merely given up looking for employment, and hence do not show up in the statistics.

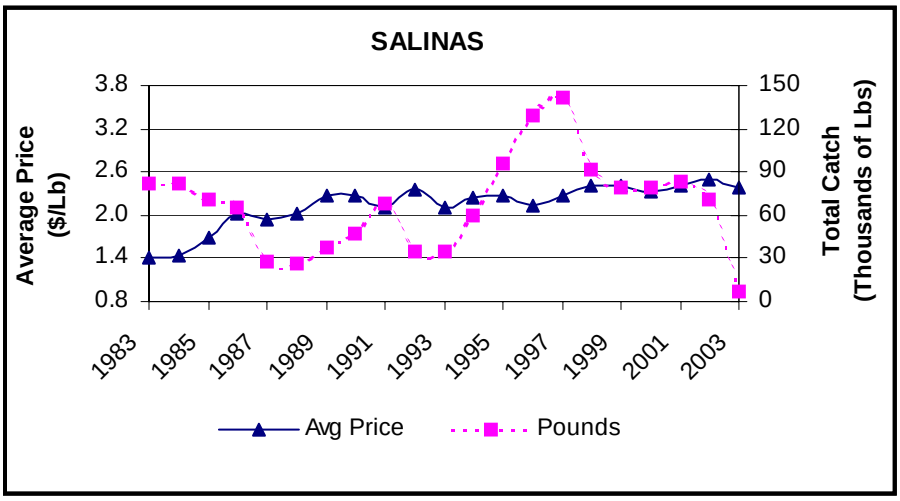
Table SRIII.7. Salinas Census Data

SALINAS	1950	1960	1970	1980	1990	2000
Population Characteristics						
Population [1]	23,435	23,133	21,837	26,438	28,335	31,113
Civilian Labor Force (CLF) [2]	5,837	4,924	4,893	5,981	8,779	7,967
CLF – Employed	5,611	4,644	4,470	4,896	6,062	5,751
CLF – Unemployed	226	280	423	1,085	2,717	2,216
Percent of unemployed persons	3.87	5.69	8.65	18.14	30.95	27.81
Industry of employed persons [3]						
Agriculture, forestry, fishing and mining [4]		1,940	825	626	362	222
Construction		216	532	314	558	616
Manufacturing		940	1,425	1,263	1,069	991
Retail trade		460	409	508	793	664
Socioeconomic Characteristics						
Mean travel time to work (minutes) [5]		N/A	N/A	19.7	21.7	33.5
Persons who work in area of residence [6]		4,036	2,726	3,166	3,760	2,868
Per capita Income (dollars) [7]			628	1,391	3,033	6,133
Median Household Income (dollars) [8]		842	1,801	3,681	7,128	11,391
Individuals below poverty level [9]			16,301	20,062	19,944	18,095
Percent of Individuals below poverty level			74.65	75.88	70.39	58.16

Fishing in Salinas

Ranked slightly higher than Santa Isabel in the landings data, 17th out of 41, Salinas witnessed dramatic increases in its fisheries during the early to mid-1990s, only to drop back to low levels early in the 21st century.

Figure SRIII.7. Salinas Landings Data, 1983-2003



The coastal plain of Salinas was a major area of cane cultivation, with Central Aguirre being the largest cane operation in the area. As with places around the South Coast, Coastal Salinas communities are very evidently the remnants of the sugarcane past, and fishing is very evidently tied to the *invernazo* fishing (fishing during dead time in the cane) that was the rule for many years. Salinas' coastal communities are as a rule working-class, and have their share of social problems related to poverty, crime, smuggling, unemployment and poor infrastructure. Similarly to Ponce and Santa Isabel, each of the coastal communities of Salinas is a 'landing site' or a fishery dependent community separate from the others, and they each have their own community of local fishermen. These coastal communities are Playa, Playita, Las Mareas, and Aguirre. Each community also, has their 'own embayment'—that is, each has a bay associated with their community, although most of Aguirre's is taken up by the abandoned sugar mill. As noted earlier, the town has the distinct markings of a company plantation town.

Figure SRIII.8. Former Company Housing, Aguirre, Salinas

Figure SRIII.9. Abandoned Sugar Mill, Salinas

Salinas is very much oriented towards the sea, with fishing, internal tourism, and recreational boating being important activities all up and down its coastline, which is blessed with 4 beautiful bays surrounded by mangroves and hundreds of mangrove channels (locally called Caños) that zig-zag between and around the bays. It is, truly, a small-scale boater's dream. Whenever hurricanes approach, boaters from nearby coasts flock to the mangrove channels of Salinas to tie their boats under the protection of mangroves. Ironically, those same mangroves that give Salinas its charm for tourism and protect boaters for miles around also have been the recipients of a continued assault by all kinds of actors, including Public Health agents fighting malaria, developers, marina builders, a city Mayor designating a coastal lagoon as a landfill, and others.

Playa has the Bay of Salinas, Playita has an associated smaller bay to the east, Las Mareas has the seaward sector of the Bay of Jobos, and Aguirre has the deep sector of the bay of Jobos. If you are traveling trough Salinas through road # 3, you will very quickly pass from one to the other. However, except for Playita and Playa (which connect in a way that it can be hard to tell when you left one and entered the other), these coastal communities are surprisingly remote from each other, geographically and socially.

Like fishers in Santa Isabel, most from Salinas fish the reefs on the continental shelf, using multiple gear varieties and targeting primarily snappers, white grunt, and lobster. Our ethnographic interviews, contrary to the census, suggests that much of the south central and southeastern part of the coast remains primarily a trap fishery, despite that traps have been losing ground to diving in recent years. An elderly fisher, Gabriel (*pseudonym*), the vice-president of the *Villa Pesquera* in Playa with extensive knowledge of the history of fishing in the area explained that different areas of the South-Southeast Coast have been known for their specialization in different kinds of fishing, and that in the last 30 years or so the distribution of specialization in fishing arts has become more even. Nevertheless, some areas are more known for a particular type of fishing arts than others.

According to Gabriel, Playa and Playita in Salinas, for example, is known for trap fishing, along with Guayama and some parts of Juana Diaz, while in nearby Aguirre, deeper in the estuary and close to the routes of 'sierra' and 'jurel' migrations in and out of the Bay of Jobos, fishers have specialized more on

net fishing. Santa Isabel is known for the use of *palangres* (long lines), and the towns more to the east, like Patillas and Arroyo, have traditionally used hook and line fishing, surface nets, and a lot of diving. Don Gabriel said, though, that in younger generations 'everybody dives' and that the surge in divers has created a lot of problems between fishing communities over stealing from traps.

Table SRIII.8. Fishing Locations and Styles, Salinas (n= 11)

Variable	Percent
Shore	18.2
Continental Shelf	90.9
Shelf Edge	9.1
Oceanic	18.2
Reef Fishes	86.4
SCUBA Diving	27.3
Skin Diving	27.3
Pelagic	40.9
Bait	54.5
Deep Water Snappers	18.2

Source: Puerto Rican Census of Fishers, 2002
Totals do not add up to 100% because fishers typically fish multiple locations

Where the census data and ethnographic data seem to agree is in the area of association membership. In the ethnographic work, as discussed in more detail below, Salinas fishers expressed disappointment with the association and have even considered founding an alternative. In the census data, only around one-third of those responding to the census claimed association membership, and a smaller percentage admitted to selling to the association.

Table SRIII.9. Selected Salinas Fisher Characteristics

Variable	Response
Association Member	36.4
Hours used for Fishing	
< 20 hours	31.8
20 – 30 hours	18.2
31 – 39 hours	13.6
40 hours	36.4
> 40 hours	0
Mean hours	26.59
Standard Deviation	14.378
Minimum hours	0
Maximum hours	40

Source: Puerto Rican Census of Fishers, 2002

Table SRIII.10. Gear Used by Salinas Fishers

Variable	Percent
Beach Seine	4.5
Trammel Net	4.5
Long Line	31.8
Troll Line	31.8
Fish Trap	31.8
Gill Net	54.5
Cast Net	63.6
Hand Line	63.6
Rod and Reel	40.9
Lobster trap	27.3
Snapper Reel	13.6
Winch	13.6
Skin	0
Spear	18.2
Lace	13.6
SCUBA	18.2
Gaff	72.7
Basket	0

Table SRIII.11. Marketing Behaviors of Salinas Fishers

Marketing Behaviors	Percent Reporting
Fish dealer/ buyer	0
Private	9.1
Association	22.7
Street vending	50
Restaurant	18.2
None	9.1
Sell fish gutted	27.3
Keep fish on ice	63.6

Source: Puerto Rican Census of Fishers, 2002

Table SRIII.12. Opinions of Salinas Fishers Concerning Marine Resources

Opinion	Percent reporting
Status of Fishery Resources	
Better	4.5
The same	4.5
Worse	81.8
Reasons for problems in fisheries	
Pollution	72.7
Habitat Destruction	31.8
Overfishing	9.1
Laws, regulations, and licensing	4.5
Crowding	0
Seasonal factors	0

Finally, a high proportion of Salinas fishers view the condition of the region's fishery resources as worse today than before, with high numbers of fishers citing pollution and relatively low numbers seeing overfishing as a cause. This reflects, no doubt, the south coast's recent history of petrochemical, pharmaceutical, and other development.

Playita and Playa

Playa and Playita go together in part because of physical proximity, but also because they share many of the same issues. The two communities are continuous to one another on land, but when approached from the sea, they are distinctly separated by coastal topography, each with its own bay. For fishers, thus, they are separate, and each community has its own *Villa Pesquera* (Asociacion de Pescadores de la Playa de Salinas—also known as Pescaderia Don Piche), and Asociacion de Pescadores de La Playita de Salinas). According to various reports, between 60-100 fishers live in Playa and Playita de Salinas; even in the fisher census these communities comprise most of those interviewed.

The best way to get to Playa and Playita is to go straight south from where the Salinas town hall and plaza is. A truly remarkable maze of streets and roads will soon appear, signaling that the coastal community is near. When one starts seeing one restaurant every 10-15 houses, one is there. Salinas, (especially Playita and Playa) are a focal point of the seafood restaurant 'scene' in the area, many people travel to Playa and Playita for the restaurants there. Linkages between fishing and other sectors of society are very much observable there. More than 40 restaurants, all focused on seafood, dot the area, a couple of the large ones associated with Marinas and small hotels, but mostly they are small restaurants owned by fishermen and the families/relatives of fishermen. 'Jueyes' (Land Crab, *Cardisoma guanhumi*) are an important resource in the area, and many of the restaurants specialize in Jueyes. Boating and recreational fishing are very important as well, and many of the fishermen in Playa and Playita double as captains, boat mechanics and charter operators for the recreational sector.

For all the economic activity in the area, infrastructure (especially roads) is incredibly limited. As a fisher from the area commented, 'Playita is always under construction!' Every time there is a significant rain in the area, Playa and Playita flood and a portion of the road is washed away. According to locals, this happens mainly because these communities were built essentially by "stealing terrain from the mangrove lagoons." They accept this as a fact of life living where they live, close to the water, but what they don't accept is the lack of dependability in other services, such as full-time electricity (which is ironic, they can see the huge Termoelectrica generator from their homes), sewage, and running water. However there is very little silent resignation here. Playa and Playita in Salinas are two places where civic organization and resistance are highly developed at the community level. In 2003, a street march against the municipal government protested living conditions and the abandonment of the area by municipal works. This was not an isolated incident, the community organizes rapidly to face various perceived threats/injustices to their living conditions. In two years of fieldwork in the area, Garcia-Quijano reported that he had never witnessed comparable organization anywhere else in his study region. Contrary to the Lonely Planet Guide for Puerto Rico, which described the coastal sector of Salinas as a 'stench of human misery,' Playa and Playita are two vibrant and active coastal communities, full of civic engagement and enterprise energy, which are fighting pretty steep odds.

This is reflected in the experiences of Don Ramos (*psuedonym*), a Salinas fisher who has belonged, at different times, to the two fishing associations in the area (he lives on the street that separates Playa from Playita). Ramos is one of the widely recognized expert fishers in the area, also a traditional sailboat builder and racer, a captain for recreational fishing trips, and a builder of 'nasas' and 'cajones de langosta'. He comes from a family of fishermen but his father was actually a fisherman from Vieques who rowed his boat to the mainland in the 1930's and settled in Salinas. Though recently retired, he is still a captain and a builder of traps. He is also an ardent critic of fishery policy and a good source of information about the problems that coastal Salinas faces. He believes that the lack of unity among fishers is one of their greatest problems, especially given that they disagree with the government. In his own words: "Here, for me, the gravest problem is unity. We don't have unity. Some throw in with one side and others with the other. We aren't… and the disagreement that we have with the government. Because some throw that way, and others that way, and others that way, and we can't reach [the point at

which] they say that in unity is strength. And that's the truth." ["*Aquí, para mi, el problema más grave es, éste, la unión. No tenemos unión. Unos tiran para un lado y otros para el otro. No estamos... y el desacuerdo que tenemos con el gobierno. Porque unos tiran por allá, y otros por allá, y otros por allá, y no llegamos dicen que en la unión está la fuerza. Y es la verdad.]*

According to Don Ramos, undermining fishers' ability to unite is what he views as corruption in the association's fish market: some of the more powerful members skim money from the market so they won't have to work. This gives the association a bad image, particularly among those who come from working class backgrounds and view hard work as an important activity. It also causes problems for fishers who would like to form an alternative association that functions well for their members. When Don Ramos tried to call a meeting to discuss forming another association, he got the cynical response, "For just the same? For just the same?"

Figure SRIII.10. Fisher Repairing Net, Salinas

The lack of unity was particularly troubling to Don Ramos because he views the problems with the resource as problems that require that fishers form a united front against the Department of Natural Resources, which he characterizes as a disappointment and an agency that harasses rather than helps fishers. They do nothing about pollution from coastal development and recreational sources, which he and Don Gabriel both cited as a problem. Fishers throughout the region mention pollution from industry

as a problem, but Gabriel also mentioned that the jet-ski problem is becoming more and more severe, to the extent that there are very few baitfish in the bay: between pollution and the jet-skis, there are no baitfish to be found, and that places a lot of constrains on fishermen who need bait to go out. They have had to start buying bait from other areas.

He also mentioned that he has noticed a rise in the utilization of detrimental and illegal practices from young, unschooled fishermen (mainly divers with few connections to old-timers), he mentioned the use of bleach to flush octopi out of their caves (the islands just south, outside, of the Bays in Salinas are widely regarded as primier octopus habitat and fishing grounds) and the taking of small lobster. He mentioned that some of the young fishermen know so little about fishing that they don't even know that a juvenile lobster (*langostin*) and an adult lobster are the same species. Thus they fish them, not knowing they are taking a juvenile. When asked if he thought their behavior was due to their lack of connection to older more expert fishers, Gabriel said definitely, that a son of his would never fish like that. His family has been fishing for at least 4 generations, and also they have been boat builders, specially '*nativo*' sailboat builders in the days before outboard engines.

He also mentioned that pollution coming from recreational yachts anchored inside the bays is an important source of environmental degradation. Some ways in which these yachts pollute, according to Gabriel, are by dumping used water and human waste, and also importantly, by leaking of engine oil, gasoline, transmission fluid, and other substance from boats that have been left there anchored (semi-abandoned) for long periods of time.

Fishers here, like fishers across the island, object to imported seafood undermining their market. Don Ramos said that some of the restaurants do bring economic activity to Salinas, but many of them, especially the largest ones, are more of a problem than an asset, mostly because they produce a lot of waste and compete with smaller restaurants without purchasing local fish: "Here, only two or three of the big restaurants," he said, "sell fish caught locally. The rest import it, a lot from Dominican Republic, Venezuela, or from the West."

As a highly vocal fisherman, Ramos has had many run-ins with DNR officials, despite that one of his most important sources of income has been being a captain for research boats, either federally- or DNR-funded. Even though he takes the jobs, he reports, he still thinks these agencies are not doing a good job protecting their resources. Playa and Playita In Salinas, along with Pozuelo and Barrancas in Guayama, are the strongholds of 'nasa' fishing in the Southeast. Playa and Playita, in Salinas are also a stronghold of fishing with 'cajones de langosta' (lobster traps), and Ramos builds and sells a lot of 'cajones', although he claims they are very easy for him to make.

Because Ramos has been a captain for research boats that have worked in ecological assessment in the area, he says that on multiple occasions he has seen first hand the results of research and then when he goes to a DNR hearing or reads a bulletin, he sees the same research with a completely different interpretation or even results that differ from what the field researchers themselves told him when he was with them in the field. An example of this that he gave me is when he was a captain for a group of biologists sampling the effects of the 'Termoelectrica' AEE Thermoelectric Power Plant, on local bottoms, and according to him he was there when the biologists confirmed the observation of himself and other fishers: that in an extended area, near the hot water outtake of the Power Plants' cooling system, there was no life other than algae. It was one of the 'dead zones' that fishermen in the Southeast frequently talk about. When he went to see a hearing of the AEE and the DRNA about that same research, he saw the same scientist saying that he had found no noticeable effects of the hot water out-take whatsoever.

According to Ramos and other fishermen, the Asociacion de Pescadores Don Piche (Playa) is highly organized, while the association in Playita is less so. Both are located close to restaurants and on multiple occasions fieldworkers witnessed fish being sold directly to restaurant people. Because there is no natural beach in the mangrove lagoons in the bay areas, one of the main benefits of being members of an association is to have access to the associations' ramps and docks (both of the associations have docks and ramps with controlled access in their installations).

Las Mareas

Despite being easily accessible from highway #3, Las Mareas seems isolated, cut off from the rest of Salinas by abandoned cane field and nestled in mangrove forests among lagoons that give its residents easy access to the sea. Fewer than a dozen roads connect its houses and few businesses, and it does not engage the tourist traffic to nearly the extent that Playa does. This may be in part due to the proximity of Playa to the main town of Salinas and the relative isolation of Las Mareas. Yet while Playa boasts all varieties of restaurants (elegant, casual, and kiosks), Las Mareas only has a few small places, similar to kiosks, that sell seafood empanadillas and other fruits of the sea.

Figure SRIII.11. Small Vessels among the Mangroves in Las Mareas (the one on the far left contains a gill net)

The fishing association in Las Mareas is small, clean, and shows few signs of being active. On an initial visit to the community there were no boats parked at the association's dock, but on a second there were two moored there. It is a new facility, even equipped with a handicap ramp, surrounded by a new chain link fence, and freshly painted. Its pier is also new, if apparently little used, with no gear strewn about or fish scales glistening along its boards as is typical of active association piers. A woman interviewed who lived near the facility said that the only *Villa Pesquera* in Salinas was in Playa, and there were neither people nor boats at the facility. However, an elderly fisher, 80 years old and fishing since he was a child, said that *casi todo* (nearly everyone) in the community were involved in fishing in some capacity. A third informant called Las Mareas a poor community and claimed that most of the fishers there were *proeles* (crew) on other boats.

Figure SRIII.12. Las Mareas Fishing Association

Southern Rural Region IV:

Arroyo and Patillas

This region of Puerto Rico, the fourth rural region along the main island's south coast, sits between Guayama and the Southeast region that extends from Maunabo to Naguabo. A former sugar, livestock, coffee, and tobacco growing area, where fishers typically moved between fishing and work in the cane, fishers in this region are primarily divers. This is significant, given that their neighbor to the west, Guayama, as well as their neighbor to the east, the region than includes Yabucoa, are two locations in Puerto Rico where fishers still remain tied to trap fishing. This has created one of the most persistent conflicts *within* Puerto Rican fisheries that we have encountered in this research: trap fishers accusing divers of stealing from their catches.

The conflict between divers and trap fishers dates back to the early use of SCUBA gear. Griffith and Valdés Pizzini learned of this during their first months of field work for Fishers at Work (2002), at that time with the story that Dominican divers had taught Puerto Rican divers how to steal from traps. This is likely continue to be an important issue in Puerto Rican fisheries as SCUBA diving—a favorite fishing technique of younger divers in particular—becomes more popular across the islands (as census data and landings data indicate—Matos 2000).

Map SRIV.1. Southern Rural Region IV

Arroyo

Over 20 years ago, Arroyo was the recipient of state funds for the improvement of its downtown marina, a development that consisted of dredging out the marina, adding a jetty and docks, and envisioning even more elaborate accomplishment in the future with a model under glass. The model still sits in the building where Arroyo's fishing association is located, but little more work has been done toward achieving the original goals. The model resembles more of a recreational boating marina than a commercial fishing one, but the association members there continue to believe that, once the development resumes, after a two-decade hiatus, they will occupy a central place along the municipality's downtown waterfront.

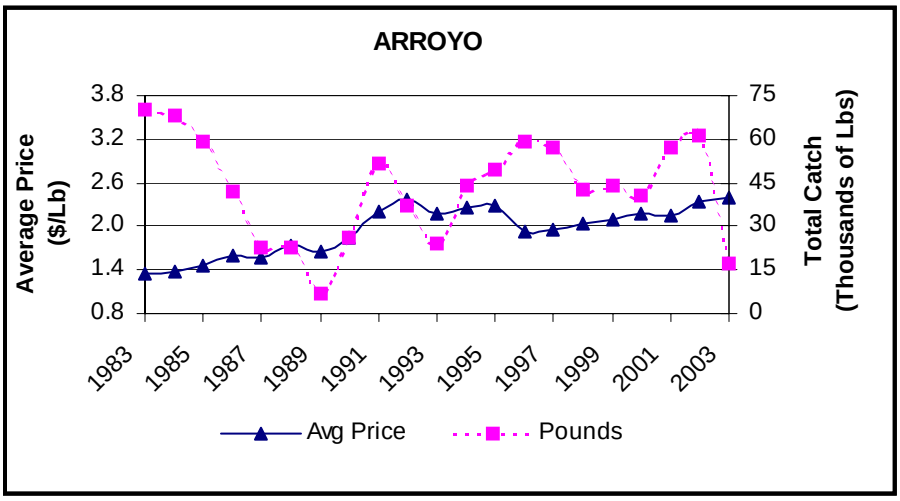
Table SRIV.1. Arroyo Census Data

ARROYO	1950	1960	1970	1980	1990	2000
Population Characteristics						
Population [1]	12,936	13,315	13,033	17,014	18,910	19,117
Civilian Labor Force (CLF) [2]	3,350	2,836	2,715	4,024	5,521	5,196
CLF - Employed	2,963	2,716	2,357	3,111	4,047	3,463
CLF – Unemployed	387	120	358	913	1,474	1,733
Percent of unemployed persons	11.55	4.23	13.19	22.69	26.70	33.35
Industry of employed persons [3]						
Agriculture, forestry, fishing and mining [4]		1,104	368	171	137	40
Construction		160	309	240	260	524
Manufacturing		492	530	526	775	459
Retail trade		204	278	348	425	381
Socioeconomic Characteristics						
Mean travel time to work (minutes) [5]		N/A	N/A	20.0	21.4	30.5
Persons who work in area of residence [6]		2,056	1,286	1,318	1,847	1,404
Per capita Income (dollars) [7]			588	1,406	2,974	5,797
Median Household Income (dollars) [8]		716	1,379	4,401	7,101	11,484
Individuals below poverty level [9]			9,327	12,588	13,357	10,488
Percent of Individuals below poverty level			71.56	73.99	70.63	54.86

This may be, more than anything, wishful thinking, given Arroyo's relatively poor economic profile. Its levels of unemployment and poverty are slightly higher than most of the municipalities in this study, the former rising through the 1990s, as employment in most sectors declined. Commuting times have increased along with those working outside their communities.

During that same time period, by contrast, fishing experienced somewhat of a rise, if fluctuating, over time, with gradual price increases from 1997 onward (correlation coefficient = -.1511). Part of this may be due to one high value species that Arroyo fishers land. The landings data indicate that lobster is the second most common species they capture, accounting for around 10% of the total 1999-2003 catch (see table I.1), just behind parrotfish (which accounts for 15% of the total).

Figure SRIV.1. Arroyo Landings Data, 1983-2003



Arroyo History

> "His community is a dense cluster of homes in the central town of a rural municipality. The municipality itself is surrounded by sugarcane fields. Hector's barrio has house after house, one nearly on top of the other, each with a small concrete or dirt yard. One of his neighbors cooks tubers in a big pot and mashes them into a paste for sale on the street. From neighborhoods such as these come not only street vendors and others who enage in the informal economy but also public works employees, sugarcane workers, and those who find employment by joining the migration streams along the U.S. eastern seaboard" (Griffith and Valdés Pizzini 2002: 149).

In this passage, Griffith and Valdés Pizzini are describing the home of an Arroyo fisher who fishes part time and, for extra income, raises and fights fighting cocks: *gallos peleados*, as they are known in Spanish, which in Puerto Rico also connotes the downtrodden. This is a fitting passage for a section on Arroyo history. Although Spaniards settled the municipality as early as the late 18th century, it was part of Guayama until 1855 and even after achieving a measure of political autonomy remained dependent on its neighbor until 1898. At that time, taking advantage of its weakness and its port facilities, U.S. forces occupied Arroyo and used it to stage invasions into other parts of Puerto Rico during the Spanish American War. After this its port's economic importance grew, primarily dealing in sugar, which dominated the economy.

Sugar's dominance lasted into the 1970s, but in 1971 the last mill was closed. Arroyo's sugar history is somewhat unique from other coastal municipalities in that, in 1944, one of its largest sugar operations, Central Lafayette, was converted into a sugar cooperative for all of the small sugar cane farmers of the region. Lafayette mill handled sugar from Patillas and Maunabo as well as Arroyo.

Among the more important historical notes is that Arroyo has acquired a reputation for its Virgen del Carmen festival, which attracts thousands from across the island, indicating that fishing has been important to Arroyo residents throughout its history (Toro Sugrañes 1995: 51). They have been able to capitalize on the cultural significance of fishing through this annual performance. Yet many of the Arroyo fishers that Griffith and Valdés Pizzini interviewed during their work on Fishers at Work supplemented fishing incomes with complex occupational histories, including work in the informal economy (as with Hector in the above quote), migrating to the U.S. mainland, and working in the cane.

Fishing in Arroyo

Arroyo's fishing association, sitting on the waterfront downtown, is an impressive-looking facility, in an impressive location, whose members are obviously well connected to the state apparatus. In addition to the improvements to the marina, the association has managed to acquire 12 fiberglass vessels from the state for use by association members. They are around 30' in length, open, in good condition. This move increased the association's membership base, because members have access to these vessels, which may mean that the figures in the table below no longer apply.

Table SRIV.2. Fishing Locations and Styles, Arroyo (n= 21)

Variable	Percent
Shore	0
Continental Shelf	95.2
Shelf Edge	9.5
Oceanic	47.6
Reef Fishes	85.7
SCUBA Diving	57.1
Skin Diving	38.1
Pelagic	33.3
Bait	38.1
Deep Water Snappers	42.9

Source: Puerto Rican Census of Fishers, 2002
Totals do not add up to 100% because fishers typically fish multiple locations

Table SRIV.3. Selected Arroyo Fisher Characteristics (n=21)

Variable	Response
Association Member	52.4
Hours used for Fishing	
< 20 hours	19
20 – 30 hours	57.1
31 – 39 hours	14.3
40 hours	4.8
> 40 hours	4.8
Mean hours	23.81
Standard Deviation	11.272
Minimum hours	0
Maximum hours	48

Source: Puerto Rican Census of Fishers, 2002

Table SRIV.4. Gear Used by Arroyo Fishers (n=21)

Variable	Percent
Beach Seine	0
Trammel Net	42.9
Long Line	4.8
Troll Line	38.1
Fish Trap	28.6
Gill Net	28.6
Cast Net	33.3
Hand Line	61.9
Rod and Reel	35
Lobster trap	4.8
Snapper Reel	0
Winch	14.3
Skin	0
Spear	47.6
Lace	4.8
SCUBA	23.8
Gaff	76.2
Basket	9.5

Source: Puerto Rican Census of Fishers, 2002

Table SRIV.5. Marketing Behaviors of Arroyo Fishers (n=21)

Marketing Behaviors	Percent Reporting
Fish dealer/ buyer	47.6
Private	4.8
Association	47.6
Street vending	4.8
Restaurant	4.8
None	42.9
Sell fish gutted	57.1
Keep fish on ice	47.6

Source: Puerto Rican Census of Fishers, 2002

Table SRIV.6. Opinions of Arroyo Fishers Regarding Fishery Resources (n=21)

Opinion	Percent reporting
Status of Fishery Resources	
Better	0
The same	66.7
Worse	33.3
Reasons for problems in fisheries	
Pollution	28.6
Habitat Destruction	4.8
Overfishing	9.5
Laws, regulations, and licensing	0
Crowding	0
Seasonal factors	19

Source: Puerto Rican Census of Fishers, 2002

Called the Coral Marine Fisher Association, Inc., the association is the only organized association in Arroyo and a very well-organized and cohesive group. One of its prominent members, Miguel, (pseudonym) is a good informant on the politics of fishing in Arroyo and in Puerto Rico, highly politically astute, and well aware that within the Arroyo fishing population are knowledge resources that could benefit fisheries management. When told we were conducting research on fisheries, he said:

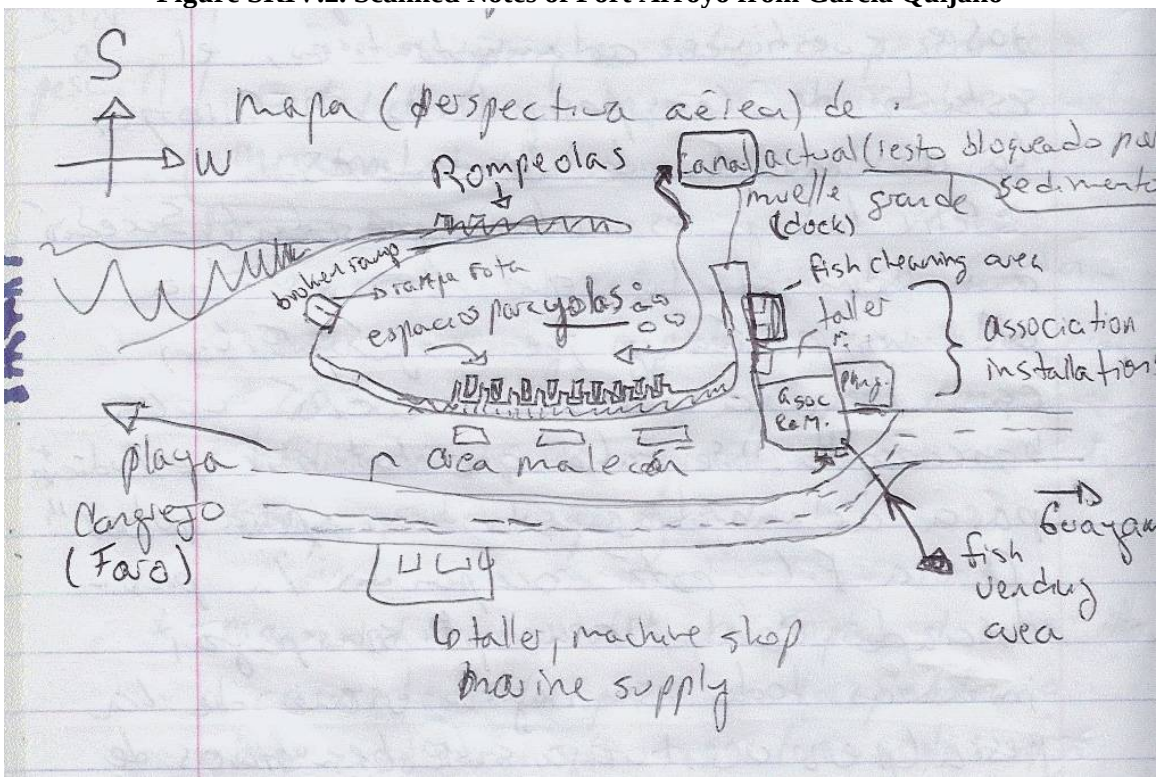
> "Well, you've come to the right place: If you want to find the person who will teach you about marine life and about fishing, from A to Z, the person you need to talk to is my uncle, Prudecio (pseudonym). And, my uncle is, besides an expert, the most non-assuming and honest person you will be able to find. He will tell you what he knows without exaggerating nor diminishing. You did right in coming to me, you got lucky. Because, a year ago some journalist came to write an article about fishing and he started asking around in the plaza, who was a fisherman that could talk to him, and some crazy guy had gone out to fish a couple of times came out and started telling him all kinds of fabrications, exaggerations, and plain lies about fishing. For example, he told the journalist that sardines are juveniles, and when they grow up, they turn into *sierras*! Can you believe that? And then the journalist repeated that on television. We knew and we were all watching the news. Can you believe that the guy just went and said on television that sardines are juvenile *sierras*? (laughs).

Prudencio was Miguel's teacher and mentor in fishing, and still is, again underscoring the family basis of much fishing in Puerto Rico. Miguel defers to Prudencio on all matters related to fishing, in part because the older man had, like many older fishermen in the area, experience in all kinds of fishing, from week-long trips to Anegada and other BVI's in the days before the EEZ's, to diving, trap fishing, nets of various kinds, trolley (silga) fishing, and even building and using land crab traps.

Miguel is very active politically in Arroyo's fishing association. Coral Marine is currently operating the Villa Pesquera installations in Arroyo's Malecon. They are very well equipped, with a large shop area, a large fish-selling area, and an air-conditioned business office. The association's 40 or so members have their own boats, but the association also has six lobster-type open SeaHawks with v-hulls and industrial Yamaha 85HP outboards. Coral Marine got those SeaHawks from the Department of Agriculture, much to the envy of fishers in other ports/communities, whom we heard complaining about it and wondering 'How did Arroyo get those boats?' We learned that it was by plain, yet astute, hard political work. Key members of the association are always on the go, if not fishing or going to meetings with other fishers, Agriculture agents, DRNA agents, then going to boat and equipment auctions and, most of all, dedicated to what was, according to association members, their 'biggest goal in all this": getting the permits and the funding to dredge the little bay in the Port of Arroyo, which had become clogged and very hard to get into and out from due to silting.

The Port of Arroyo is adjacent to the Malecon of Arroyo, and consists of a small embayment protected by a breakwater, about 30 small-boat slots used mostly by fishermen. On the entrance to the embayment, to the western side, are the Association grounds, (see scanned García Quijano notes (2003)).

Figure SRIV.2. Scanned Notes of Port Arroyo from García Quijano



Talking about his involvement in fishing politics, Miguel said that the monetary gain that he gets from his work with the association is that it allows him to have good equipment with which to fish. In general, he reports taking it upon himself to improve the association just because the other fishers are people he cares about, family members and friends.

> "Let me tell you that all of my money comes from fishing, because I don't charge a penny [for my work with Coral Marine]. Fishing is my livelihood, for me it's a hobby, a therapy, and **a cure** (in the junkie sense). Even better, going out with Prudencio, and learning from him, is great, you'll see! I live from this, and this is why Prudencio always taught us to conserve and protect the sea. Some other fishermen litter out there, but not us. WE are the garbage collectors of the sea! Every day we bring back with us garbage, plastic bags, that we find floating around. We let many fish go, when they are small. And we respect the closures. On the other hand, the people from the DRNA, if and when they get out form air conditioned offices –because they have a great attraction to air conditioning- to the sea, you never see them coming back with litter. Even if they see a plastic bag floating around, they wont pick it up. Even though their job is to protect the resources. I do this to protect my source of food, and my way of life. I have invited, many times, the government folks to come out to sea with me, so they can see the quality of person that a fisherman is. So they can make decisions based on what it is like out there, not based on what they think fishing is, or what they have been told. So they can make their decisions based on direct experience. They never go out, and one guy even told me once that my boat was no good, without ever seeing it!"

At one time the association had a professional administrator, but that ended shortly after it began, due to the cost and, as Griffith and Valdés learned during their work on Fishers at Work, because the administrator was using questionable accounting methods. Now all of the administration is voluntary

work done by Miguel, a paid secretary, and other members. The hired administrator "went to school and actually studied administration," yet he almost drove the association to bankruptcy, because "as people in the street know, those who study administration are really studying the best way to steal. We are never going to hire an administrator who is not a fisherman again." The association's grounds are clean, spacious, and well organized—an environment conducive to fish sales. Norman Jarvis would be proud. They have 8 freezers in working order, an office, a large dock and a smaller one, a fish cleaning/weighing area, a net reparation area, a SCUBA tank filling station, and a boat-engine repair shop. They are also a working boat ramp near the association and an out-of-order ramp on the far side of the embayment. In 2004, they began getting ready to open and operate a restaurant that would sell the association's catch, but it still wasn't completed in the Spring of 2005. They reported, however, that the opening of the restaurant was imminent as they were just waiting for the last restaurant operation permits.

The Sea Hawks were donated by a boat dealer in Arecibo, and the association got them through negotiating with the Department of Agriculture and enlisting the mayor for lobbying. The Sea Hawks have become an issue for fishers from other ports, who resent the success of Arroyo's association in securing the boats. One in Guayama said that the thought they were using those boats to steal from traps, and that they had given the boats to '*a bunch of kids that didn't know what they were doing*'. Our experience with the Arroyo fishers was quite contrary to that version of events, as each time we went to sea with Arroyo fishers, we witnessed obvious experts at work who were, above all, very conservation conscious and respectful. The assertion that divers steal from traps is widespread among trap fishers, although it is doubtful that all divers practice theft. Because Arroyo fishers are mostly divers, and some of them (but not all) are young, they are routinely accused of stealing from traps, and worse of all, of using the government-bought Sea Hawks. Of course, it is possible that these accusations are due to resentment because of the political success of the association in getting the boats and securing municipal help, as well as just plain mistrust between the old ways (trap fishing) and modern ways (SCUBA-assisted fishing), which requires less technical expertise.

Arroyo fishermen have been very successful in enlisting politicians at the local level as their benefactors. In a small, very strongly ocean-oriented town like Arroyo, the fishers association can use the possible electoral numbers of association members, as well as members' families and friends, as leverage to secure the mayor's and local representative's attention. At several meetings between association members, independent fishers who are friends of the association, as well as fishers from Patillas, who have very close social ties with 'Arroyano' fishers, and Arroyo's mayor candidates, fishers make it clear that they will vote for the candidate that does the most for the fishing community. Valdés Pizzini (1989) makes illustrates the use of local political power in his discussion of fishers' opposition to a marine sanctuary in Parguera during the 1980s.

Fishermen in Arroyo can be divided into two groups, based on whether they live on the beach or farther up the mountains. Fishers from both can be successful. For example, of two of the most widely known experts and master fishers in Arroyo, one is from the mountain barrios of Arroyo and the other from El Palmar barrio, located next to the town center, right on the beach. However, the fishers from the inland mountain barrios also identify themselves as farmers and most raise livestock and grow crops. Fishers from "el pueblo" (the coastal town) either only fished or combined fishing with a town-based job. Arroyo was also the base of a large sugar cane operation for a couple of centuries (Central Lafayette) and many fishers, both from 'campo' and 'pueblo' were sugar cane workers for many years.

Finally, one elderly fisher in Arroyo is an expert user of the three-layered cotton net (*trasmallo de tres mallas*), which is an old fishing art that is being lost but that can yield excellent fishing results when fishing around the reef for fishes of various sizes. Other expert fishers in Arroyo use these *trasmallos* as well, and they report that Arroyo is one of the few last strongholds of this fishing art in Puerto Rico, much in the same way that Santa Isabel is a stronghold of '*palangreros*' (longliners). These fishers and others

are involved in a program in Arroyo where they teach local public school kids about fishing, the sea, and local marine life, presenting fishing as a possible vocational career for Arroyo kids. Although there are not many other economic opportunities in Arroyo, the mere existence this program indicates the importance of fishing in Arroyo.

Patillas

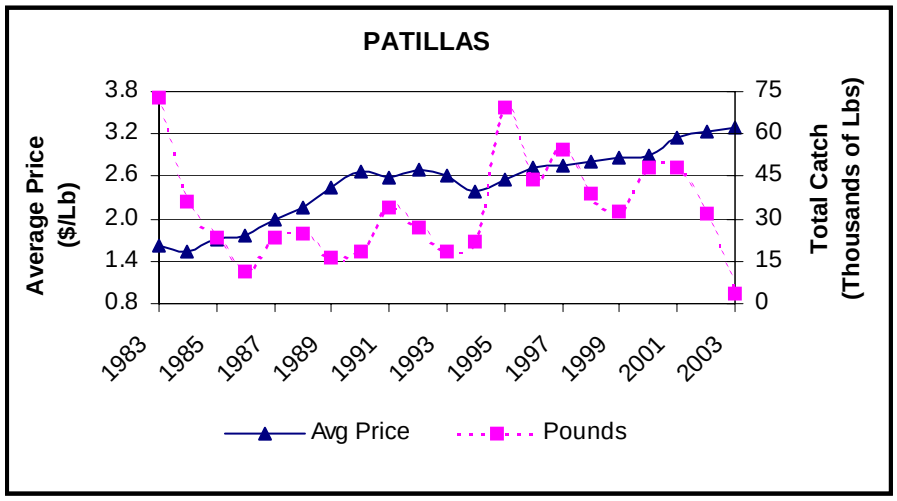
Neighboring Arroyo to the east, Patillas's economic profile is slightly better than its neighbor, with a lower rate of unemployment but similar levels of poverty. Nearly twice as large as Arroyo, it is less densely populated, with only around 1,000 more individuals. Like its neighbor, however, construction is the only sector we track where employment is rising, and the last few years for which we have landings data suggest that fishing is following the same route as the declining sectors.

Table SRIV.7. Patillas Census Data

PATILLAS	1950	1960	1970	1980	1990	2000
Population Characteristics						
Population [1]	18,851	17,106	17,828	17,774	19,633	20,152
Civilian Labor Force (CLF) [2]	4,780	3,304	3,350	3,523	5,929	5,142
CLF - Employed	4,618	3,156	3,076	2,857	4,226	3,676
CLF - Unemployed	162	148	274	666	1,703	1,466
Percent of unemployed persons	3.39	4.48	8.18	18.90	28.72	28.51
Industry of employed persons [3]						
Agriculture, forestry, fishing and mining [4]		2,036	658	167	184	66
Construction		176	425	283	434	506
Manufacturing		108	603	633	658	519
Retail trade		264	374	333	524	447
Socioeconomic Characteristics						
Mean travel time to work (minutes) [5]		N/A	N/A	23.9	27.3	31.9
Persons who work in area of residence [6]		2,504	1,870	1,534	2,219	1,754
Per capita Income (dollars) [7]			544	1,136	2,619	5,950
Median Household Income (dollars) [8]		471	1,372	3,186	6,360	12,021
Individuals below poverty level [9]			14,736	14,193	14,479	10,998
Percent of Individuals below poverty level			82.66	79.85	73.75	54.58

Ranking 27th in 1999-2003 landings, compared to Arroyo's 22nd rank, there is little remarkable about the fluctuating landings (experienced or reported) over the 1983-2003 period. Their banner years appear to have been 1983 and 1996, when their catch would have placed them around 15th or 16th in the rankings. Though prices have risen more or less steadily, they have not responded to changing supplies (correlation coefficient = -.0316).

Figure SRIV.3. Patillas Landings Data, 1983-2003



Patillas History

Guayama's political reach extended beyond Arroyo to include Patillas until 1811, when Patillas incorporated as its own municipality, dedicated to agriculture and raising livestock. Patillas was rural from its earliest days as a municipality, its large and fertile territory sparsely settled. It became a well known as a destination for foreigners, especially Corsicans, and today several of its residents' last names can be traced to Corsica (Toro Sugrañes 1995: 305).

Early in the 19th century, sugar cane production took place primarily on small farms in Patillas, as did tobacco and coffee, its three principal products. In the mid-19th century, two large Haciendas—La Felicita and San Isidro—emerged to dominate agricultural production. They both shipped sugar and rum from the port at Jacaboa, where San Isidro was located, although some of the agricultural products produced in Patillas made their way to more distant mills in Arroyo and Guayama.

In addition to a known destination for foreigners, Patillas experienced piracy directly for many years early in its colonial history. From its experience with pirate attacks, the residents of Jacaboa, its principal port, built a battery protected by six cannons. Patillas remained primarily rural and agricultural into the 20th century, even continuing to produce tobacco and coffee after sugar's general demise. By the 1990s there had been little industrial development, with only two factories locating in the municipality. A local tourist industry developed during the last part of the 20th century, based primarily on guesthouses and the beaches at Guardarraya and el Bajo. The latter also happens to be the site of Patillas's only *Villa Pesquera*.

Fishing in Patillas

Table SRIV.8. Fishing Locations and Styles, Patillas (n= 10)

Variable	Percent
Shore	0
Continental Shelf	100
Shelf Edge	10
Oceanic	40
Reef Fishes	100
SCUBA Diving	80
Skin Diving	20
Pelagic	20
Bait	80
Deep Water Snappers	40

Source: Puerto Rican Census of Fishers, 2002
Totals do not add up to 100% because fishers typically fish multiple locations

Table SRIV.9. Selected Patillas Fisher Characteristics (n=10)

Variable	Response
Association Member	70
Hours used for Fishing	
< 20 hours	0
20 – 30 hours	0
31 – 39 hours	30
40 hours	50
> 40 hours	20
Mean hours	40.3
Standard Deviation	5.143
Minimum hours	35
Maximum hours	50

Source: Puerto Rican Census of Fishers, 2002

Table SRIV.10. Gear Used by Patillas Fishers (n=10)

Variable	Percent
Beach Seine	20
Trammel Net	0
Long Line	10
Troll Line	20
Fish Trap	40
Gill Net	30
Cast Net	40
Hand Line	80
Rod and Reel	20
Lobster trap	0
Snapper Reel	0
Winch	20
Skin	0
Spear	80
Lace	50
SCUBA	60

Variable	Percent
Gaff	90
Basket	20

Table SRIV.11. Marketing Behaviors of Patillas Fishers (n=10)

Marketing Behaviors	Percent Reporting
Fish dealer/ buyer	0
Private	0
Association	90
Street vending	10
Restaurant	50
None	0
Sell fish gutted	100
Keep fish on ice	100

Source: Puerto Rican Census of Fishers, 2002.

Table SRIV.12. Opinions of Patillas Fishers Regarding Fishery Resources (n=10)

Opinion	Percent reporting
Status of Fishery Resources	
Better	0
The same	60
Worse	40
Reasons for problems in fisheries	
Pollution	10
Habitat Destruction	0
Overfishing	10
Laws, regulations, and licensing	10
Crowding	0
Seasonal factors	0

Like Arroyo, Patillas is a coastal town with a tradition of dependence on the sea. There are a few contrasts with nearby coastal towns, most of them related to the topography of Patillas. In fact, the changing topography between its two main coastal Barrios, 'El Bajo' and 'Guardarraya,' divides and differentiates them even today. El Bajo de Patillas is the first coastal barrio one encounters going on road #3, east, from Arroyo to Patillas, and is located on the same alluvial coastal plain as Arroyo. It is also located near the Former Central Lafayette, and has a strong history of dependence on sugarcane work for Central. In many ways, El Bajo de Patillas is closer to Arroyo than to the other coastal barrio of Patillas, even socially.

Guardarraya

The coast of Guardarraya, on the other hand, and especially the Malapascua sector, is comprised of a narrow strip of land between the tall mountains of the eastern end of the Cordillera Central of Puerto Rico, and the sea. The topography of Guardarraya's coast is very dramatic: between Guardarraya and Maunabo the Cordillera dives into the Caribbean Sea. People in Guardarraya, and this includes fishers, tend to be independent of others sectors, and in many occasions they have expressed to me that they are proud of it.

Guardarraya has a small but active group of fishers. Some of them, besides regular commercial fishing, appear to be running small-scale charter fishing as well. There is also a lot of subsistence (decidedly not luxury/recreational, but not commercial either) fishing by locals, compared with other nearby areas. It is very difficult to pass by he back reef areas close to the shore in Guardarraya without seeing people

involved in line, rod/cast, spear fishing, and collecting. The Guardarraya coastline differs from El Bajo to the West and Maunabo to the east in that the coral reefs are much closer to the shore in front of Guardarraya, especially in the Malapascua sector. This gives locals access to reef fish without having to deal with open/water long-distance navigation. Of course, the reefs, proximity to the shore make them vulnerable to siltation and pollution, but the coastline is rugged and rocky, as well as relatively unpopulated and undeveloped, which may cut down on potential damage to the reefs.

El Bajo

The largest group of fishers in Patillas operates out of El Bajo (The Shallows), and as the name implies, their coastal barrio fronts the extensive shallows that were formed by the combined action of a delta of the Río Patillas, the coastal mangroves, and the fringing coral reefs. All of this makes navigation tricky, but these factors also enhance biological productivity of coastal waters, and thus, historically, fishers from El Bajo have been able to fish relatively close to shore. El Bajo is very oriented towards the sea, and the public beach of Patillas is located there, as well as the only bay suitable for overnight anchorage of boats and sailboats. El Bajo is also, along with Santa Isabel and Salinas, one of the most important traditional ports for the *chalana* (native sailboat) regatta circuit. In late July, when the yearly El Bajo regatta takes place, the colorful *chalanas* with their large sails, racing up and down the beautiful bay is truly a sight to behold. The seafood restaurant scene of Patillas is also concentrated in El Bajo, and one of the most famous restaurants in the Southeast, "El Mar de la Tranquilidad,' is located there.

The Asociacion de Pescadores de El Bajo de Patillas has about 35-40 members, depending on the year, and is located right next to the Maritime Police Station and the Public Balneario of Patillas, as well as very near the large vacation houses of rich people from San Juan that are usually only occupied during holidays. In a way, it is pretty dramatic when you make your way towards the Balneario of Patillas area, how all the different and sometimes strongly competing stakeholders some together within meters of each other along a short length of coast. The installations of the Association itself are very spacious and well kept, and under the sea grape and *emajaguita* trees that fill the yard there, it was probably the most comfortable and just around nice and pleasant *Villa Pesquera* in Puerto Rico. The lockers, the freezer, and the weighing/selling station all look in very good condition and were evidently in regular use. The Association of El Bajo is located in a beach, and the water up to the association is very shallow, thus the association's dock is one of those slender, long docks commonly used in mangrove lagoons to provide maximum extension into deeper water. Compared to the nearby Coral Marine association in Arroyo, the El Bajo group seems to have fewer divers (although quite a few nonetheless), more trap fishermen and deepwater liners (at least 4 of the members fabricate traps, both traditional and plastic milk-crate), smaller yolas, and definitely less political activity, although this not to say they are not active. They do seem to be more active than the Guardarraya group. Few associations are as active politically as the Coral Marine in Arroyo.

According to association members, fishers from Patillas (and those from Arroyo and Maunabo as well) have, because of their location in the coastline, the opportunity to access the extensive shallows between Eastern Puerto Rico and the Islands of Vieques and Culebra, as well as the extensive shallows located to the west of Patillas, from Arroyo to Juana Diaz. Fishermen form these areas report fishing in places such as 'Caja de Muertos' and 'Berberia' to the east, 'Las Coronas' and 'Los Guajiles' to the south, and 'El Canal' and Vieques to the East, among other places. For day trip fishing, location is everything and they take advantage of it. A fisher hailing from Patillas or Arroyo is within three hours by sea of Caja de Muertos, and within three hours of Vieques. This broad range of operations may have something to do with the rumors by fishermen from Guayama and Salinas that Arroyanos and Patillenses are trap stealers and that they infringe on others' territories. They simply lack a small, defined territory when compared with Guayamenses, for example, and thus are viewed as not having and not respecting any territories at all. Also, like the association in Peñuelas, both Arroyo and Patillas tend to be more flexible in accepting

new membership and members who live elsewhere (two Dominican fishermen are members of El Bajo Association).

Many of the members of the El Bajo's Association actually live in Arroyo, and members commonly spend time and even land catches in both Patillas and Arroyo. They readily accept that the two associations are close, and even engage in cooperative activities: for example, El Bajo divers routinely go to the Arroyo Association to fill their SCUBA tanks. Also, the El Bajo fishers have been taking care of the larger boats that belong to the Arroyo Association, because the siltation problem in the Arroyo port temporarily made it impossible for the Arroyanos to keep those large boats there. An interesting phenomenon is that these two associations seem to 'share' a number of proeles that shift between fishing for an Arroyo fisher or a El Bajo fishers, depending on the day.

Many fishers in Patillas identify with fishers from southwest Puerto Rico or from Vieques and Culebra more than nearby regions such as Guayama, in part because of their long-distance, formerly transnational fishing excursions (to the British West Indies, The Dominican Republic, and elsewhere). Now Patillas fishers report that this way of fishing ceased to be available after the EEZ's went in place in the late 70's early 80's, since most of the fishing grounds they used to visit now fall under the jurisdiction of the British Virgin Islands. As one said to me "My life (in those times, before the EEZ's) was 7 months of the year fishing here (near shore in his yola, doing daytrips) and the rest I would spend fishing and living out of a boat."

Regarding fishery management in Puerto Rico, one Patillas fisher said that, in his view, then main problem with the state's style of management was that "there was a serious discrepancy between 'la Ley de la Pesca' y 'La Realidad de la Pesca' (the laws that govern fishing vs. the reality of fishing). According to him, the laws regarding fishing attempt to be so exact that they completely miss that the sea ecosystems in Puerto Rico are very complex, especially because of the patchiness of the resource.

This view resonates with others to suggest that Puerto Rican fishers' understanding of local ecosystems is more akin to advanced *ecosystem ecology* than to traditional population biology, which dominates the science used by agency-based fishery management (García Quijano, forthcoming; cf. Griffith 1999 for a similar case in Mid-Atlantic fisheries). To put in in simple terms, population biology (for example, a yield-per-recruit model) focuses on predictions of numbers that describe populations of fish, while ecosystem ecology focuses on attempting to understand the complexity inherent in the ecosystem and, from there, to think about what kinds of combinations of parameters might result in a ecosystem continuity and/or change.

In the words of the same Patillas fisher quoted above: "A fisher that doesn't have flexibility/room to operate cannot subsist from fishing." He added: "*Esta Ley esta fuera de control*" (This law is out of control), referring specifically to the size limits. Reporting that his favorite kind of fishing is deep-water fishing for groupers and deep-water snapper, because of the way that the size-limit regulations are enacted, he is forced to be wasteful, which causes him a lot of grief and puts lot of constraints on the time and effort he spends fishing. He added that regulations are making it so difficult, that most young fishers are turning into full-time divers, a type of fishing that he views as potentially more destructive if done carelessly, and that also, the knowledge of deep-water fishing is being lost.

Northern Municipalities I:

Carolina, Loíza, Río Grande, Luquillo

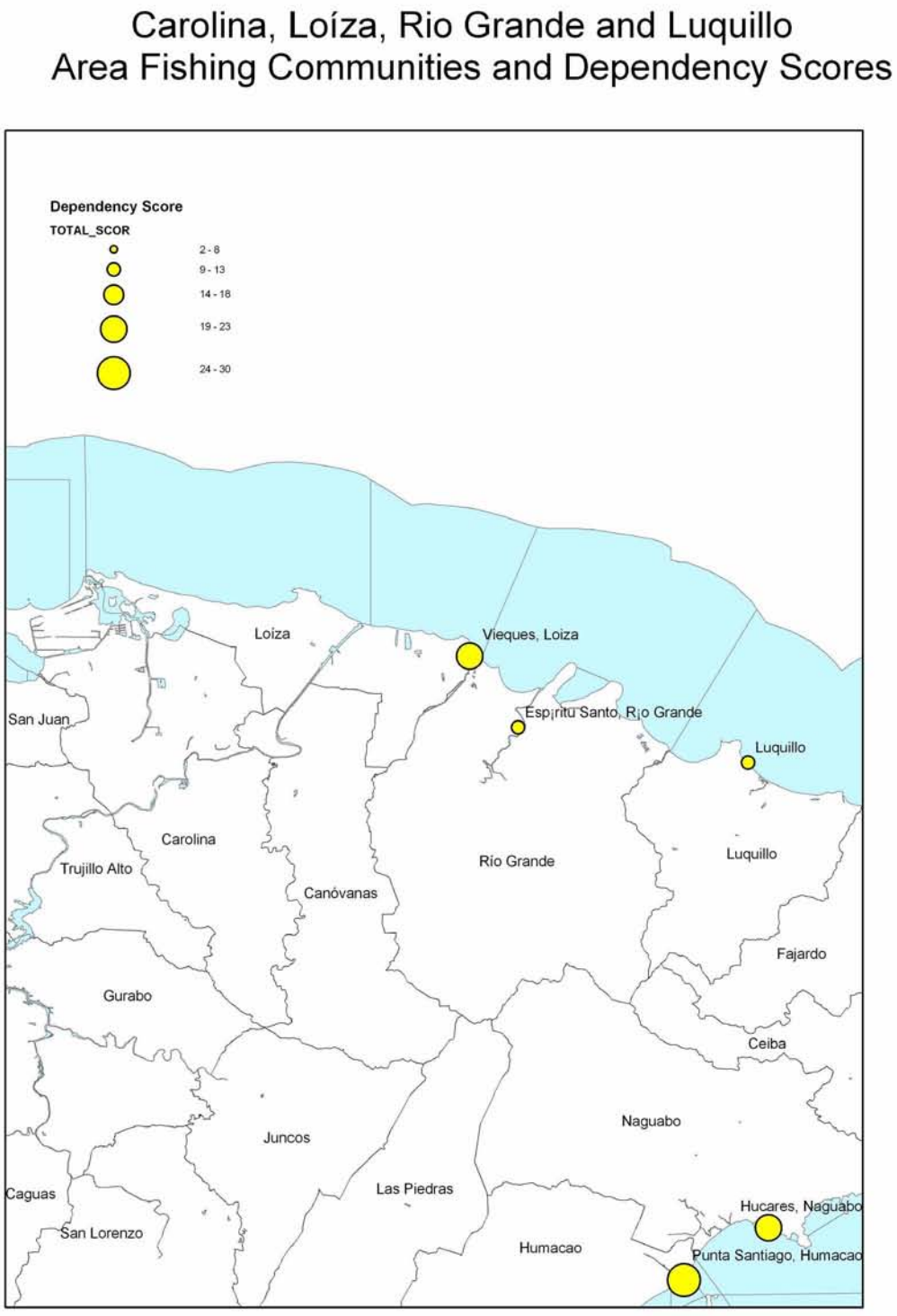
This area of Puerto Rico, between San Juan and Fajardo, is perhaps best known for its reputation as the heart of Puerto Rico's Afro-Caribbean tradition, a reputation that has been disputed and supported by scholars yet harnessed by local residents as a tourist attraction. Along a long, winding road between San Juan's main airport and the north coast, Carolina residents staff kiosks that sell traditional food and goods that trace their origins to Africa, and seasonal festivals in Loíza celebrate African dances and other traditions. Facing the rough north coast, sheltered bays and launching locations are at a premium, although *jueyeros* exploit the vast wetlands of the area, selling bundles of land crabs along the main road leading to Fajardo.

These activities serve to supplement and enhance the much larger luxury tourism in this region, best known for beach-oriented resort development in Carolina's Isla Verde and on several points between Carolina and Fajardo. Isla Verde is among the most highly developed tourist area in Puerto Rico, and current developments in Río Grande—particularly the Hotel Paradisus—rival those in Isla Verde. Luxury tourist development has been a point of contention in this region among fishers, given the tendency for such development to infringe upon fishing territories and, more importantly for fish stocks, destroy critical coastal habitat such as mangrove forests and wetlands.

This region was formerly the site of slave plantations that did, in fact, import large numbers of peoples of African descent, which led to some historians to contrast these regions with the *jíbaros* of the highlands. This latter designation generally called to mind the more independent, peasant farmers who grew coffee, tobacco, mixed vegetables, and other commodities, while the lowland plantation areas were cast as locations of widespread poverty and high seasonal unemployment. In his dissertation about the Piñones region of Loíza, as noted in part in the historical discussion, Giusti-Cordero disputes the idea that idle times on the sugar cane plantations were in fact idle times in the homes of rural workers. He suggests that harvesting marine resources, including land crabs, mussels, and fish, were important pursuits during those times of the year that the sugar mills and field employed skeleton crews.

All these municipalities, along with Fajardo and others, were at one time a single administrative unit called Loíza, which extended over much of eastern Puerto Rico. Later the Loíza region came to be known as the three municipalities of Carolina, Loíza, and Río Grande, which were united by similar economies and ecological characteristics. Of the latter, particularly important were its mangrove forests and coastal wetlands fed by a network of seven rivers. These both watered the rich alluvial plain of the coast, setting the stage for the development first of haciendas and peasant farms and later of slave plantations, and helped to create a littoral of wetlands and mangrove forests that provided critical habitat for larval and juvenile fish and land crabs.

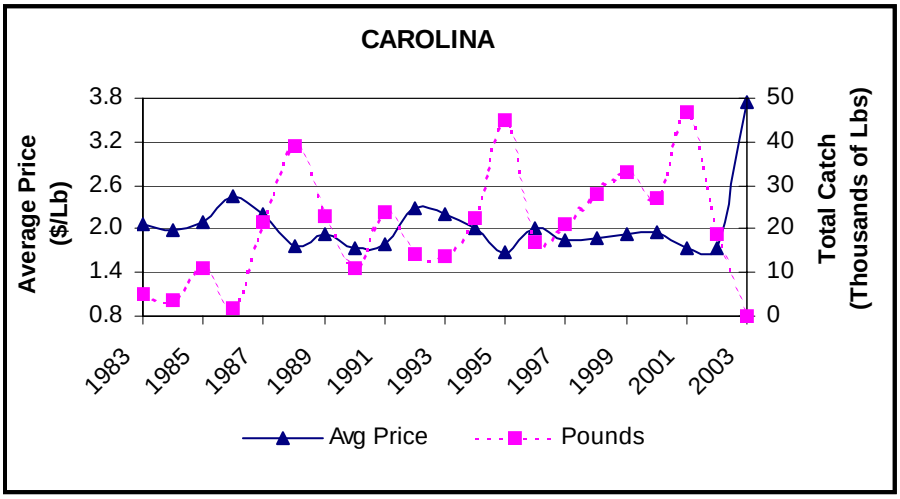
Map NI.1. Western North Coast Municipalities



Carolina

Bordering eastern San Juan, Carolina is mostly metropolitan, only the northeastern part of this municipality is significant as a fishing site. Just east of the Luiz Muñoz airport in San Juan, along a narrow stretch of coastline leading to the neighboring municipality of Loíza, the public beach and kiosks that barbeque pork and other foods surround Carolina's sole landing center. It is called Torrecillas and is located near the Carolina-Loíza border. For the 1999-2003 period, Carolina ranked 30th among all coastal municipalities reporting landings, well below each of its neighboring municipalities. During the most recent year reported (see graph below), however, catch fell to nearly zero, beginning to plummet two years earlier, when landings approached 50,000 pounds. Prices in Carolina reflect, somewhat, these trends, with record highs of over $3.00 per pound in 2003, the year only 100 pounds were reported landed. This precipitous drop in landings may account for our own failure to encounter anyone at Torrecillas to interview; hence, the data presented on Carolina come exclusively from secondary sources.

Figure NI.1. Carolina Landings, 1983-2003



According to landings data from 1999 to 2003, the three most important species landed in Carolina are Jacks, Yellowtail Snapper, and White Mullet, and the three most important gear types are bottom lines, gill nets, and trolling lines. These species and gear varieties overlap with others from this region on the North Coast, particularly its neighbors to the east, Loíza and Río Grande. Yet Carolina's proximity to San Juan may have influenced its landings in recent years. The comparatively low unemployment rate in Carolina compared to many other coastal municipalities may indicate a more robust economy. Under such conditions, we know from historical and ethnographic work on Puerto Rican fisheries, fishers often leave fishing temporarily for wage work.

Table NI.1. Carolina Census Data

CAROLINA	1950	1960	1970	1980	1990	2000
Population Characteristics						
Population [1]	29,224	40,923	107,643	165,954	177,806	186,076
Civilian Labor Force (CLF) [2]	7,805	11,776	33,984	56,862	72,358	65,220
CLF – Employed	7,492	11,036	32,903	50,425	61,684	57,008
CLF – Unemployed	313	740	1,081	6,437	10,674	8,212
Percent of unemployed persons	4.01	6.28	3.18	11.32	14.75	12.59
Industry of employed persons [3]						
Agriculture, forestry, fishing and mining [4]		1,556	401	317	428	209
Construction		1,528	3,100	2,690	3,605	3,163
Manufacturing		2,004	5,907	6,199	6,198	3,875
Retail trade		1,188	4,848	7,267	9,899	6,922
Socioeconomic Characteristics						
Mean travel time to work (minutes) [5]		N/A	N/A	32.5	34.1	32.2
Persons who work in area of residence [6]		5,432	9,861	15,352	23,022	23,129
Per capita Income (dollars) [7]			1,472	2,916	5,524	10,511
Median Household Income (dollars) [8]		1,689	4,924	8,386	13,368	21,236
Individuals below poverty level [9]			42,589	74,439	73,952	62,496
Percent of Individuals below poverty level			39.57	44.86	41.59	33.59

Carolina History

Originally part of a much larger administrative unit of an economically depressed area known as Trujillo Bajo, across the Río Grande de Loíza from Río Piedras (currently a city in the San Juan metropolitan area, where the University of Puerto Rico's main campus is located), Carolina's earliest established town, San Fernando de Carolina, wasn't founded until the middle of the 19th century. While people had settled the region earlier, no official town had been founded until this time. This was fairly late in Puerto Rican colonial history, given that San Juan was among the earliest European cities founded on the main island, but was likely related to the region's geography. Carolina sat on the Río Grande, which routinely flooded and inundated surrounding areas, taking a long time for its water levels to fall and reinforcing the association between wetland/mangrove-forested environments and danger. To the east, Loíza's plantation economy dominated most of this region, while to the west the island's capitol city and metropolitan area's shipping and commerce overshadowed developments in Carolina. Shortly after its 1852 founding, Carolina suffered a devastating cholera epidemic (1855-56) and remained burdened by Trujillo Bajo's stagnant economy through the 1860s; not until 1873 did their economy become robust enough that they could fully annex the towns of Trujillo Bajo. That same year slavery was abolished, freeing hundreds of slaves. Five years later the municipality had nearly 10,000 inhabitants and 16 commercial establishments (Toro Sugrañes 1995: 94).

Early on the municipality became more associated with plantation agriculture and the raising of livestock than the shipping and commerce to its immediate west. Coastal residents of Carolina grew or worked primarily with coconuts and sugar cane, while others grew tobacco, rice, coffee, and other crops in the interior. Cattle ranching was also important to the municipality's 19th century economy, and ranching's importance, unlike many other economic sectors, grew throughout the 19th and 20th centuries even as sugar cane production dwarfed most other agricultural pursuits. Sugar production eventually founded 15

centers with the capacity to produce refined sugar and rum, but its economic importance declined through the 1950s. In the Carolina countryside, while sugar's importance in Carolina lasted around a century, cattle ranching remained an important economic force; by 1967 there were 27 "first class" cattle ranches in Carolina, though they fell to 20 through the 1970s.

Tourism has been important to Carolina through most of the 20th century, in part because of the proximity of the major airport, which now serves upwards of 6,000,0000 travelers annually. Neighboring the airport is Isla Verde, which has 15 luxury hotels and is considered at least as important a tourist destination as San Juan's Condado district. Since World War II, the population of Carolina has been more and more concentrated along its periphery with San Juan, becoming an important industrial, educational, and banking center for Puerto Rico. Under the 936 tax laws, over 150 factories located in Carolina, producing primarily pharmaceuticals, chemicals, and electronics. Against this robust background, commercial fishing has played a small, and apparently diminishing, part.

Fishing from Carolina

The following data from the fisher census comprise the bulk of our information on Carolina fishing. Only 14 fishers responded to the census, and over 90% of those were part-time fishers, with nearly 80% fishing fewer than 30 hours per week. Favored fishing locations are reefs and the continental shelf.

Table NI.2. Fishing Locations and Styles, Carolina (n= 14)

Variable	Percent
Shore	0
Continental Shelf	92.9
Shelf Edge	14.3
Oceanic	35.7
Reef Fishes	100
SCUBA Diving	7.1
Skin Diving	28.6
Pelagic	28.6
Bait	21.4
Deep Water Snappers	35.7

Source: Puerto Rican Census of Fishers, 2002
Totals do not add up to 100% because fishers typically fish multiple locations

Table NI.3. Selected Fisher Characteristics, Carolina (n=14)

Variable	Response
Association Member	78.6
Hours used for Fishing	
< 20 hours	21.4
20 – 30 hours	57.1
31 – 39 hours	14.3
40 hours	0
> 40 hours	7.1
Mean hours	24.79
Standard Deviation	10.101
Minimum hours	10
Maximum hours	48

Source: Puerto Rican Census of Fishers, 2002

Gear varieties reported in the census are in line with those reported in the landings data, with lines the principal gear used, followed by gill nets. Gaffs are usually used in conjunction with lines. A discrepancy does exist between the two data sets, however, in that troll lines were the third most commonly cited gear in the landings data, but here are preferred by fewer than 10% of the fishers.

Table NI.4. Gear Used by Carolina Fishers

Variable	Percent
Beach Seine	0
Trammel Net	7.1
Long Line	14.3
Troll Line	7.1
Fish Trap	7.1
Gill Net	50
Cast Net	28.6
Hand Line	78.6
Rod and Reel	57.1
Lobster trap	0
Snapper Reel	0
Winch	28.6
Skin	7.1
Spear	21.4
Lace	7.1
SCUBA	0
Gaff	78.6
Basket	0

Despite that nearly 80% reported belonging to an association, the association is among the preferred marketing outlet by under 10% of fishers, with private buyers or dealers and street vending more popular. Again, the proximity of San Juan may make these alternatives more lucrative than in other areas.

Table NI.5. Carolina Fishers' Marketing Behaviors

Marketing Behaviors	Percent Reporting
Fish dealer/ buyer	85.7
Private	0
Association	7.1
Street vending	28.6
Restaurant	0
None	7.1
Sell fish gutted	0
Keep fish on ice	85.7

Source: Puerto Rican Census of Fishers, 2002

Finally, in line with other North Coast fishers, high percentages of the Carolina fishers reported pollution and habitat destruction principal problems affecting stocks. Pollution may derive from the proximity of the airport, which is extremely busy, and many fishers here probably attribute the problems with habitat destruction to coastal real estate and hotel development. This is clearly the case in Loíza and Río Grande, the two municipalities to the east of Carolina.

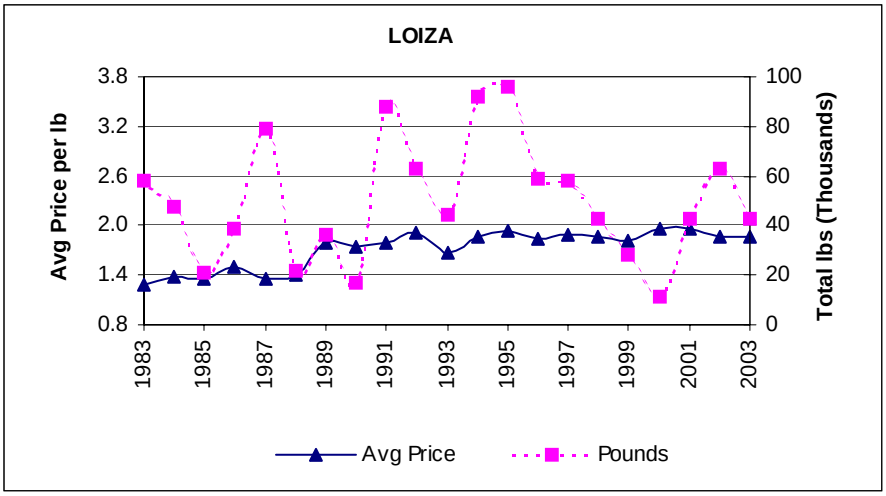
Table NI.6. Opinions of Carolina Fishers Regarding Resources

Opinion	Percent reporting
Status of Fishery Resources	
Better	0
The same	35.7
Worse	64.3
Reasons for problems in fisheries	
Pollution	57.1
Habitat Destruction	28.6
Overfishing	14.3
Laws, regulations, and licensing	21.4
Crowding	0
Seasonal factors	0

Loíza

With its name based on the name of a female cacique and its reputation one of a repository for African culture, Loíza possesses a mystique for many Puerto Ricans and visitors to the island that has become important to the local tourist trade and to the identities of its residents. Located between Carolina and Río Grande, Loíza's fishing is confined to a narrow sandy corridor that, like the coast of Carolina, adjoins areas known to tourists for its roadside stands and occasional festivals celebrating an African heritage.

Figure NI.2. Loíza Landings Data



The landings data seem to indicate that fishing in Loíza has fluctuated considerably over the decades between 1983 and 2003, from lows of around 20,000 pounds to highs near 100,000. Price has risen over the same period by around 60 cents per pound, with little relation to the supply (correlation coefficient = .1412). The landings data also indicate that, of formerly four sites reporting landings in Loíza, since 2000 only one site, a community called Vieques (the same name as the island), has reported any landings.

Census data also note a drop in people employed in the category containing fishers, although this is common across the island. Unemployment declined slightly through the 1990s, probably due to the municipality's proximity to San Juan. Commuting time increased over this same period. Recent declines in agricultural labor are especially significant, given Loíza's history. Giusti-Cordero's monumental doctoral dissertation, Labor, Ecology and History in a Caribbean Sugar Plantation Region: Piñones (Loíza), Puerto Rico: 1770-1950, documents a lengthy and complex history of agricultural production in which sugar only emerged as its principal commodity after the employment of slave labor in cassava and manioc production, most of it supplying San Juan.

Table NI.7. Loíza Census Data

LOÍZA	1950	1960	1970	1980	1990	2000
Population Characteristics						
Population [1]	24,755	28,131	39,062	20,867	29,307	32,537
Civilian Labor Force (CLF) [2]	5,482	6,704	9,739	5,546	9,731	8,163
CLF - Employed	5,311	6,260	9,129	4,522	6,890	5,972
CLF – Unemployed	171	444	610	1,024	2,841	2,191
Percent of unemployed persons	3.12	6.62	6.26	18.46	29.20	26.84
Industry of employed persons [3]						
Agriculture, forestry, fishing and mining [4]		2,032	810	53	122	42
Construction		952	2,042	596	714	648
Manufacturing		1,196	2,412	665	839	313
Retail trade		496	900	438	817	684
Socioeconomic Characteristics						
Mean travel time to work (minutes) [5]		N/A	N/A	35.9	36.0	39.2
Persons who work in area of residence [6]		3,916	3,453	1,429	1,584	1,202
Per capita Income (dollars) [7]			715	1,367	2,808	5,283
Median Household Income (dollars) [8]		951	2,530	4,726	8,319	11,200
Individuals below poverty level [9]			28,254	15,291	19,867	19,394
Percent of Individuals below poverty level			72.33	73.28	67.79	59.61

Loíza History

The early association with Loíza with the female cacique, Yuisa, indicates its importance as a Taino region prior to the Spanish. The arrival of the Spanish proved devastating to its namesake, however, as she married a Spaniard and was killed by her own people for it. Archaeological evidence supports the fact that this was an important region for the Taino. They used the Río Grande de Loíza to explore and utilize the interior.

Spanish settlement of the region occurred early; by the second half of the 16th century there were already several towns and people dedicated to manioc, cassava, and sugar production, with a number of grinding mills and processing centers. Livestock also became important early on. The town of Loíza had close to 1,200 inhabitants in 1776 living in more than 100 houses, making it one of the most important towns in Puerto Rico. By the 1830s this had increased to over 4,000, about 17% of whom were slaves.

Early in the 20th century, suffering economic difficulties after a devastating hurricane in 1902, the entire municipality was incorporated into Río Grande. It wasn't to regain its status as an autonomous municipality until 1990. As noted earlier, agriculture was the cornerstone of Loíza's economy from the very beginning of human settlement, given its fine soils. Among the crops produced were yucca, bananas, plantains, rice, corn, sugar cane, avocados, and, in its highlands, coffee. Livestock included horses, cows, pigs, sheep, and chickens. Fishing (in both marine and fresh water environments) and the gathering of land crabs has always been important as well.

Fishing in Loíza: Barrio Vieques

From four landing centers reporting catches up until the late 1990s, three of Loíza's landing centers stopped or severely cut the landings they reported before 1999, leaving only one functioning Fishermen Association of Loíza, Barrio Vieques. This association is closely aligned with the African traditions celebrated there. In the words of the association's president, "In Loíza, fishing and folk art go together." As a testament to this, part of the installations of the association's building have been converted into a workshop/gallery for some Vejigante mask-makers and painters who are also fishers, or fishers who are also mask-makers. Our visit to the association took place during Holy Week, so we were able to witness the dynamics of a day of unusually high demand for fish.

Figure NI.3. Photo of Fishing-Themed Art Inside Loíza Fishers Association

Figure NI.4. Yolas in the Ramp-Less Beachfront, Vieques, Loíza Fishers Association

As a predominantly Catholic people, the tradition still followed by many Puerto Ricans is not to eat red meat during Holy Week, and some maintain the tradition of not eating it at all during Lent, or at least on every Friday during Lent. Thus Lent is a period of high fish sales, and these are heightened during Semana Santa. During that time, if devout people don't assure themselves of a supply of fish, they might not have any animal protein to eat or to offer visitors, and visiting is an important activity, nearly always accompanied by food, during holidays in Puerto Rico.

During Lent, easily up to 50 or more people can visit at the association's grounds at any one time, all looking anxiously to the sea waiting for the last remaining yola to come back to land. Of two yolas fishing the Lent day we visited (the seas were relatively rough, with 6-8 swells and high winds), one had come back due to concerns about the weather and the other hadn't come back. As one of the fishermen later, Antonio, said, "A moment like this carries stakes for everyone." The customers really would like to have fish, the association makes money from fish bought there, and most important of all, fishers really like it when a crowd forms waiting for fish and there is a good catch to sell, so customers leave satisfied and return the next time they want to buy fish. This is in line with other fishers who claim, "We defend ourselves with fresh fish."

Eventually, the last yola, Los Compadres, arrived (see photos). They landed a good catch, having caught several kinds of deep water snappers. Immediately they were surrounded by customers yelling and fighting for a place in the line. Because fish is sold through the association, Antonio had to interrupt our conversation for about 30 minutes to go take care of incoming fish. He took the catch that has just arrived to the weighing and preparing room. People ran after him, pushing thought he door, all struggling to get in first. This was a group desperate for fish! Given such gold rush conditions, Antonio had to negotiate for a while to make sure that the catch was spread among the consumers and that nobody bought too much and left the other unhappy (the demand dramatically exceeded the offer). He set a per pound limit per person.

Figure NI.5. Customers Gathering at Loíza Association to Buy Fish during Lent

While this was happening a fish vendor from outside the association brought a pick-up truck full of fish and began selling it inside the association's grounds. This man was not related to the association. Antonio was made aware of this and quickly went and talked to the guy. After some negotiation, the fish seller was allowed to stay. Later, one of the other fisherman, talking about the man in the pick-up, told a costumer: "I am not sure who this guy is or if he has a big boat, but his fish are not fresh, they have been frozen for a few days. They are good fish, but they are not truly fresh."

According to Barrio Vieques president, the association has about 25 active members, but at one point in time they had more than 70 members. "There are many, many fishermen in Loíza," he said, "but most of them fish for themselves not with an association." The main reasons for the decline have been death and retirement. The association's ice maker is the most attractive part of the installations for fishermen, as well as its two large freezers, a communal fish preparation area, parking, and lockers for fishermen. As noted earlier, part of the association's ground is dedicated to and artisan workshop/gallery and small restaurant, not presently in use. This seems like standard equipment for an installation of its kind, with a glaring exception. There is no dock, ramp, channel, or installation of any kind that would facilitate going in or out of the water. There is only the beach (a high energy beach, by the way), right in from of the association. The fishermen have put in a couple of anchored moorings and tie their boats as well as they can. A makeshift ramp has been fashioned just by dumping pebbles and cobbles between the association's parking and the water, through the beach, but this erodes away every couple of months and accommodates only the lightest of trailers/boats. In general, fishers have to get our of their boats, engines, catch, everything, while still in the water, and then pull the yolas to shore by hand.

"Just like in the 1940's" the president said about this. He added that this brings about several moments of hazard when going off or coming to shore, because the fishermen have to lower gear, engines, and catch by hand from the boats into chest-deep water when the seas are rough. Many fishers from Loíza trailer their boats for half an hour to use the ramp of the fishers association of the Espiritu Santo River, in Río Grande. The president himself had a bandaged hand, which he explained came from lowering his outboard engine by hand, when the lever that holds the keel out of the water slipped and the motor

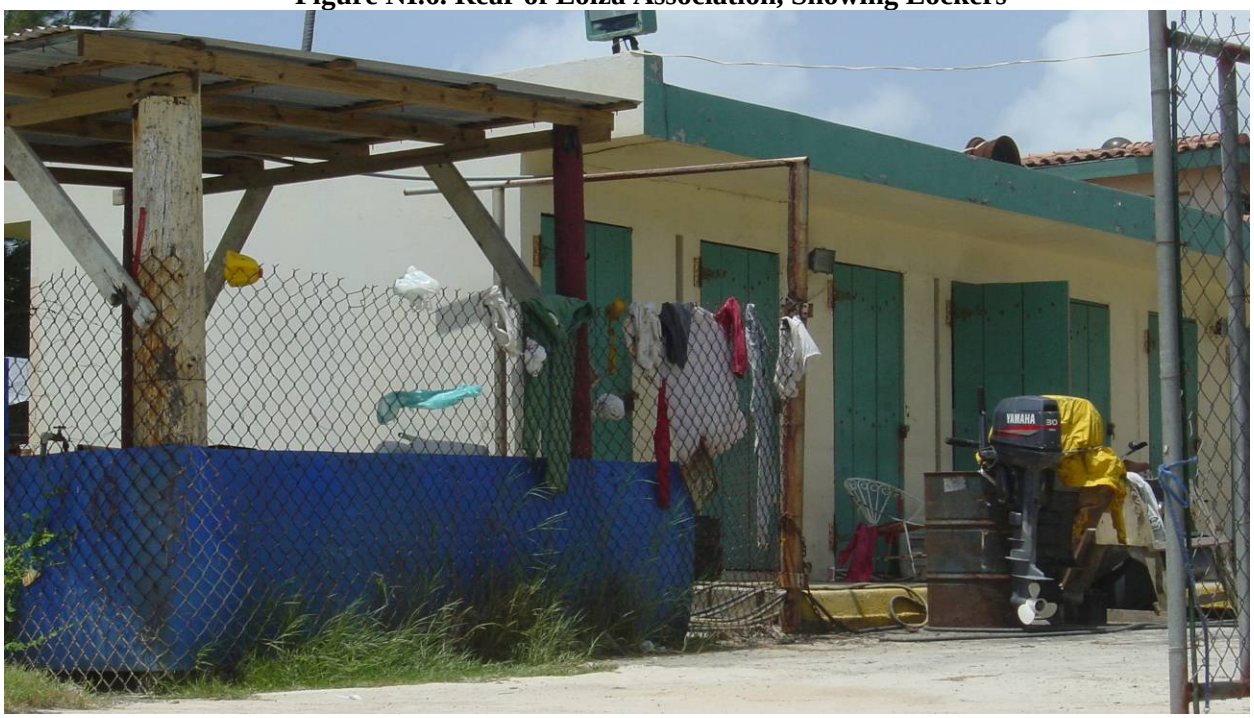
slammed down on Tomas' hand, pinning the hand between the engine and the boat's transom bar. The result was six stitches and a week unable to go out and fish.

Another fisher, also an artisan in the workshop/gallery, also told an occupational injury story, this one about one of the youngest and most productive fishers of the association, once a prospect for Major League Baseball; he was caught by an outboard propeller while getting gear from the boat in high waves. The propeller caught him in an arm, shoulder, chest, neck, and a leg. The accident almost killed him, and ruined his career as a baseball player. This man continues to be a highly productive fisherman, however.

In general, compared to other fisher association grounds, Loíza is among those who evidence the least investment and maintenance by the government, while being one of the highest in maintenance efforts and involvement by the fishers themselves, reflecting its importance in Barrio Vieques. When asked about this importance, the president said:

> "The poor people in Loíza live either from the sea or from popular art/crafts (masks, public art, etc.) From fishing and art, that's what we live from. From 100+ families in Barrio Vieques, 75 families fish. But most do not have members belonging to the association. They do their own thing. There is also an association on Barrio Toca and in Barrio Piñones. All my ancestors have been fishermen…The first gift I ever received in my life, when I was little, was a small *atarraya* (castnet), handmade by my grandfather. With that atarraya I started going to the mangrove channels near Cape Miquillo, to catch sardines to eat and sell. I would then put my catch in a *'dita'* [A container made from the local "higuera" plant. Its use dates form Taino times]"

Figure NI.6. Rear of Loíza Association, Showing Lockers



The importance of deep water snappers is shown in the census data from Loíza, with 65% saying that they target such species. The same proportion say they fish the continental shelf, while over half also reef fish. That the fishers of Loíza are dedicated to fishing as a way of life is suggested by the high percentage that belong to the association and that about one-third of those who fish do so 40 or more hours per week,

with one in five fishing more than 40 hours per week. The Association's power is reflected, moreover, in the observations above, that all of the catch is to be sold through the association, as well as in the census data, which show that over two-thirds use the association as their market.

Table NI.8. Fishing Locations and Styles, Loíza (n= 20)

Variable	Percent
Shore	50
Continental Shelf	65
Shelf Edge	10
Oceanic	50
Reef Fishes	55
SCUBA Diving	10
Skin Diving	5
Pelagic	20
Bait	40
Deep Water Snappers	65

Source: Puerto Rican Census of Fishers, 2002
Totals do not add up to 100% because fishers typically fish multiple locations

Table NI.9. Selected Loíza Fisher Characteristics

Variable	Response
Association Member	95
Hours used for Fishing	
< 20 hours	25
20 – 30 hours	35
31 – 39 hours	10
40 hours	10
> 40 hours	20
Mean hours	27.7
Standard Deviation	14.651
Minimum hours	0
Maximum hours	48

Source: Puerto Rican Census of Fishers, 2002

The gear varieties listed below reflect the gear information from the landings data presented in the table in the introduction, yet show too that Loíza fishers employ a range of gear varieties. Although the several type of hook-and-line fishing predominate, and gill nets are also important, several other gear types supplement these principal gears. Over half of Loíza fishers use fish traps, for example, though this information was not reflected in the landings data.

Table NI.10. Gear Used by Loíza Fishers

Variable	Percent
Beach Seine	10
Trammel Net	5
Long Line	30
Troll Line	30
Fish Trap	60
Gill Net	65
Cast Net	55
Hand Line	80

Variable	Percent
Rod and Reel	20
Lobster trap	30
Snapper Reel	5
Winch	0
Skin	0
Spear	10
Lace	5
SCUBA	10
Gaff	50
Basket	20

Table NI.11. Marketing Behaviors of Loíza Fishers

Marketing Behaviors	Percent Reporting
Fish dealer/ buyer	15
Private	0
Association	70
Street vending	15
Restaurant	0
None	5
Sell fish gutted	0
Keep fish on ice	80

Source: Puerto Rican Census of Fishers, 2002

Table NI.12. Opinions of Loíza Fishers Regarding Fishery Resources

Opinion	Percent reporting
Status of Fishery Resources	
Better	0
The same	40
Worse	55
Reasons for problems in fisheries	
Pollution	60
Habitat Destruction	5
Overfishing	0
Laws, regulations, and licensing	0
Crowding	0
Seasonal factors	0

Source: Puerto Rican Census of Fishers, 2002

Loíza fishers, like many along the North coast or near metropolitan areas, were more likely to single out pollution as a principal cause of problems with fishery resources than others. It is interesting, however, that only 5% listed habitat destruction as a problem, given the current problems between fishers and the luxury resort hotels in this region, which involves the hotel's destruction of mangrove forests and wetlands to build two walkways. Discussed below, in the context of both Loíza and Río Grande fishing associations, this dispute has stirred up complaints about regulatory agencies in general. In Loíza, these have been buttressed by the historical association of this region's residents with their African past.

Loíza is Puerto Rico's black town, the center of all that is black in the island, and issues of marginality and race are very poignant. Citizens are very aware of this, and it was evidenced in one of the few opening statements of the Loiceño informant whom we interviewed. He said, "They want to force us out of fishing because we are Black and Poor!" (*"Nos quieren sacar de la pesca porque somos negros y*

pobres."). This echoes a common fisher's statement around the island: that agencies involved in conservation are quick to target small-scale fishermen because they are poor and thus easy targets, but here in Loíza the fishers add "Black" to the equation. Several others chimed in with similar themes: "If they are going to arrest us for fishing," one said, "they better start building larger jails, because we are going to keep on fishing."

Antonio added that: "Here, its harder and harder to fish. They want to end fishing as a way of life. 'EL reglamento,' they wrote it based on studies made near Miami, rather than based on studies made here in Puerto Rico. What they should do is make their studies here and then come and try to put a 'reglamento' based on what they get here, because this is not Miami. Puerto Rico is surrounded by water, but the fishsing grounds are not so large and the platform is much smaller here. In Puerto Rico there are no large commercial fishing boats owned by rich people. Why didn't they go out to the sea with us, to see how we fish, what is it that we do out there? We would have taken them if they had asked."

Just like many fishers throughout this study from other parts of the islands, Antonio resents that the meeting that the proponents of the 'reglamento' called was held on the swanky Tropi-Mar Hotel and Convention Center in Isla Verde, a place where the formally educated bureaucrats and fishery managers would have a "homecourt advantage," because they feel more at ease and more familiar with the place. According to Jose, holding the meeting in that "hotel in San Juan" ensured that the fishermen who went to the meeting would feel uncomfortable while the officials would feel at ease. In his own words, "The fishermen, many of whom do not have a school diploma, will be uncomfortable going into an hotel like that. It was an environment that was hostile to the fishermen but comfortable to the officials." Another added: "The fisherman from places like this (like Loíza) is not going to go to those hotels."

When asked what their main complaint was about the 'reglamento,' Antonio said: "That it is going to choke us to death… The *Loiceño* fisherman, like the majority of Puerto Rican fishermen, doesn't fish great quantities. We are not those great boats who fish to make a profit, who have great immense chinchorros or palangres (longlines) that extend for miles and miles. Fisheries here are still artisanal. We have modernized just a little, but it is still artisanal. If we were great boats of tons and tons, one of those that in times past we would see some to our waters and catch thousands of pounds of fish, well, then, it would make sense to regulate us so strongly. But the artisanal fisherman, like us , who goes out to catch 10, 20, 80 pounds of fish in one given day for daily sustenance, that is the one who gets jumped on by the government, (al que le van a caer encima), why? Because he is poor and he is an easy target!"

The informant (again, echoing statements issued by many fishers in other places) said that he has himself observed how supermarkets sell imported fish of the same species caught here, but which are smaller than local fishermen are allowed to catch, sizes that are illegal for them to catch. Specifically, he was referring to highly commercial deep water fishes such as *Chillo, Vesugo*, and *Colirrubia* (Silk Snapper, Vermillion Snapper, and Yellowtail Snapper). He has observed that these smaller-than-locally-legal fish routinely come from Costa Rica and Miami, among other places. "Those little fish," he said, "so little that if they catch me out at sea with one of them on my boat, I would be fined a hefty sum. Man, the only thing that I am asking for is that if those guys are allowed to sell those little fish, why aren't we allowed?"

The informant suspects (another repeated theme) that somebody must have won the political favor of importing those little fish, and they aren't regulated like fishers because they are powerful and have friends in the government. One advantage fishermen try to parlay is their position as suppliers of really fresh fish: "Thankfully, people still come to buy fish when they want fish that is fresh and that has not been frozen for 4-5 months."

Recently, as noted earlier, Loíza has been a battleground of coastal residents battling large tourism developments that are establishing themselves in beaches and mangrove wetlands. Residents of the

Mediania Alta and Piñones sectors of Loíza and Isla Verde in Carolina are fighting initiatives to develop wetland and beach areas and other initiatives to expand current developments such as the Radisson Hotel. Interviews at Loíza quickly turned to theme of the "large interests" of coastal developments and to bias of the state interacts vis-à-vis different stakeholders, arguing that developers are allowed to fill up large extensions of wetland and shallow reef habitats, while fishers are increasingly regulated by the state and, they commonly assert, harassed by DNR enforcement personnel. From the association grounds they showed me an immense construction, called the Hotel Paradisus, an all inclusive resort which built on Cape Miquillo, a peninsula located between the Loíza and Río Grande coasts; this is an area rich in mangrove wetlands, channels and estuarine waters and that traditionally has served as a place to fish for bait and an important nursery and rookery area. When I asked if Cape Miquillo was an important bait area, one fisher responded:

> "It is much more than just a bait area. From there (pointing to Cabo Miquillo), from Miquillo we made a living. As Miquillo goes, so do we. Miquillo is where we got our bait, [where] we fished for Jueyes (land crabs), fished for estuarine fish, gathered wood for wooden traps and boat building, and where we took our boats when bad weather was coming."

Figure NI.7. Internet Photo of Tourism Developments in Cape Miquillo

Figure NI.8. Photo of Hotel Paradisus Resort, Taken From the Association's Grounds

One informant commented on the irony that while now there is a closed season (La Veda) for land crabs and people are fined for catching a few of them out of season, the developers of Hotel Paradisus are

> "given the green light to destroy, on one swift stroke, more land crabs than what the inhabitants of both towns (Río Grande and Loíza) could ever fish to sell and eat to survive. On the same token, if we want to cut one mangrove stick for a trap, we get fined, but those people are allowed to destroy the whole mangrove foerest! The hotel name is Paradisus (paradise). But Paradisus for whom? Not for us! I would tell that agency [NOAA] that they are failing completely in protecting wetlands (*humedales*) and mangroves when they allowed this to happen."

Returning to the subject of current fishing regulations, Antonio says that the regulations themselves are evidence that the agency personnel never go out to fish. An example of this is the size-limits regulations for deep water species (red snappers, silk snappers, red hinds, etc.), which contradict local knowledge. Using a metaphor that has been also used by many other fishers throughout this study, Antonio pointed to an arrow-shaped "nasa chillera" (red snapper trap) and said:

> "If fish could read, I would put a little sign and the entrance of the trap that read: 'Small fish not allowed, please do not enter.' But, the fish, just like many of the fishermen, cannot read (*love the irony about the written word and traps, more below*). The nasa is a trap, so if it works at all, if the fish comes in, it is trapped. That is what a trap is supposed to do! It is just like Viet-Nam, when I went there, the Vietnamese made these huge traps, and if you fell in you would be impaled in wood spears, or you would remain there until somebody found you. Of course, if you know the trap is there you don't step on it, because that is what it is, a trap."[3]

In line with comments from other fishers around Puerto Rico, fishers from Loíza explained that when deep-water fish (the principal species targeted here) come to the surface, they are already dead, because

[3] Garcia-Quijano makes the point that alluding to the written word and traps may imply that written words (or technical language in Fishery Management plans or laws) can be the makings of a trap for those who don't read or write well or who have difficulty following technical language.

those fish are being pulled up to the surface from depths between 80-250 brazas (+/- a fathom); the sudden involuntary change in pressure kills them. This is wasteful activity to them, about which Antonio said:

> "And you are going to tell me that when those fish get to the surface, after pulling them 100 *brazas* by hand… we have to throw them back in the water? So that the birds can eat them? In the supermarkets they sell them *chiquitos e importados* (small and imported). That is a waste! The birds don't need them! We do! Even if to eat ourselves!
>
> "But, because that plan was written up in an office, because they never came here to go our to sea with us, to see *como es la cosa* (how things are) out there, what it is like for us, the amount of work that we have to do to bring those fishes to the boat….then this is the plan we get"

This diatribe expresses sentiments common across Puerto Rican fishing communities, whether place based or network based: that because small-scale fishing is a moral enterprise, productively using natural resources for beneficial ends, wasting small fish because of directives from a regulatory agency is highly offensive to them. During another part in the interview, Antonio pointed to the sea and said, "From there we have raised our families, and we have sent our kids to school. From there we have produced doctors, nurses, laywers, everything!" Because of the sea's extended productivity, producing not only seafood but families and professional, wasting small fish contradicts their own attempts to protect extremely small fish—that is, juvenile and larval sized fish—by joining ranks against developers who are destroying critical habitat.

When questioned about the initiatives for MPA's or closed areas, Antonio was also in disagreement, based on his experience in local ecosystems:

> "That doesn't work, because the fishes we fish here, they move around a lot. When one goes out fishing to the same places we have gone all of our lives, sometimes you find fish, sometimes you don't. If there are no fish, one just goes and tries somewhere else, because I am not going to be wasting my time. I just go somewhere else. How we cope with this is by talking. We communicate with each other, talk, and when the catch is going down in an area , we are not catching too much, we go somewhere else, we tell other fishers, and we go somewhere else. What we do is we give the fishing areas 'un break" a break to recuperate, you understand? That is why just closing one or another are won't do anything."

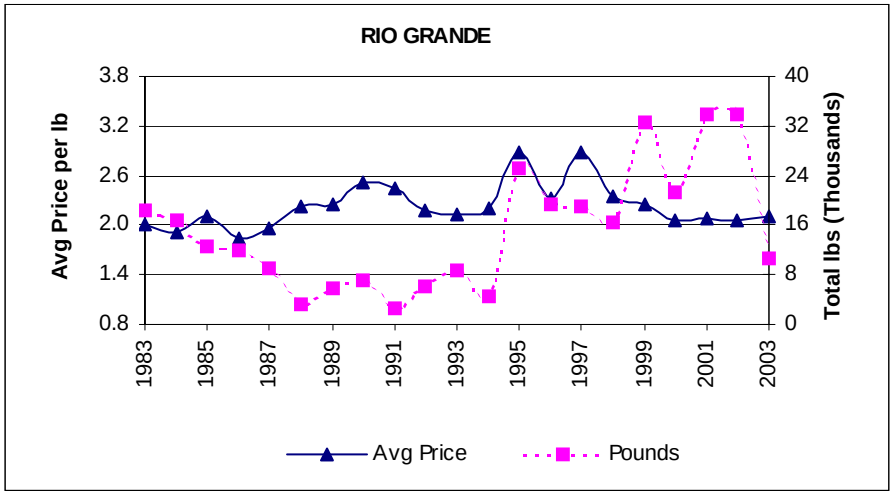
Antonio then gave an example similar to Ceiba fishers' comparison of fishing with farming: that of a rotating closed areas scheme that might work much better than permanently closed area. His reasoning was that rotating closed areas would be much more in tune with the actual movement of fish.

They also echoed fishers in other parts of the island with their comments about regulations surrounding licensing. Under the new regulations, if fishers don't submit statistics for a year or two, thye have to apply for a "Beginning Fisherman" license—even the most senior, highly experienced fishers in Loíza; by forcing some of the most respected fishermen to adopt the title of beginners, the whole management plan loses legitimacy.

Río Grande

Río Grande is best known for the tropical rainforest, El Yunque, which rises above the central town of Río Grande to the south, in the opposite direction from the main highway leading to the commercial and recreational fishing locations of the municipality. Tourism constitutes a large part of its economy, due not only to El Yunque but also to the resort development on or near three points that extend into the ocean: Punta Miquillo, Punta Picua, and Punta Percha. These resorts sit within the vast wetland that is fed by the Río el Espíritu Santo. Expansion of the resorts thus involves destruction of critical marine resources habitat, a fact that figures into the current problems facing the fishers of Río Grande. The following graph shows that, at their peak, Río Grande fishers were landing between 30,000 and 35,000 pounds annually, although landings in 2003 were less than this and in most years prior to 1995, landings data show far lower catches.

Figure NI.9. Río Grande Landings, 1983-2003



It appears that landings increased significantly in the mid-1990s and were sustained after through the remainder of the decade. This was a time of apparent economic stability in Río Grande, with unemployment rates changing little between 1990 and 2000. Some of this stability may be due to the proximity of Río Grande to the metropolitan area, most parts of which are accessible with around a half-hour commute.

Table NI.13. Río Grande Census Data

RÍO GRANDE	1950	1960	1970	1980	1990	2000
Population Characteristics						
Population [1]	16,651	17,233	22,032	34,283	45,648	52,362
Civilian Labor Force (CLF) [2]	4,108	4,304	5,291	8,902	15,604	15,122
CLF - Employed	3,798	4,024	4,976	7,660	12,355	12,041
CLF – Unemployed	310	280	315	1,242	3,249	3,081
Percent of unemployed persons	7.55	6.51	5.95	13.95	20.82	20.37
Industry of employed persons [3]						
Agriculture, forestry, fishing and mining [4]		1,264	239	144	324	94
Construction		536	983	758	1,318	1,185
Manufacturing		1,044	1,739	2,031	2,034	1,359
Retail trade		296	467	961	1,721	1,406
Socioeconomic Characteristics						
Mean travel time to work (minutes) [5]		N/A	N/A	32.2	33.8	37.7
Persons who work in area of residence [6]		2,796	2,367	2,942	3,820	4,094
Per capita Income (dollars) [7]			754	1,772	3,529	7,347
Median Household Income (dollars) [8]		967	2,384	5,514	9,728	15,006
Individuals below poverty level [9]			14,565	21,858	26,740	24,130
Percent of Individuals below poverty level			66.11	63.76	58.58	46.08

Río Grande History

Río Grande's 17th and 18th centuries were characterized by large landowners (*hacendados*), most of whom were based in neighboring Loíza, and it wasn't until the early 19th century that residents began to contest the dependent, internal colonial status of the territory. They were successful in breaking free of Loíza's dominance in 1840, naming the municipality for a river that crossed through its territory.

Río Grande remained sparsely populated through the 19th century. Toro Sugrañes characterizes it as a "small town with only four streets around its plaza" (1995: 335). At the turn of the 20th century there were only around 10,000 residents, but by 1920 they were able to pave their streets and build an aquaduct. Though Toro Surgrañes contends that these developments extended the urban area "in all directions" (ibid. 336), large parts of Río Grande remained rural, used for raising livestock for the nearby market in San Juan, and, importantly for fishing, much of the rural area up and down the Río de Espíritu Santo was surrounded by wetlands. Current fishers contend the area extending from the coastal to El Yunque constitutes an ecological corridor that is protected by law.

Whether protected or not, Río Grande early on realized its potential as a tourist destination. Its fine beaches, its mountains and forests, and its proximity to San Juan tourism an important part of its economy during the second half of the 20th century. Río Mar Resort, Hotel Paradisus, Coco Beach Resort, and Bahía Beach Plantation are all within Río Grande's territory and all attract tourists from around the world. Despite their importance as sources of employment and revenue for the municipality, these developments have caused problems for the fishers of Río Grande as well as other municipalities of this region.

Fishing and Defending Fishing in Río Grande

The fishers of Río Grande's *Villa Pesquera*, known as Palmer on the list of landing centers, in conjunction with fishers from neighboring Loíza, are currently defending destruction of marine resources—principally the mangroves—against a large resort called the Hotel Paradisus. The *Villa's* facilities are expansive, opening up out of cattle land at the end of a narrow road, the first part of which is bumpy and the last part of which is paved. They share space with the marine patrol, have a nice restaurant and fenced in dry dock facility, and sit on a river, the *Río Espiritu Santo*. This location, on a river as opposed to near the sea, is somewhat unique among Puerto Rican *Villas Pesqueras*, and it may as well account for the association's vehement opposition to the Hotel's proposed development. Across the river is a vast wetland that, according to the association president, the Hotel Paradisus is currently destroying. On the window of the office opposite the seafood restaurant is taped newspaper coverage of the dispute, featuring the president.

Alzan su voz de protesta pescadores de Río Grande, *(Raising their voice in protest fishers of Río Grande)* the headline reads beneath a photo of a man holding a banner that reads, **NO A LA MANTAZA DE LA VIDA MARINA** *(No to the massacre of marine life)*. Their specific complaint is against two ornamental walkways that the Hotel is constructing in the wetlands, destroying the environment. A second article chronicles the development, showing a drawing of the proposed development.

Figure NI.10. Newspaper Article Taped to the Window of the Río Grande *Villa Pesquera*, Outlining Opposition to the Hotel Paradisus's Proposed Walkway

Bajo fuego dos tablados de Paradisus

Por Mildred Rivera Marrero
end.mrivera1@elnuevodia.com

RÍO GRANDE - La Asociación de Pescadores de este pueblo volvió ayer a levantar su voz de protesta contra una propuesta del hotel Paradisus para construir dos paseos tablados dentro del mar y emplazó al gobierno a cumplir con su función de proteger el ambiente.

El presidente de los pescadores, Bernard Rosario, recordó que ése es otro proyecto más que atenta contra los recursos naturales de la reserva natural conocida como el Corredor Ecológico del Este y que las agencias de gobierno aprueban alegando que son excepciones a la ley.

Rosario emplazó específicamente al secretario de Recursos Naturales y Ambientales, Luis Enrique Rodríguez, y al presidente de la Junta de Planificación, Angel Rodríguez. Estos, señaló, no han contestado sus denuncias.

El peligro de la propuesta de Paradisus, propiedad del desarrollador Arturo Díaz, es que eliminaría cerca de 100 millas de la hierba marina conocida como thalasia, que sirve de alimento para especies como los manatíes, las langostas y el carrucho. Asimismo, mataría el área que sirve de vivero para esas y muchas otras especies, afirmaron Rosario y el especialista ambiental Mario Pérez.

"Son 250 pies (de madera) derechitos hacia el mar. Eso llega hasta el arrecife de coral. Dicen que es un paseo tablado, pero anticipo que eso es para ir armando el muñeco para que sea el muelle de Paradisus", declaró Pérez en entrevista telefónica con **El Nuevo Día**.

Pérez se refería a las dos estructuras de madera perpendiculares a la orilla y separadas por 1,000 pies entre sí para cuya construcción habría que dragar e hincar pilotes.

Ambas actividades matarían las hierbas marinas, y aquellas restantes, morirían a consecuencia de la sombra que le daría el paseo tablado, explicó el especialista. Pérez lamentó que es esa área, precisamente, la que mayor cantidad de hierbas marinas tiene puesto que estas cubren entre 70% y 90% del fondo del mar.

El especialista expuso las objeciones al proyecto en una carta el 30 de septiembre enviada a Rodríguez y al presidente de la Junta de Calidad Ambiental, Esteban Mujica.

El proyecto también obstruiría el paso natural que tienen, entre la orilla y los arrecifes, los pescadores para ir a trabajar a mar abierto. Fue ese canal el que utilizó ayer Rosario para llegar hasta la playa frente al Paradisus y hacer una protesta.

Tanto él como los demás pescadores portaban pancartas en defensa del ambiente y pitos para llamar la atención de la administración del hotel y de los turistas.

EN CAMINO hacia la playa, Rosario mostró cómo el campo de golf de ese hotel llega justo hasta la orilla de la desembocadura del río Espíritu Santo, que tiene vegetación propia de un manglar. Ese hecho, afirmó, demuestra que toda esa zona era mangle y para hacer el desarrollo, se eliminó ese recurso natural y se rellenó el área.

"¿Quién puede sembrar un bosque de mangle? Nadie. Sólo Dios", declaró Rosario, quien luego explicó que la eliminación del mangle también afecta al proceso de anidaje de las tortugas y los reglares.

"Las tortugas se desorientan con la claridad (que dejó la eliminación de la vegetación) y no pueden subir esas piedras (colocadas a la orilla de la playa)", denunció, señalando hacia las grandes rocas ubicada a todo lo largo de la costa que bordea el campo de golf de Paradisus.

El líder de cerca de 117 pescadores mostró mapas de la década del 70 en los que se muestra claramente cómo el área donde ubican Paradisus y la urbanización Coco Beach eran humedales. Ambos proyectos, ubicados en la península conocida como Punta Miquillo, son desarrollo de Arturo Díaz, según los pescadores.

Cuando se hizo la declaración de Reserva Natural en esa área en la década del 80, se

El peligro de la propuesta de Paradisus es que eliminaría cerca de 100 millas de la hierba marina thalasia, que alimenta a especies como los manatíes, las langostas y el carrucho.

catchyó esa zona de Punta Miquillo, explicaron Rosario y Pérez.

Esa exclusión es inexplicable, manifestó Rosario, porque esa península cibao a su izquierda y a su derecha áreas que sí son parte de la reserva natural.

PUNTA MIQUILLO "es igual que (la playa) la Selva, en Luquillo, y no hay nadie de tancia desde allá", afirmó Rosario, para explicar lo inexplicable de la decisión de las agencias del gobierno.

"Vamos a hacer un estudio con nuestros asesores para ver cómo fue que se excluyó", concluyó el líder de los pescadores.

The fishers argue that this development is against the law protecting the area known as the *Corredor Ecológico de Este* (Ecological Corridor of the East). The development will destroy critical habitat and feeding grounds for manates, lobster, and conch, yet the fishers claim that the government has allowed this exception to the law in this case, allowing the destruction of around 100 miles of critical habitat and the additional dumping of the 70% to 90% of the cut material in the bottom of the sea. This is doubly destructive to fish habitats, at once destroying nursery grounds, which fish stocks need to thrive, and substrates, which affect fish congregations and catch.

There are 72 members of the association; 32 were fishing the first time we visited the facilities. Sport fishers also use the facility, but the association president emphasized the difference between them and commercial fishers. The landings and census data conform to what those interviewed here reported, that bottom line and net fishing are the most common, yet some fishers also use diving equipment and traps. The following table draws on landings data to determine such things as predominant gears and species landed. While yellowtail snapper constitutes only a little more than 10% of the catch, this is a significant amount, making yellowtail snapper the most frequently caught fish in Río Grande, among more than 30 species. This is similar to other areas in the northern and eastern part of Puerto Rico.

Table NI.14. Principal Gears and Top-Listed Species
Río Grande Landings, 1983-2003 (N=11880)

Gear & Species Type	Percent
Long lines for reef fish	65.8
Gill nets	15.2
Diving equipment	8.1
Pots & traps	3.6
Troll lines	2.2
Cast nets	2.1
Yellowtail Snapper (colirubia)	10.4

Source: Puerto Rican Landings Data

Table NI.15. Fishing Locations and Styles, Río Grande (n= 26)

Variable	Percent
Shore	50
Continental Shelf	80.8
Shelf Edge	3.8
Oceanic	76.9
Reef Fishes	96.2
SCUBA Diving	34.6
Skin Diving	34.6
Pelagic	7.7
Bait	61.5
Deep Water Snappers	69.2

Source: Puerto Rican Census of Fishers, 2002
Totals do not add up to 100% because fishers typically fish multiple locations

Table NI.16. Selected Río Grande Fisher Characteristics

Variable	Response
Association Member	92.3
Hours used for Fishing	
< 20 hours	23.1
20 – 30 hours	46.2
31 – 39 hours	19.2
40 hours	11.5
> 40 hours	0
Mean hours	24.88
Standard Deviation	9.066
Minimum hours	6
Maximum hours	40

Source: Puerto Rican Census of Fishers, 2002

Table NI.17. Gear Used by Río Grande Fishers

Variable	Percent
Beach Seine	11.5
Trammel Net	3.8
Long Line	15.4
Troll Line	50
Fish Trap	42.3
Gill Net	69.2
Cast Net	84.6
Hand Line	76.9
Rod and Reel	69.2
Lobster trap	0
Snapper Reel	19.2
Winch	11.5
Skin	0
Spear	46.2
Lace	38.5
SCUBA	23.1
Gaff	73.1
Basket	3.8

Table NI.18. Marketing Behaviors of Río Grande Fishers

Marketing Behaviors	Percent Reporting
Fish dealer/ buyer	3.8
Private	0
Association	96.2
Street vending	96.2
Restaurant	3.8
None	0
Sell fish gutted	26.9
Keep fish on ice	92.3

Source: Puerto Rican Census of Fishers, 2002

Table NI.19. Opinions of Río Grande Fishers Regarding Resources

Opinion	Percent reporting
Status of Fishery Resources	
Better	0
The same	0
Worse	96.2
Reasons for problems in fisheries	
Pollution	88.5
Habitat Destruction	80.8
Overfishing	3.8
Laws, regulations, and licensing	0
Crowding	0
Seasonal factors	0

Source: Puerto Rican Census of Fishers, 2002

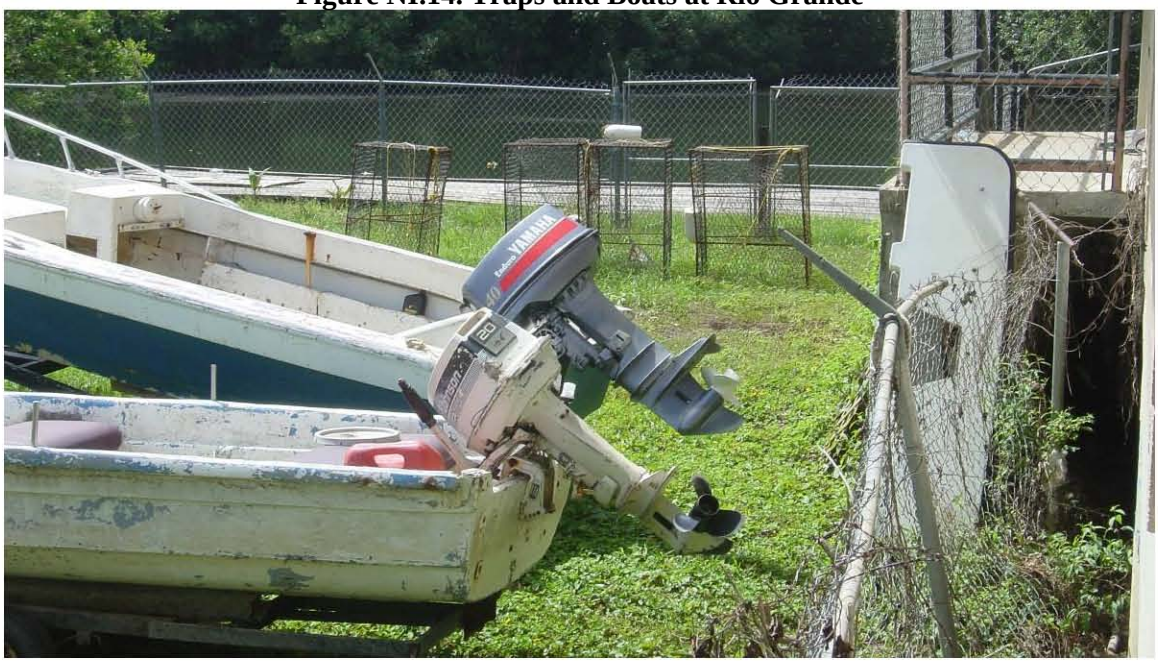
Figure NI.11. Ramp at Río Grande (the sign says it prohibits Jet Skis)

Figure NI.12. Main Building of the Río Grande *Villa Pesquera* & Restaurant

Figure NI.13. Doorway into the "Nuevo" Restaurant, Showing Multiple Forms of Payment

The members have been successful at garnering funds and using them to build up the association to where it can serve the public in at least three important ways: exercising their stewardship over the natural resources of the region, serving high quality seafood in both indoor and outdoor locations, in a riverfront setting, and offering storage for recreational fishers and boaters.

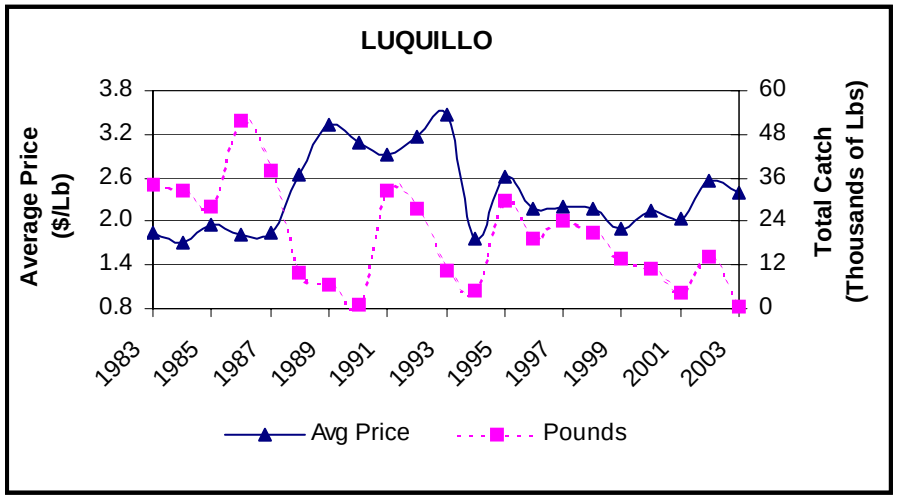
Figure NI.14. Traps and Boats at Río Grande



Luquillo

Between Fajardo and Río Grande, Luquillo's coastline is marked by extremely rough seas and no natural harbors that might make launching fishing vessels an easy task. As such, the association in Luquillo, *Asociación de Pescadores de Luquillo Pueblo, Inc.*, does not have facilities like those of other *Villas Pesqueras* across the islands and ranks fairly low in terms of landings, 38th out of the 41 coastal municipalities reporting landings. No fishers from Luquillo responded to the fisher census, despite that the association president claims to have 173 members, 42 of whom are full-time, bona fide fishers.

Figure NI.15. Luquillo Landings, 1983-2003



Landings data from Luquillo show a slow decline in landings through the last few years of the 20th century, dropping to nearly nothing in 2003. The census data reflect this, too, in that the extractive industries of agriculture, fisheries, and forestry account for but 30 individuals out of the more than 19,000 thousand municipality residents. During the 1980 to 2000 period, construction was the only sector (listed here) that saw steady increases in employment, although retail trade increased from 1980 to 1990, but dropping during the most recent decade recorded. This also reflects one comment made by the president of the Luquillo fishing association: "Ninety percent of the fishermen," he said, "are craftsmen."

Likely they value these characteristics against the otherwise gloomy background of Luquillo's overall economic profile. Nearly a quarter of the municipality's work force is unemployed, and over half of the population live below the poverty line. These rates are higher than either of its neighbors, with Río Grande's unemployment affecting only around one-fifth of the work force (still high by U.S. mainland standards) and lower rates in Fajardo.

Table NI.20. Luquillo Census Data

LUQUILLO	1950	1960	1970	1980	1990	2000
Population Characteristics						
Population [1]	9,967	8,582	10,390	14,895	18,100	19,817
Civilian Labor Force (CLF) [2]	2,314	2,216	2,744	3,673	6,226	6,069
CLF - Employed	2,183	2,016	2,522	3,023	4,671	4,670
CLF - Unemployed	131	200	222	650	1,555	1,399
Percent of unemployed persons	5.66	9.03	8.09	17.70	24.98	23.05
Industry of employed persons [3]						
Agriculture, forestry, fishing and mining [4]		540	136	56	136	30
Construction		396	581	303	403	469
Manufacturing		324	672	796	1,042	663
Retail trade		156	285	371	693	455
Socioeconomic Characteristics						
Mean travel time to work (minutes) [5]		N/A	N/A	26.7	25.8	28.5
Persons who work in area of residence [6]		1,220	1,137	1,049	1,834	1,623
Per capita Income (dollars) [7]			861	1,633	3,795	7,529
Median Household Income (dollars) [8]		1,067	2,606	4,934	9,145	13,631
Individuals below poverty level [9]			7,021	10,246	10,692	10,203
Percent of Individuals below poverty level			67.57	68.79	59.07	51.49

Luquillo History

Although Luquillo is among the oldest of the municipalities in this region, several facets of its history suggest that it may have long been the victim of internal colonialism—in other words, under the domination of absentee owners in San Juan, Humacao, Fajardo, and other more powerful seats of government in Puerto Rico.[4] It was founded in 1797 and named after a Taino cacique called Yukiyú. The Taino influence didn't end with the founding of the municipality, however. Early in its history, Luquillo acquired a reputation as a dangerous municipality, home to many Native Americans who lived in the mountains of the interior (Toro Sugrañes 1995: 253). Because of this the coastal region developed more rapidly than its interior, and early on its relationship with San Juan was forged through maritime traffic.

By the 1820s Luquillo had grown to over 2,000 inhabitants, of whom 168 (around 7%) were slaves. In 1830 its port recorded the arrival of 63 ships from Spain; 65 left the port that same year, but Luquillo residents owned few of those that were logged in official documents. Like the other, neighboring municipalities, Luquillo's early economy depended on livestock and agriculture, including sugar but also mangoes, corn, yucca, and coconuts, once boasting 12 mills. However, as with shipping, interests from

[4] Internal colonialism is similar to enclave development in other parts of Latin America and North America, creating a situation in which dominating powers siphon off resources from distant regions without making investments in such things as education, democratic institutions, and other resources that might increase opportunities among those who live in the region. One of the classic North American cases of internal colonialism has been the relationship between Pittsburg and Philadelphia, with workers in the former serving powerful families in the latter in the context of the steel industry, but cases of internal colonialism have been documented throughout Latin America as well (Stavenhagen 1976).

other municipalities eventually became more important in handling the sugar and other commodities grown in Luquillo.

Fishing From Luquillo

We noted earlier that Luquillo, despite having large numbers of fishers (173 with 42 bona fide), has no association facilities. Instead, they meet in the city hall and, for lack of facilities, do not force their members to sell to the association. There are only 17 vessels in use from the fishery, ranging in length from 17' to 26' and traveling as far out as 20 miles. However, most of their fishing is done within three miles of the coast, under the jurisdiction of *Recursos Naturales*, along the north coast to San Juan and around the northeast coast to the waters off Fajardo. Only a few fishers from Luquillo travel to the waters off Culebra or into the deep waters north of the island.

Landings and interviews with fishers overlap to some degree: they both listed snappers and king mackerel as important species, with their principal gears being nets, lines, and traps. However, fishers we interviewed also mentioned lobster, tuna, and other species, and the landings data listed white grunt as their most commonly landed species; in addition, 14 of the members are divers—clearly a minority but in line with developments across the island.

They sell fish directly to people in the community, to area restaurants, but most of their lobster are sold to a resort in Fajardo. Most of their gear is either purchased in Fajardo or other parts of the island, yet there are interesting recent developments with gear in Luquillo. Specifically, a former government official, a woman, has become not only an active fisher but has also begun making fishing gear—nets, traps, and hook-and-line rigs—and teaching this craft to younger members of the community. Two of the association's members, in fact, are only 14, although most are older and the oldest is in his late 70s. The current association president, 68 years old, has been president for 15 years.

Luquillo fishers share with other fishers in the region a concern over land-based threats to marine resources. Although they are not directly involved in the dispute with Hotel Paradisus and other developments (and in fact benefit from luxury tourism in Fajardo, selling lobster to a luxury resort there), they are currently protesting contamination from construction and population growth and from a gas station. They claim to practice methods of conserving stocks, such as not setting traps in known spawning grounds when they know certain species are spawning, and they disagree the size limit regulation on yellowtail snapper, citing the death-from-great-depth argument. They also said that they have had problems with reporting their landings, which have been declining over the past three years but seem, they say, worse than they are because their statistics haven't been properly recorded.

In general, Luquillo is an interesting case of a predominantly part-time fishery whose members are, nevertheless, deeply attached to the resource, attempting to revive and keep alive old skills while defending the resource through protest and their own marine protective measures. Coming from a history of outside intervention/ domination, Luquillo fishers have been attempting to take hold of their own fates through their continued interaction with the sea.

Postscript: Lessons from the Conflict with Luxury Tourist Development

The attempt by fishers from this region to defend the mangrove forests and wetlands from the Hotel Pardisus's plan to construct walkways, the Radisson expansion, and other tourist development is a physical manifestation of what fishers mean when they say that they are "sacrificing" to live lives of fishers, protecting their livelihoods with significant inputs of time and energy. At the same time, these

protective efforts also draw upon attributes of the cultural setting in which fishers in this region takes place: specifically, by drawing on the African past—which is, ironically, central to the region's performance tourism—fishers have been able to marshal support for their cause as one of environmental racism or injustice.

Northern Municipalities II:

Arecibo, Hatillo, Camuy, Quebradillas, Isabela

We group the North Coast Municipalities together because of the region's relative lack of fishing activity. We discuss them in two parts, western and eastern groups, to make the presentation somewhat easier to follow and because the ethnographic information collected in the west was collected a year prior to similar information in the east. Despite this presentation strategy, we argue that all ten municipalities form one fishing region with similar fishing practices, constraints in fisheries development, and relatively low landings. None of the municipalities in this region are in the top half of the 41 that report landings, and 70% of them fall in the lowest quartile.

Primarily because of the heavy surf, rocks, currents, and few sheltered bays, commercial fishing operations along the North coast have been largely displaced by recreational activities: surfing, surf fishing, recreational boating, sportfishing (from Club Nauticos) and the general attraction of the beach on weekends. Not only do few commercial vessels hail from the north coast, but seafood restaurants and markets are not as ubiquitous here as along the western and southern coasts either. What is not present at these sites, that is, is just as important as what is. Statistics and landings data for these municipalities offer initial support for grouping them.

Arecibo, the largest and most urban of the five, and Isabela, are the only two municipalities in which fishing plays any role in the local economy. The above tables paint similar pictures as those of other Western Puerto Rican municipalities: rising and high rates of unemployment; falling yet continued high rates of people below the poverty line, and changing occupational structures from the extractive industries to construction, manufacturing, and retail trade. Landings data is non-existent for Quebradillas, and the other municipalities rank low relative to the others.

Tables NC.1 – NC.5. North Coast Demographic Data

ARECIBO	1950	1960	1970	1980	1990	2000
Population Characteristics						
Population [1]	75,361	69,879	73,468	86,766	93,385	100,131
Civilian Labor Force (CLF) [2]	20,577	22,132	17,364	21,445	30,203	29,460
CLF - Employed	19,505	20,944	16,392	17,774	23,271	23,350
CLF - Unemployed	1072	1188	972	3,671	6,932	6,110
Percent of unemployed persons	5.21	5.37	5.60	17.12	22.95	20.74
Industry of employed persons [3]						
Agriculture, forestry, fishing and mining [4]		5,608	1,874	889	642	509
Construction		932	1,398	987	1,489	1,894
Manufacturing		3,080	3,362	4,463	4,990	4,633
Retail trade		2,400	2,929	2,668	3,694	3,027
Socioeconomic Characteristics						
Mean travel time to work (minutes) [5]		N/A	N/A	N/A	21.7	23.7
Persons who work in area of residence [6]		15,604	12,556	12,824	17,006	14,545
Per capita Income (dollars) [7]			840	1,860	3,652	7,290
Median Household Income (dollars) [8]		860	1,929	4,479	7,520	12,496
Individuals below poverty level [9]			52,001	57,276	58,954	50,256
Percent of Individuals below poverty level			70.78	66.01	63.13	50.19

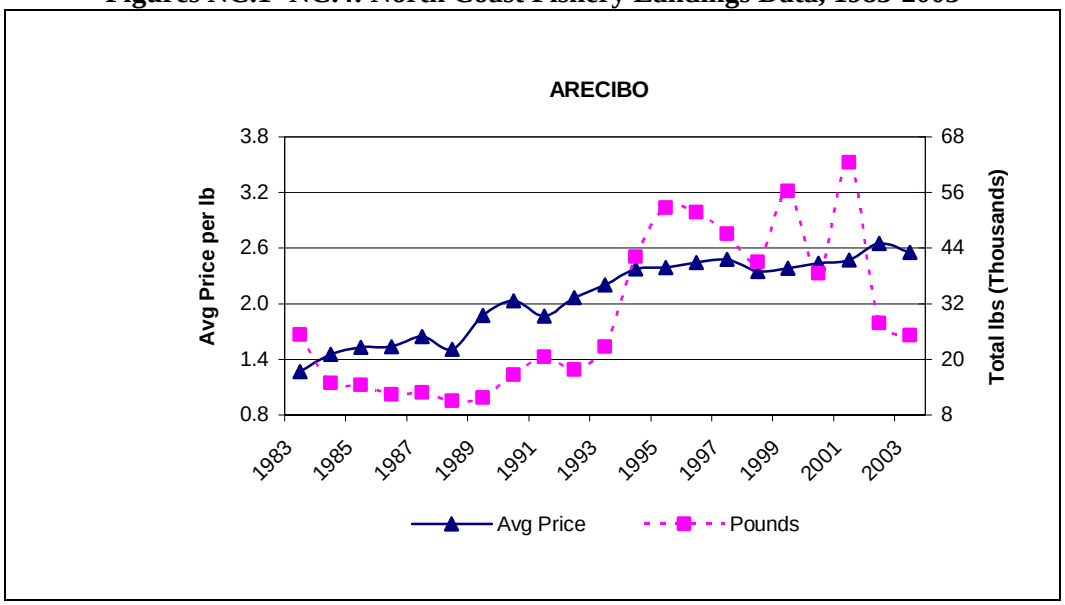
CAMUY	1950	1960	1970	1980	1990	2000
Population Characteristics						
Population [1]	20,886	19,739	19,922	24,884	28,917	35,244
Civilian Labor Force (CLF) [2]	5,178	4,592	4,683	6,019	9,297	10,554
CLF - Employed	5,061	4,404	4,176	4,947	7,205	8,432
CLF - Unemployed	117	188	507	1,072	2,092	2,122
Percent of unemployed persons	2.26	4.09	10.83	17.81	22.50	20.11
Industry of employed persons [3]						
Agriculture, forestry, fishing and mining [4]		2,264	904	342	451	380
Construction		184	484	488	480	666
Manufacturing		700	900	1,399	2,223	1,927
Retail trade		372	475	553	947	1,062
Socioeconomic Characteristics						
Mean travel time to work (minutes) [5]		N/A	N/A	N/A	22.0	25.7
Persons who work in area of residence [6]		3,628	2,796	2,519	4,062	4,171
Per capita Income (dollars) [7]			620	1,568	3,181	6,380
Median Household Income (dollars) [8]		687	1,557	4,290	7,892	13,168
Individuals below poverty level [9]			15,480	17,862	19,065	18,258
Percent of Individuals below poverty level			77.70	71.78	65.93	51.80

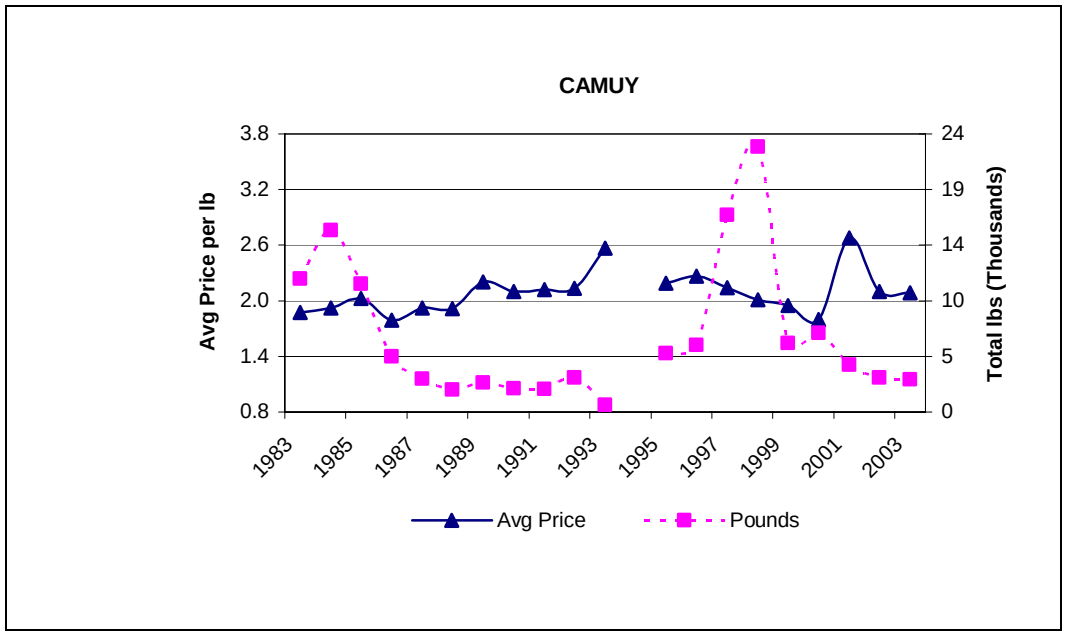
HATILLO	1950	1960	1970	1980	1990	2000
Population Characteristics						
Population [1]	20,877	20,238	21,913	28,958	32,703	38,925
Civilian Labor Force (CLF) [2]	5,221	4,568	4,777	7,336	10,730	10,811
CLF - Employed	4,982	4,388	4,495	5,465	7,819	8,374
CLF - Unemployed	239	180	282	1,871	2,911	2,437
Percent of unemployed persons	4.58	3.94	5.90	25.50	27.13	22.54
Industry of employed persons [3]						
Agriculture, forestry, fishing and mining [4]		2,420	1,177	676	724	537
Construction		232	582	373	497	641
Manufacturing		464	775	1,229	1,639	1,575
Retail trade		400	571	788	1,174	926
Socioeconomic Characteristics						
Mean travel time to work (minutes) [5]		N/A	N/A	N/A	20.8	26.6
Persons who work in area of residence [6]		3,088	2,411	2,271	3,102	3,500
Per capita Income (dollars) [7]			616	1,490	3,186	6,773
Median Household Income (dollars) [8]		810	1,700	3,926	7,900	12,378
Individuals below poverty level [9]			17,529	21,982	21,452	21,670
Percent of Individuals below poverty level			79.99	75.91	65.60	55.67

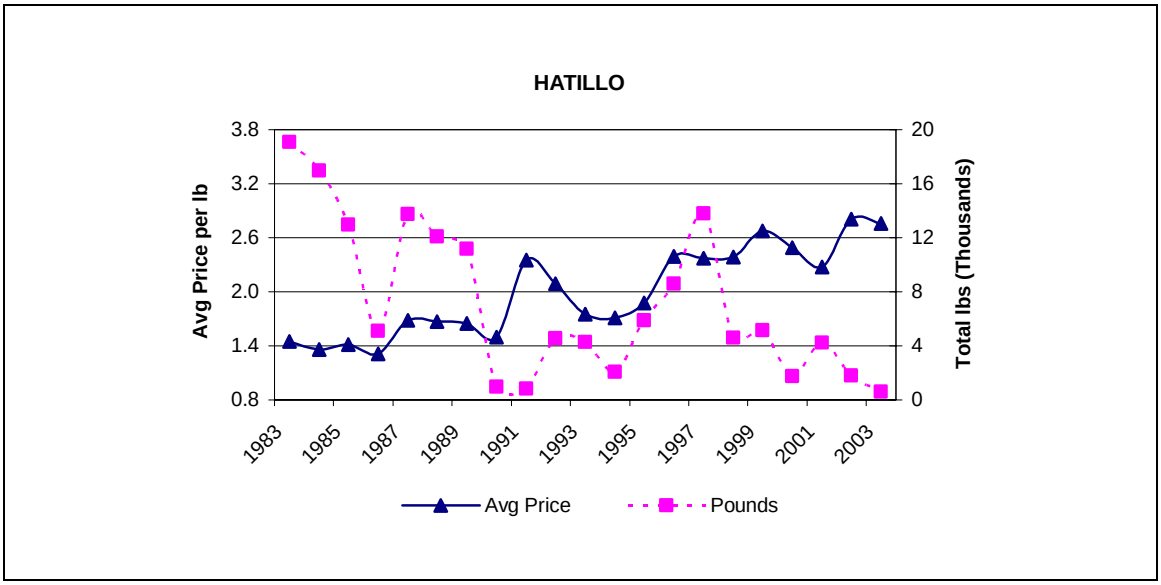
ISABELA	1950	1960	1970	1980	1990	2000
Population Characteristics						
Population [1]	29,113	28,754	30,430	37,435	39,147	44,444
Civilian Labor Force (CLF) [2]	8,280	5,676	6,122	8,486	11,725	12,975
CLF - Employed	8,043	5,504	5,700	6,854	7,819	9,827
CLF - Unemployed	237	172	422	1,632	2,343	3,148
Percent of unemployed persons	2.86	3.03	6.89	19.23	19.98	24.26
Industry of employed persons [3]						
Agriculture, forestry, fishing and mining [4]		2,768	1,115	478	462	246
Construction		428	773	570	458	813
Manufacturing		376	1,126	1,781	2,844	1,862
Retail trade		544	803	914	1,459	1,163
Socioeconomic Characteristics						
Mean travel time to work (minutes) [5]		N/A	N/A	N/A	19.3	25.7
Persons who work in area of residence [6]		4,048	4,121	4,102	6,129	5,368
Per capita Income (dollars) [7]			630	1,475	3,074	6,816
Median Household Income (dollars) [8]		506	1,569	4,252	7,433	11,685
Individuals below poverty level [9]			24,582	28,039	27,329	24,548
Percent of Individuals below poverty level			80.78	74.90	69.81	55.23

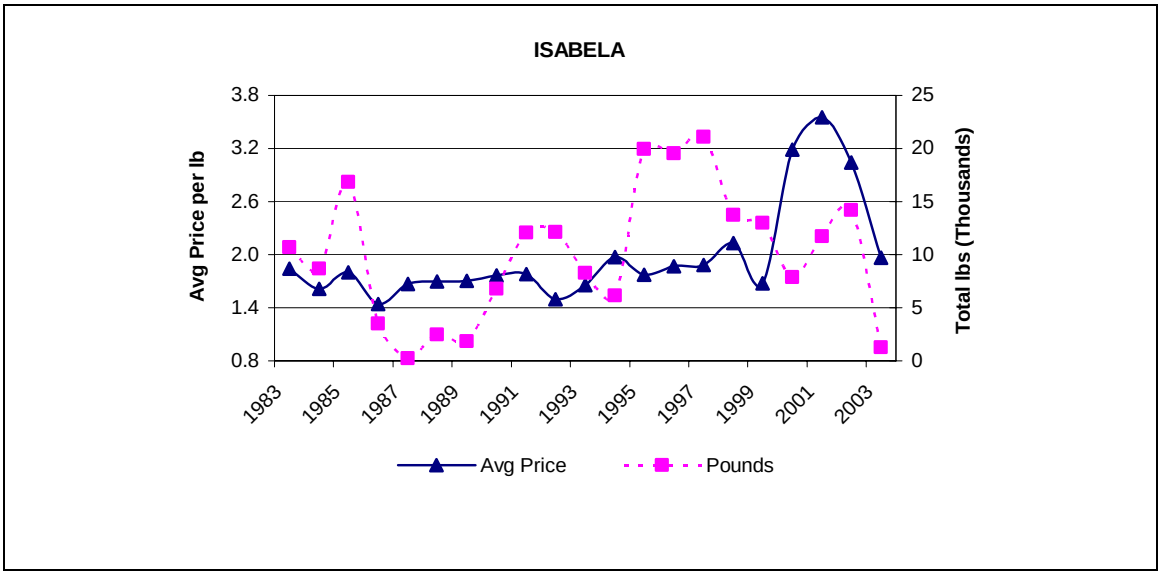
QUEBRADILLAS	1950	1960	1970	1980	1990	2000
Population Characteristics						
Population [1]	13,712	13,075	15,582	19,728	21,425	25,450
Civilian Labor Force (CLF) [2]	3,669	2,964	3,472	4,915	6,811	7,368
CLF - Employed	3,582	2,896	3,282	3,956	5,134	5,690
CLF - Unemployed	87	68	190	959	1,677	1,678
Percent of unemployed persons	2.37	2.29	5.47	19.51	24.62	22.77
Industry of employed persons [3]						
Agriculture, forestry, fishing and mining [4]		1,344	535	149	189	149
Construction		240	449	374	347	526
Manufacturing		300	828	1,120	1,252	1,420
Retail trade		240	408	512	914	572
Socioeconomic Characteristics						
Mean travel time to work (minutes) [5]		N/A	N/A	N/A	20.3	24.7
Persons who work in area of residence [6]		2,360	2,176	2,127	3,109	2,731
Per capita Income (dollars) [7]			664	1,600	3,058	6,209
Median Household Income (dollars) [8]		817	1,878	4,831	7,631	12,210
Individuals below poverty level [9]			12,161	14,107	14,361	14,056
Percent of Individuals below poverty level			78.05	71.51	67.03	55.23

Figures NC.1- NC.4: North Coast Fishery Landings Data, 1983-2003









These charts show some highly erratic landings and price fluctuations, though again not necessarily linked to one another in any predictable way. The correlation coefficients reflect this, with Arecibo's .7151, Camuy's -.2770, Hatillo's -.5178, and Isabela's .1428 (average = .015775). These findings are difficult to interpret, but again may point to the ability of fishers with lower landings to be more selective about what they sell and what they keep for themselves, distorting the average prices per pound in ways that we are less likely to find in municipalities with higher numbers of landing centers and higher landings. This entire north coast region has only one more landing center (8) than in Cabo Rojo alone.

North Coast History

Rainfall across the northern coasts of the Greater Antilles has nearly as much to do with the salient features of their histories as does human exploration and settlement. Always far wetter than the southern coasts, north coast environments on Caribbean islands with large central mountain chains encouraged settlement if only because the rivers flowing north have carved out sanctuaries from the sea. The northern municipalities described here are no exception. Lush and in places swampy, they attracted some of the earliest Native American settlers and continued to attract explorers into the colonial period.

Prior to European settlement, the north coast had been settled by the predecessors to the Taino—natives referred to in the literature as "archaic Indians." Significant archaeological sites have been found in Isabela (at Coto), Manatí, and Dorado and signs of their settlement are scattered all across the region. As hunters and gatherers, rivers tended to collect early natives, although the later caciques that emerged reached across coastal and mountain landscapes between the rivers as well.

Arecibo became the center of Spanish influence in the region, its port among the most important on the main island for shipping agricultural products. Turtle fishing was an early important economic activity from Arecibo, along with the production of a wide variety of crops and livestock. Toro Sugrañes calls Arecibo the most productive municipality on the island in terms of 19th century agriculture.

Variations of this economic profile characterized the municipalities to its east and west. Camuy emerged early as an important producer of livestock and milk. Vega Baja and Vega Alta, whose histories were intertwined because of periodic flooding from powerful rivers, was the site of primarily subsistence, peasant farming on fertile alluvial soils. Isabela specialized in livestock and fishing, with some production of plantains, tobacco, corn, and fruits until sugar rose to prominence in the 19th century.

Variations in agricultural activity and ties to other resources meant that slavery was unevenly distributed over the region, with higher concentrations of slaves in places like Arecibo and less common in Vega Baja and Vega Alta. The abolition of slavery across the region was accomplished with little difficulty, rapidly replaced, as it was, by a combination of a peasant-rural proletariat (or semiproletariat) labor force (Steward 1952).

Sugar—with all its tense and impoverishing class relations—dominated the north coast through the first five to six decades of the 20th century. However, during the past few decades the region has become more and more important as a center for both manufacturing and tourism. Resorts have sprung up in Dorado and other areas, and in many of the municipalities there were factories that produced clothes and shoes. While some of the manufacturing has declines, particularly the textile industry, the region still produces pharmaceuticals and computer equipment.

Fishing from the West Northern Muncipalities

Arecibo

Near the lighthouse and mouth of the Río Grande de Arecibo, the calm waters attract a variety of classes of recreational fishers, some of whom may fish for subsistence. Near the Club Nautico de Arecibo, an intersection beside a short bridge is bustling with *pincho* (shish kebob) stands and roadside barbeque operations. They advertise seafood *pinchos* along with other kinds. Recreational fishers fish from the bridge. They also fish from the much larger bridge leaving Arecibo just before the turn to the Club Nautico. Beyond the intersection is a small beach and another marina, Arecibo Outboard Club, which stores sportfishing and other recreational vessels.

Figure NC.5. Club Nautico de Arecibo with Sportfishing Boats in Background

The Club Nautico at Arecibo is distinct from those of the west and south coasts. Unlike the Club Nautico marina in Boquerón, for example, or the marina in Puerto Real, where commercial vessels squeeze in between the yachts, here there are few commercial vessels. Wilson reported in 1998 that 8 commercial fishers kept boats there, but they fished primarily for trip expenses (1998: 172). Our observations revealed that, today, nearly all the slips are taken up by sportfishing/ recreational boats. There is a ramp near the outboard club, and this happens to be one of the calmest, most sheltered locations along the whole North Coast, yet it has been more or less completely gentrified. In 1998, the club had between 250 and 300 members with 82 boat owners, with a few part-time artisanal fishers and many recreational fishers; only three have commercial licenses (Wilson 1998: 171). Recreational fishers hailing from Arecibo target sportfish such as marlin, dolphin, and tuna, while the artisanal fishers are more likely to target grouper and snapper using hand lines.

The Arecibo waterfront has been unevenly gentrified. Along the beach road are abandoned buildings that have been gutted and stand empty, although a few upscale neighborhoods parallel the coast nearby. In the neighborhood just off the short loop road 660, there are few signs of fishing and many signs of a population of the kind that may supply itinerant merchants and roadside stands to the tourist roads. Route 2 is lined with people selling food, towels, hammocks, toys, etc. Other neighborhoods near the beach road are somewhat more upscale, yet mixed, with still no signs of households using commercial fishing gear or keeping vessels.

Most of the fishing activity remains confined to the river mouth and bay where the Club Naútico is located. In 2002, we reported that one of the tourist attractions of Arecibo is the fish larvae (*el siti or zeti*), which is popular among Puerto Rican tourists in particular. This has developed into a festival held in October and June, which Wilson describes as follows: “During the festival, the restaurants prepare traditional foods with the Zeti’s meat. This festival, which coincides with the Zeti’s natural patterns of migration, promotes for a few days the economic development of the local sea food industry” (1998: 169).

Jarielito

Arecibo's fishing association, Jarielito, has around 30 members who fish with hand lines for a few deep water and a few pelagic species. They fish either 10 miles off the coast of Arecibo or to the west, where they target tuna, sawfish, and dorado. Among the problems Wilson reported was the association's lack of facilities to store fish in freezers, which limits their sales to low-level retail activity. Many restaurants in the area prefer imported fish.

Hatillo

In Hatillo, across from the police station, is a structure that appears to be an abandoned Villa Pesquera, inside of which was a ruined commercial yola. This was the only sign of fishing activity in the municipality. There seems to be slightly more commercial fishing activity going on from *Camuy* than from either of the other areas. Near a road called Camino de Muerte, we photographed one commercial vessel near a row of small housed, adjacent to the beach. Farther down 485 there was a surfer's place where 4 other vessels sat near a stainless steel fish-cleaning location. It may be possible to launch boats from this area: though it is rocky and rough, there is a large island and another large rocky spit that might provide some protection from the surf while they are launching the boats, much in the same way we described fishers launching vessels from Jobos Beach (Griffith and Valdés Pizzini 2002).

Figure NC.6. Fishing Vessels & Cleaning Station on Beach in Camuy

Puerto Hermina

This is a small beach facility on the Camuy/ Quebradillas border, where we photographed two recreational fishers. Otherwise, the place was empty (though there were two other cars) on this pretty Sunday afternoon. It is located at the bottom of a long, winding, paved road. At the top of the road is a nice restaurant, which said nothing about specializing in seafood, and a neighborhood where there was no conspicuous fishing gear.

Jobos

Here we have a little historical perspective. About 15 years ago, when we first visited this beach, a small fleet of commercial fishing boats set sail from Jobos. Now, however, the place has been completely gentrified, with a tiki bar and surfers and bathers and a handful of restaurants and hotels adjoining the beach.

The low commitment to fishing along the north coast, in every municipality except Isabela (discussed in more detail below), is evident in the data from the fishing census. In the five northern municipalities, a total of 68 fishers were included in the census, with more than three-fourths of those fishing fewer than forty hours per week and the mean only 24.5 hours:

Table NC.6. Association Membership and Hours spent Fishing, W. North Coast (n=68)

Variable	Response
Percent Affiliated to Association	83.8
Hours engaged in fishing activity	
0 – 20	44.1
21 – 30	32.4
31 – 39	4.4
40	14.7
> 40	4.4
Mean hours	24.5 (sd = 12.712)
Minimum	0
Maximum	55

Hand lines—the favored gear of subsistence, casual, and recreational fishers—are the most widely used gear in the northern municipalities, with nets, traps, and other gears used by relatively small numbers of fishers. Most fish the continental shelf, which is narrow along the northern coast, extending only around a quarter of a mile to the very deep Puerto Rican trench, which drops off precipitously; nearly two-thirds also list "oceanic" as a fishing location, however, indicating they have boats or access to boats. About the same percentage fish for their own bait, likely with cast nets. The low rate of fishing from the shore, as with low rate of use of beach seines, is probably a reflection of the north coast's notoriously rough seas.

Table NC.7. Locations and Fishing Types among W. North Coast Fishers (n=68)

Location or FishingType	Percent
Shore	10.3
Continental Shelf	92.6
Shelf edge	7.4
Oceanic	64.7
Reef fishes	88.2
SCUBA	11.8
Skin	7.4
Pelagic	44.1
Bait	61.8
Deep Water Snappers	58.8

Table NC.8. Gear used among W. North Coast Fishers (n=68)

Gear	Percent
Beach Seine	2.9
Trammel Net	1.5
Troll line	61.8
Fish trap	17.6
Gill net	17.6
Cast net	30.9
Hand line	79.4
Rod & Reel	30.9
Lobster trap	1.5
Snapper reel	2.9
Winch	24.5
Spear	13.2
SCUBA	10.3
Gaff	75.0

Based on observations and interviews conducted during the cultural mapping, it seems that the north coast fishers represent subsistence/ recreational fishing more than other municipalities in Western Puerto Rico. Although over eighty percent claim to be affiliated with an association, only a little over half sell to the association—just a slightly larger proportion than sell along the street, a favorite method of casual fishers—and nearly a quarter do not market their catch at all.

Table NC.9. Marketing Strategies among W. North Coast Fishers (n=68)

Marketing	Percent
Private	1.5
Fish buyer/ dealer	19.1
Association	54.4
Street vending	42.6
Restaurant	8.8
Own *pescadería*	0
Gutted	47.1
Iced	45.6
None	23.5

West North Coast fishers share many of the same views of the status of fishery resources we find across the islands, with nearly three fourths believing them to be in worse condition today than in past years. They differ from their counterparts in the eastern section of this region, however, in high numbers citing both pollution and habitat destruction as the principal causes of resource decline. This may be due to the dominance of the metropolitan area of Arecibo in the region, whose population and industry are responsible for both habitat-destroying development and pollution.

Table NC.10. Opinions of W. North Coast Fishers Regarding Fishery Resources (n=68)

Opinion	Percent reporting
Status of Fishery Resources	
Better	2.9
The same	23.5
Worse	72.1
Reasons for problems in fisheries	
Pollution	76.5
Habitat Destruction	72.1
Overfishing	10.3
Laws, regulations, and licensing	4.5
Crowding	0
Seasonal factors	0

Isabela: Punta Sardina

Isabela's *Villa Pesquera* sits amid several small businesses that cater to tourists across from one of several beaches in the area. Despite being situated along the north coast and comprised of part-time fishers, this association, like La Guancha in Ponce and El Seco in Mayagüez (both discussed below), takes advantage of a brisk seasonal and weekend tourist trade. Situated directly across from the beach, in an area that was built by the federal government (Department of Agriculture) and then rented to the municipality. The association sits in an area that experiences very high tourist traffic, much of it international. October is the height of the tourist season. The association adjoins four small huts that double as shops, bars, etc. and a convenience store that is also a bar & restaurant. A woman working at the convenience store reported that there were only two to three *bona fide* fishers fishing from that location.

The Association president, however, said that there were 15 members, all of whom fish part-time. They are principally divers and *cordel* (long-line) fishers, targeting lobster, conch, octopus, snapper, grouper, and dorado. They fish near the shorline from Quebradillas to Aguadilla, and never go as far away as the closed areas. While they aren't affected directly by the closures around Desecheo or Tourmaline, they are currently filling a niche in the nearshore waters that may be more heavily targeted as these off-shore areas become less accessible (legally). We know from other interviews that most fishers are familiar with the near-shore environment: during the windy, hurricane prone times of year, they are less likely to venture far off shore and so become knowledgeable about these nearshore areas: they are predisposed to fish them more heavily if regulations prevent them from going off-shore.

Members typically sell to a restaurant that is part of the facility, Restaurant el Pescador, though sometimes they sell from their homes or on the street as well. The president also noted that all of the fishers who fish from this area have other occupations, citing the lack of economic incentives to fish. That they are deeply embedded in the tourist development of the area is evident from the fact that the association president operates a small bar/ empandilla stand out of one of the permanent structures built by the DOA.

Figure NC.7. Isabela Villa Pesquera Association President's Bar/ Empanadilla Stand (note the Villa Pesquera lockers in the background)

Figure NC.8. Pescaderia near Villa Pesquera, Isabela

The president's wife works with him in the stand, and she said that this area was a great tourist destination, attracting people from all over the world. She mentioned "everywhere," but then specifically said a lot of people came from China. They stay in the beach hotel that is just beyond the new condominium complex. There is much construction going on in this region, and one of the association's projects is to get a ramp constructed. Right now they are waiting for an engineering report to secure a

permit and get it underway; already there has been a $20,000 university study to assess the feasibility of putting in the ramp. He said that once it was put in it wouldn't only aid commercial fishers, but jet skis and recreational boaters as well, indicating that they are willing to cooperate with the recreational sector.

The association hosts a Virgen del Carmen celebration, which is well attended. While they are a seemingly active association, with fine facilities, having the Virgen celebration, and applying to build a ramp, they nevertheless remain part-time and clearly well-integrated into the tourist industry, which dominates this area of the North Coast.

Figure NC.9. Monument between Villa Pesquera & Beach, Isabela

The plaque below her reads**:**

A
TOMAS CRUZ MEDINA, Q.E.P.D.
POR SU IDEA DE
ERIGIR EL ALTAR A LA
VIRGEN DEL CARMEN

In addition to the permit for the ramp, they would like to get permits to keep their boats on site rather than having to trailer them home every evening. Again, with all the construction occurring along the North Coast, combined with the tourist industry, there are alternative employment opportunities for fishers and their families, yet these may be either short-term (as with construction) or relatively low-paying, subservient jobs (as waiters, clerks, etc. in the hotels). There is no Club Nautico in Isabela: both people we interviewed said that the closest one was in Arecibo.

Our field team visited Isabela again on a Saturday to assess weekend activity. Although there were several people on the beach, the area around the Villa Pesquera was relatively dead. Only one of the huts

was open (the same one that was open the other day, belonging to the president), but there were some fishers landing their catch and I got the sense from seeing others around the community that the little parcela adjoining the association may be a kind of place-based "fishing community."

It seems to be primarily a weekend fishery, which is in line with part-time fishing. The pescaderia was open and there were about six men and a boy standing around unloading a boat and packing all the equipment both in a truck and in one of the *Villa's* storage lockers.

At least 4-5 seafood and other restaurants and bars neighbor the *Villa*, some at the end of the beach, near the rocks that offer some shelters for launching:

- El Sardinera Guest House & Restaurants
- El Pescador Restaurant
- Cafetin Brisas del Mar
- Waterfront Convenience Store
- 2-3 other places

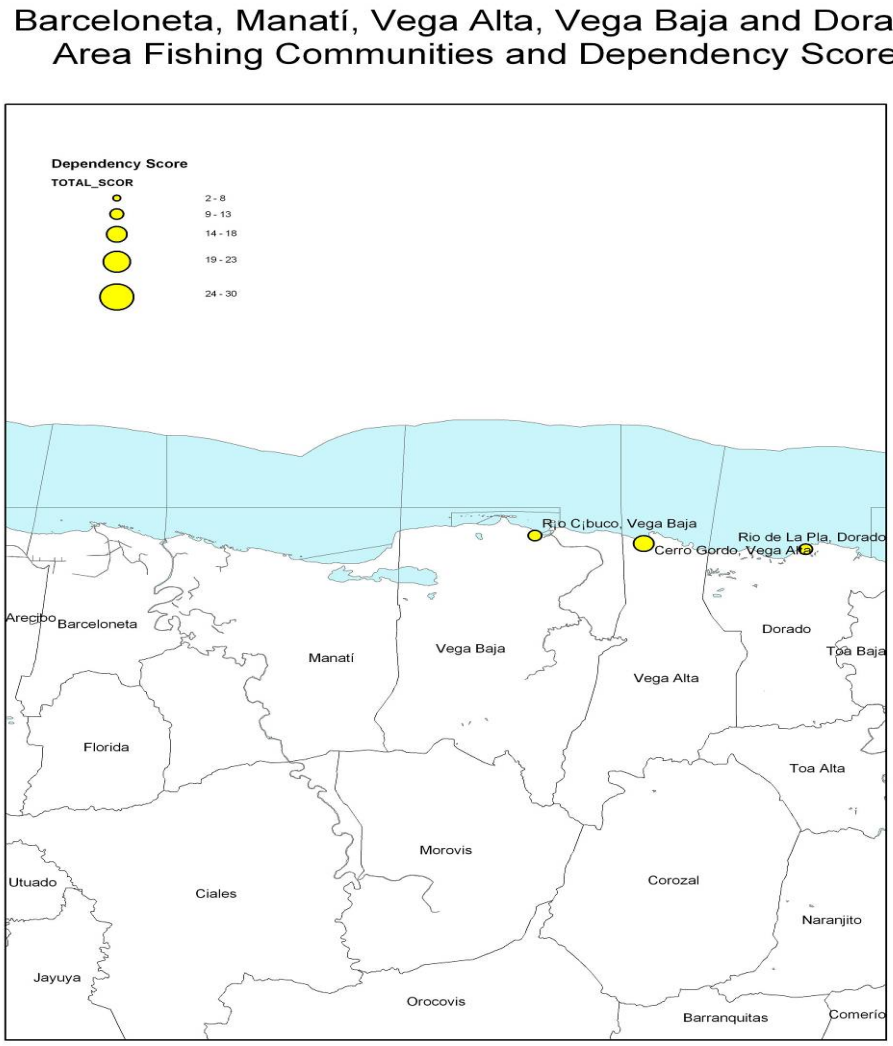
This whole area is welcomed with signs advertising the *Villa Pesquera*, separated from the rest of Isabela by the winding steep road from the main coastal highway to the sea. This enhances its appearance as a place-based fishing community, even if one where the fishers straddle part-time fishing and catering to the tourist trade.

Northern Muncipalities III:

Barceloneta, Manatí, Vega Baja, Vega Alta, Dorado

These municipalities stretch between the two largest metropolitan areas on the north coast— Arecibo and San Juan—where much of the coast is swampy and undeveloped yet interrupted at times by extensive, new, sprawling condominium and resort development. Like the other northern municipalities, fishing does not play a large part in the economy, again in part because of the lack of sheltered waters for launching. Tables NC.11 – NC.15 show that this is a region with typically high rates of poverty and unemployment, with the picture only improving as one moves closer to San Juan. Dorado's economic profile, slightly better than those of the others, still suggests somewhat lackluster performance.

Map NC.1. East North Coast Municipalities



Tables NC.11 – NC.15. East North Coast Census Data

BARCELONETA	1950	1960	1970	1980	1990	2000
Population Characteristics						
Population [1]	19,897	19,334	20,792	18,942	20,947	22,322
Civilian Labor Force (CLF) [2]	4,700	4,760	4,887	4,949	6,781	6,464
CLF - Employed	4,549	4,512	4,580	4,155	4,833	4,926
CLF – Unemployed	151	248	307	794	1,948	1,538
Percent of unemployed persons	3.21	5.21	6.28	16.04	28.73	23.79
Industry of employed persons [3]						
Agriculture, forestry, fishing and mining [4]		2,204	790	214	105	75
Construction		272	707	418	406	527
Manufacturing		840	1,099	1,505	1,544	1,393
Retail trade		324	539	303	463	468
Socioeconomic Characteristics						
Mean travel time to work (minutes) [5]		N/A	N/A	20.2	20.5	21.8
Persons who work in area of residence [6]		3,300	2,689	2,432	3,002	2,710
Per capita Income (dollars) [7]			648	1,665	3,183	6,938
Median Household Income (dollars) [8]		654	1,779	4,542	7,173	11,706
Individuals below poverty level [9]			15,491	12,685	13,478	12,483
Percent of Individuals below poverty level			74.50	66.97	64.34	55.92

MANATI	1950	1960	1970	1980	1990	2000
Population Characteristics						
Population [1]	30,449	29,354	30,559	36,562	38,692	45,409
Civilian Labor Force (CLF) [2]	7,374	7,436	7,593	10,281	11,967	12,569
CLF - Employed	6,836	6,864	7,132	8,126	9,635	9,553
CLF – Unemployed	538	572	461	2,155	2,332	3,016
Percent of unemployed persons	7.30	7.69	6.07	20.96	19.49	24.00
Industry of employed persons [3]						
Agriculture, forestry, fishing , mining [4]		1,992	881	320	214	195
Construction		444	718	660	589	708
Manufacturing		1,804	2,108	2,986	2,991	2,512
Retail trade		776	1,128	1,020	1,443	1,020
Socioeconomic Characteristics						
Mean travel time to work (minutes) [5]		N/A	N/A	22.5	21.0	27.1
Persons who work in area of residence [6]		5,432	4,566	4,638	5,752	4,865
Per capita Income (dollars) [7]			748	1,864	3,434	7,502
Median Household Income (dollars) [8]		786	1,924	4,871	7,161	12,796
Individuals below poverty level [9]			22,055	22,742	25,032	23,465
Percent of Individuals below poverty level			72.17	62.20	64.70	51.67

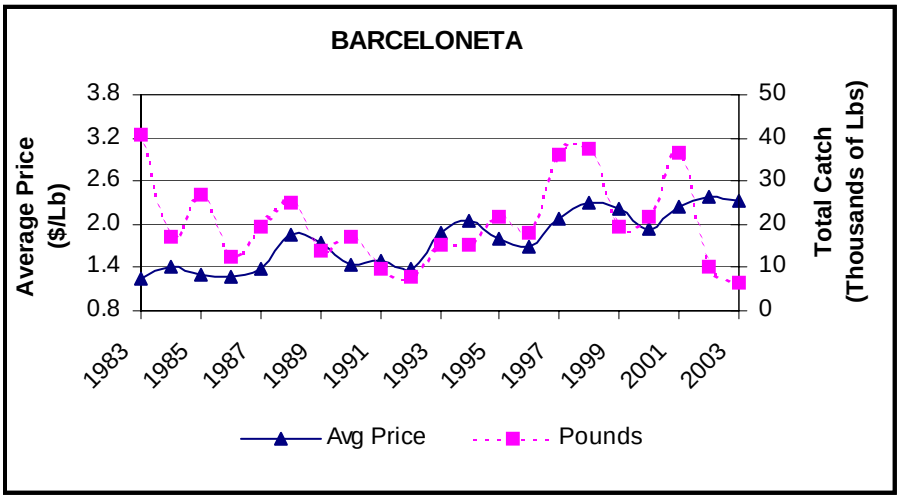
VEGA BAJA	1950	1960	1970	1980	1990	2000
Population Characteristics						
Population [1]	28,925	30,189	35,327	47,115	55,997	61,929
Civilian Labor Force (CLF) [2]	7,191	6,960	8,825	12,665	18,353	17,867
CLF - Employed	6,943	6,636	8,128	10,560	13,765	14,152
CLF – Unemployed	248	324	697	2,105	4,588	3,715
Percent of unemployed persons	3.45	4.66	7.90	16.62	25.00	20.79
Industry of employed persons [3]						
Agriculture, forestry, fishing and mining [4]		2,296	767	360	293	156
Construction		460	892	831	981	1,053
Manufacturing		1,552	2,557	3,836	3,878	3,597
Retail trade		644	1,059	1,224	1,923	1,675
Socioeconomic Characteristics						
Mean travel time to work (minutes) [5]		N/A	N/A	24.9	24.2	29.8
Persons who work in area of residence [6]		4,772	4,291	5,136	6,767	5,901
Per capita Income (dollars) [7]			755	1,898	3,389	7,279
Median Household Income (dollars) [8]		877	2,414	5,571	8,455	13,933
Individuals below poverty level [9]			26,089	29,594	34,185	31,287
Percent of Individuals below poverty level			73.85	62.81	61.05	50.52

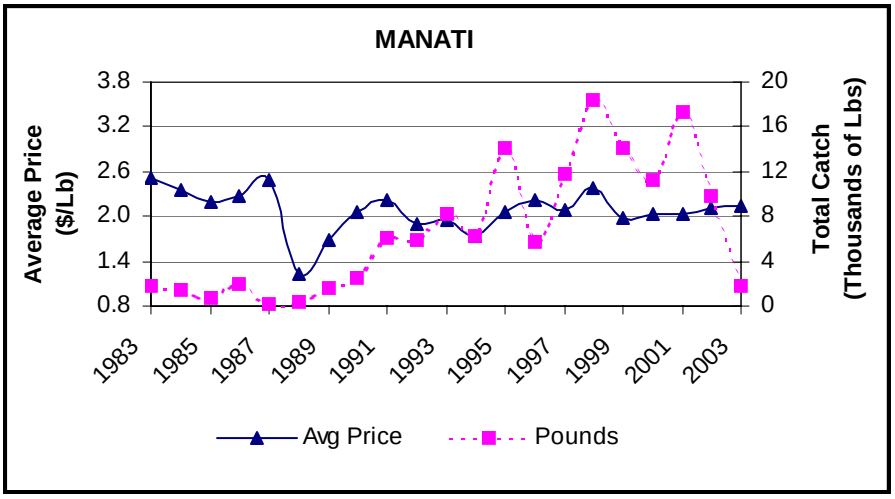
VEGA ALTA	1950	1960	1970	1980	1990	2000
Population Characteristics						
Population [1]	16,521	17,603	22,810	28,696	34,559	37,910
Civilian Labor Force (CLF) [2]	3,822	3,980	5,376	7,558	11,350	10,561
CLF - Employed	3,678	3,544	4,968	6,273	8,731	8,612
CLF – Unemployed	144	436	408	1,285	2,619	1,949
Percent of unemployed persons	3.77	10.95	7.59	17.00	23.07	18.45
Industry of employed persons [3]						
Agriculture, forestry, fishing and mining [4]		1,092	408	223	117	106
Construction		344	753	492	736	858
Manufacturing		836	1,367	2,195	2,252	1,776
Retail trade		340	657	700	1,168	977
Socioeconomic Characteristics						
Mean travel time to work (minutes) [5]		N/A	N/A	28.3	28.7	31.2
Persons who work in area of residence [6]		2,224	2,083	2,590	3,294	2,884
Per capita Income (dollars) [7]			705	1,680	3,313	7,356
Median Household Income (dollars) [8]		968	2,405	5,361	8,834	13,495
Individuals below poverty level [9]			16,616	18,805	21,909	19,224
Percent of Individuals below poverty level			72.85	65.53	63.40	50.71

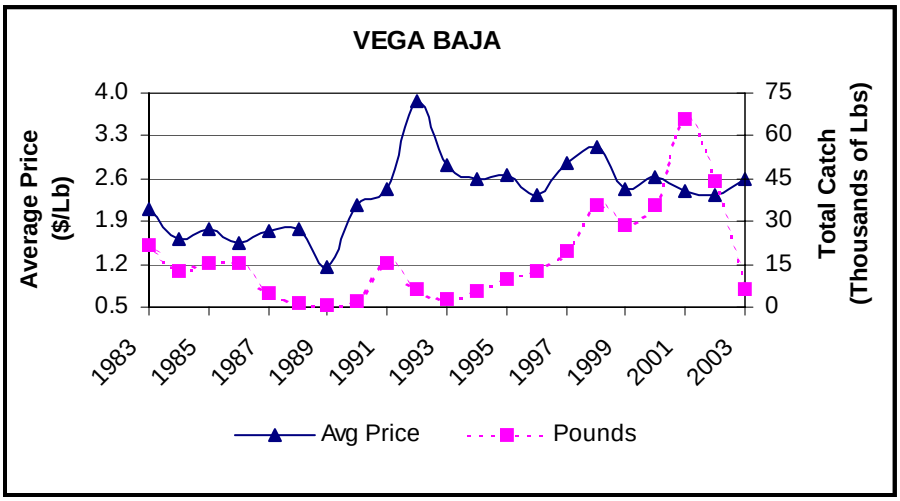
DORADO	1950	1960	1970	1980	1990	2000
Population Characteristics						
Population [1]	11,749	13,460	17,388	25,511	30,759	34,017
Civilian Labor Force (CLF) [2]	3,024	3,200	4,297	6,201	10,099	10,386
CLF - Employed	2,954	2,988	4,008	5,511	8,107	8,848
CLF – Unemployed	70	212	289	690	1,992	1,538
Percent of unemployed persons	2.31	6.63	6.73	11.13	19.72	14.81
Industry of employed persons [3]						
Agriculture, forestry, fishing and mining [4]		1,036	293	182	227	130
Construction		340	677	425	586	672
Manufacturing		464	833	1,546	2,022	1,383
Retail trade		196	308	455	972	892
Socioeconomic Characteristics						
Mean travel time to work (minutes) [5]		N/A	N/A	28.3	27.3	32.1
Persons who work in area of residence [6]		1,684	1,797	2,301	3,318	3,165
Per capita Income (dollars) [7]			781	1,938	4,326	8,765
Median Household Income (dollars) [8]		1,244	2,655	5,391	9,534	16,460
Individuals below poverty level [9]			12,046	16,537	17,204	14,012
Percent of Individuals below poverty level			69.28	64.82	55.93	41.19

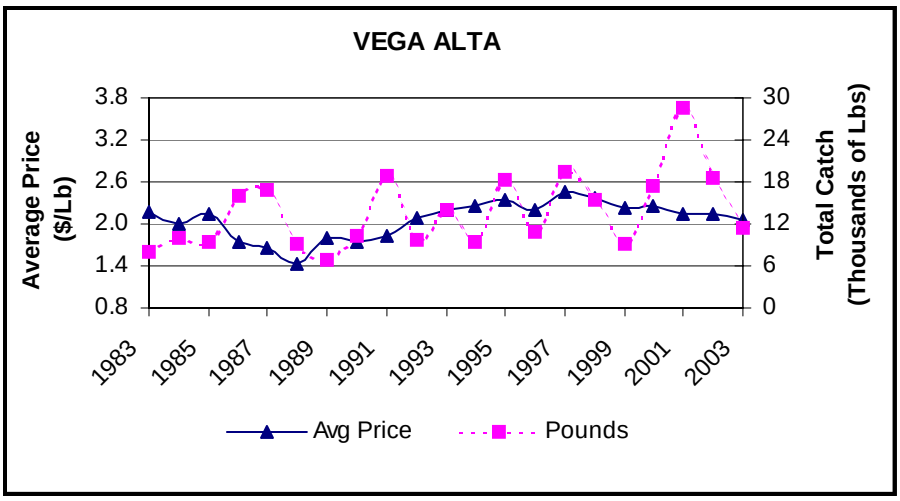
Of all the economic sectors listed in these tables, construction is the only sector that saw improvement from 1990 to 2000, reflecting both public works and the development of new housing, including coastal condominium high rises. Landings data from these municipalities reflect the decline in employment in agriculture, forestry, and fisheries. As noted in the introduction, north coast municipalities make up most of the lower quartile of the 1999-2003 landings data. Only Vega Baja did not make the bottom of the list.

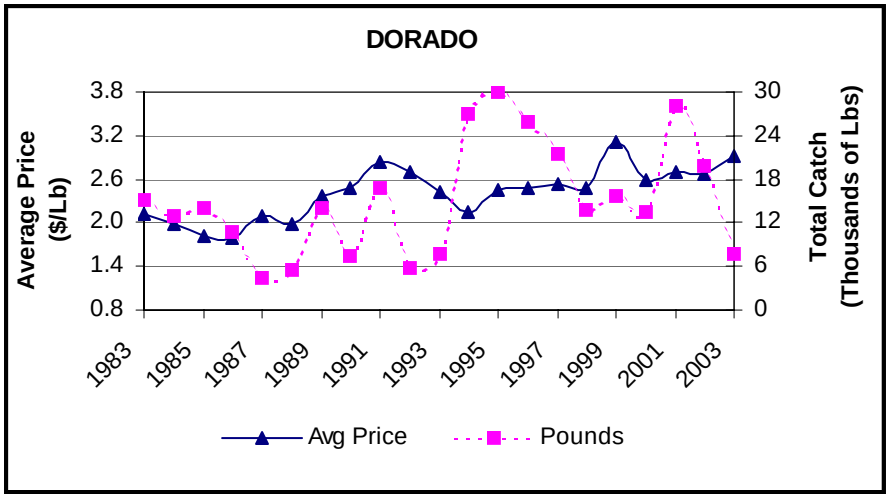
Figures NC.10 –NC.14. East North Coast Landings Data, 1983 - 2003




MANATI
Average Price ($/Lb)
Total Catch (Thousands of Lbs)
3.8
3.2
2.6
2.0
1.4
0.8
20
16
12
8
4
0
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
Avg Price
Pounds


VEGA BAJA
Average Price ($/Lb)
Total Catch (Thousands of Lbs)
4.0
3.3
2.6
1.9
1.2
0.5
75
60
45
30
15
0
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
Avg Price
Pounds


VEGA ALTA
Average Price ($/Lb)
Total Catch (Thousands of Lbs)
3.8
3.2
2.6
2.0
1.4
0.8
30
24
18
12
6
0
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
Avg Price
Pounds



Landings in all these municipalities have fluctuated considerably over the past 20 years, while price has risen steadily, more or less independently of supply. The correlation coefficients are as follows:

- Barceloneta .0821
- Manatí .0341
- Vega Baja .1808
- Vega Alta .2273
- Dorado .1741

Fishing from the East North Coast

Both the fishing census and landings data agree that this is primarily a line and gill net fishery, the fishers dividing their time between the reefs of the continental shelf for snappers and other deep water species and oceanic fishing for pelagics. The north coast is a known location for sports fishing that targets big game species such as marlin and swordfish; commercial fishers may take part in some of this activity, but are more likely to fish for smaller food fish than the larger game species. They are, too, primarily part-time fishermen, with just over two-thirds affiliated to an association, compared to over 80% west of Barceloneta on the north coast. Their part-time status is reflected in our ethnographic work, encountering fishers fishing irregularly over space and time in this region.

Table NC.16. Association Membership and Hours spent Fishing, E. North Coast (n=66)

Variable	Response
Percent Affiliated to Association	69.7
Hours engaged in fishing activity	
0 – 20	36.4
21 – 30	30.3
31 – 39	6.0
40	21.2
> 40	6.0
Mean hours	12.36 (sd = 12.466)
Minimum	0
Maximum	55

Table NC.17. Locations and Fishing Types among E. North Coast Fishers (n=66)

Location or Fishing Type	Percent
Shore	9.1
Continental Shelf	80.3
Shelf edge	4.5
Oceanic	59.1
Reef fishes	80.3
SCUBA	12.1
Skin	13.6
Pelagic	56.1
Bait	51.5
Deep Water Snappers	54.5

Table NC.18. Gear used among E. North Coast Fishers (n=66)

Gear	Percent
Beach Seine	10.6
Trammel Net	9.1
Long Line	39.4
Troll line	42.4
Fish trap	19.7
Gill net	48.5
Cast net	68.2
Hand line	68.2
Rod & Reel	65.2
Lobster trap	6.1
Snapper reel	10.6
Winch	27.7
Spear	27.3
SCUBA	9.1
Gaff	74.2

Table NC.19. Marketing Strategies among E. North Coast Fishers (n=66)

Marketing	Percent
Private	3.0
Fish buyer/ dealer	9.1
Association	50
Street vending	33.3
Restaurant	6.1
Own *pescadería*	4.5
Gutted	15.2
Iced	68.2
None	15.2

Table NC.20. Opinions of E. North Coast Fishers regarding Fishery Resources (n=66)

Opinion	Percent reporting
Status of Fishery Resources	
Better	7.6
The same	18.2
Worse	57.6
Reasons for problems in fisheries	
Pollution	42.4
Habitat Destruction	10.6
Overfishing	12.1
Laws, regulations, and licensing	1.5
Crowding	3.0
Seasonal factors	4.5

Barceloneta

Between Arecibo and Manatí, along the north shore, Barceloneta has at least two significant multipurpose fishing sites: Las Palmas Altas and La Boca. Both are situated along and at the mouths of rivers that offer some shelter from the otherwise crashing surf of the north coast. Both are recreational/ subsistence fishing and commercial fishing locations and neither has been extensively gentrified. Neighboring parcelas, even the houses along the waterfront, seem to be more working class than higher class.

Asociación de Pescadores Las Palmas Altas

The community of Las Palmas Altas sits along highway 641, a narrow coastal highway with a handful of small colmados and restaurants, most of which open only on weekends. In most places the highway runs within a few yards of the beach, allowing for, at the most, a single house lot, and in some places comes within about 100 yards of the surf (clearly within the 1918 Tsunami flood zone).

The association is a nice facility, although there was no one there at the time we visited and the gate was locked. The entire compound consists of a parking lot, a ramp, and a building with a covered porch/ patio on the back facing the river. Just upstream are a few rapids that must make sitting in that location quite pleasant. It is surrounded by a nice steel fence (not chainlink) and concrete walls.

Figure NC.15. Asociación de Pescadores Las Palmas Altas

Three vessels sat in the large parking lot (which was otherwise empty) near the ramp, and a fourth vessel was moored in the calm waters of the river near what appears to be a social club. One of them (the middle one, Figure NC.16) might have been a sportfishing vessel, but the others looked like those vessels in Playa Santa that the government gave to the fishers there: somewhat more modern in design than *yolas.*

Figure NC.16. Vessels Parked near Ramp at Las Palmas Altas

The posted signs warn that it is a private facility and that people wanting to park there need to request permission. No signs suggest that they have a pescadería, however, although there is enough space inside the facility that they could have one. Yet no signs advertised the selling of fish.

Figure NC.17. Side View of Asociación de Pescadores Las Palmas Altas

Just a few hundred yards to the west of the association, the river seen in the above picture empties into the sea. A recreational fisher near the river mouth, across from the pier (figure NC.18), said that it was just a small stream and didn't have a name. On the map, it is designated as one end of the *Caño Tiburones* (Canal of Sharks) that parallels the highway, running more or less east-west and emptying both here and in Arecibo, near the lighthouse.

Figure NC.18. Recreational Fishers on Pier at Mouth of *Caño Tiburones*

Where this river/ stream/ canal empties into the sea is a recreational fishing spot. On the western shore of the stream's mouth is a pier where at least two families of recreational fishers were fishing today. On the eastern shore another recreational fisher (the one who claimed the stream had no name) was setting up to fish.

La Boca

Just beyond the turn into the town of Barceloneta, where 681 becomes 684, there is a small community/ parcelas called La Boca. Locals I spoke with their said, "Toda de este area se llama La Boca," and was named, most likely, for the mouth of the *Río Grande de Manatí* (or so the map calls it). In fact, the people who mentioned this to me said that the river was also called La Boca, contrary to the map designation. These were recreational fishers, enjoying the day with a handful of others who had parked their cars facing the river, in a small parking lot.

This area is a recreational fishing area, although perhaps some commercial fishers use it as well. Far out on the point I saw two men tossing cast nets into the water, near where the river empties into the sea. Earlier, too, at a place called Pescaderia Pérez, on the coastal road in the parcela, I saw several men sitting around shooting the breeze, who may have been pescadores; another small cluster of men sat in the parking area at the end of the road, near the abandoned pescaderia depicted below.

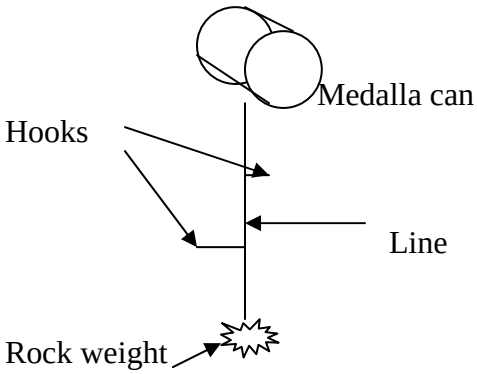
Figure NC.19. Abandoned Pescaderia Reyes/ Villa Pesquera at La Boca

This old pescadería sits across the drive and parking lot from the river. It was a Tuesday, but still active (still holiday season). Near the entrance to the parking lot were two seafood restaurants: one called "La Llave del Mar" (The Key to the Sea), specializing in seafood. The other was similarly disposed.

From the parking lot one can see the point depicted in the photo below (figure NC.20), from which the two men, barely visible here, were tossing cast nets for bait. They may have been using the same bait (camarones, or shrimp) as an old Medalla can fisher we interviewed: he had an interesting rig consisting of a Medalla beer can wound with line, two hooks, and a small stone that looked like a piece of gravel tied to the end. A sketch follows.

Figure NC.20. Fishers Casting Nets Off Point at the River Mouth, La Boca

Figure NC.21. Medalla (Beer) Can Rig Used by Fisher at La Boca



The sketch shows the basic rig, which had two hooks attached to a line that were wound around a Medalla can. Medalla is the local brewery's light beer.

Manatí

Much of coastal Manatí is swampy country, which may account for the lack of development along the beach. There are wide low country areas that seem too soggy on which to build, over which the road runs. Much of the country on either side of highway 686 looked to me like swamp. This municipality has a short coast line, with rough seas, and, according to one informant, no Villa Pesquera. This isn't surprising, with the lack of protected areas here. There are two Balenarios—Las Molinas y Playa Los Tubos—and the only recreational fishing takes place was from a bridge over highway 686 about 100 to 200 yards east of Playa Los Tubos.

The former beach, Las Molinas, may in fact see some recreational fishing, in that there is a wide lagoon type structure inside the surf, protected by rocks. The opening in the rocks is far too rough to launch boats from, however, and we did not actually see any recreational fishers, just lots of bathers and beach goers. Neither of these areas were active when we visited, although we only went during the week. Tubos was empty, and Las Molinas had only a handful of cars. One informant reported that the closest Villa Pesquera was in Vega Baja.

In a place called Los Altos there were a few *parcelas*, one of which was called Shanáy (perhaps after Shanghai, in Vietnam, because a disproportionate number of Puerto Ricans died in Vietnam and Korea). Among the *parcelas* in Los Altos were a few wealthy persons' homes.

Vega Baja

In contrast to Manatí, Vega Baja has been recently and is currently being heavily developed, with gated communities lining both sides of 686. The development includes a park called *Los Pescadores* ("The Fishermen") on the water, which is currently being renovated:

Figure NC.22. Park in Downtown Vega Baja

Vega Baja's *Villa Pesquera* is beyond this, down a long, isolated road in a line of facilities that includes a Pescadería, a Maritime Police station, and the Club Nautico de Vega Baja. This was the site of a dispute between recreational and commercial fishers that Griffith and Valdés Pizzini discussed in their book (2002: Chapter 7).

We were only able to interview people at the Villa Pesquera. The Club Nautico was completely empty, closed, and devoid of any activity at all. In fact it didn't look like it had been used for some time, although the inside, a social club, was relatively clean and well-cared for looking. Several photos of the facility follow:

Figure NC.23. Pier and Muelle at the Club Nautico de Vega Baja

Figure NC.24. Signs Adorning Club Nautico de Vega Baja

Figure NC.25. View of Club Showing Tournament Cross-Bars

Figure NC.26. Interior of Club Nautico, Showing Stuffed Marlin

As these photos depict, very likely the most preferred activity from the Club Nautico de Vega Baja is sportfishing for large game fish off the north coast of Puerto Rico, where the deep trench makes this fishing some of the best in the world. In Vega Baja (the town) they were actually advertising the selling of *Pinchos de Marlin* (marlin shishkabobs), which may suggest that this area is a good staging ground for deep sea fishing. However, there is an ambivalent dimension to this in Vega Baja, as the photo of the pier and the ramp show that, strewn with debris, they are difficult areas to launch vessels from.

Concerning the dispute chronicled in Fishers at Work, Workers at Sea noted above, the Club Nautico wanted a permit to build a ramp but the local fishers complained that they were being discriminated against. The club charges $10.00 for parking, which certainly discourages poor fishers from using the ramp (there is very little parking elsewhere). However, nearby there is a similar facility that will soon be the site of the Villa Pesquera de Vega Baja.

Villa Pesquera de Vega Baja

From this small, block and concrete building by the water, which sits on what must be at least a million dollar piece of real estate, they operate a small (*un congleador*—single freezer) *pescadería* and a restaurant with only two tables. The woman who operates the place is a kind of entrepreneur. She was a small elderly woman, perhaps 65-70, and she cooked in a hair net. They serve typical fare: seafood dishes and the array of empanadillas, king mackerel filets, and seafood snacks.

Figure NC.27. Villa Pesquera de Vega Baja (futuro)

When asked whether or not this was the Villa Pesquera, the woman said that it would be "*pronto.*" She said that there were about 20 members (mas o menos) in the association, but that they couldn't fish full time because of the conditions of the sea, which too often were rough. In the freezer were the fruits of their efforts, but all frozen, none fresh: chillo, mero, ballyhoo, etc. This suggests these are line fishers, reinforcing the information in the census and landings data.

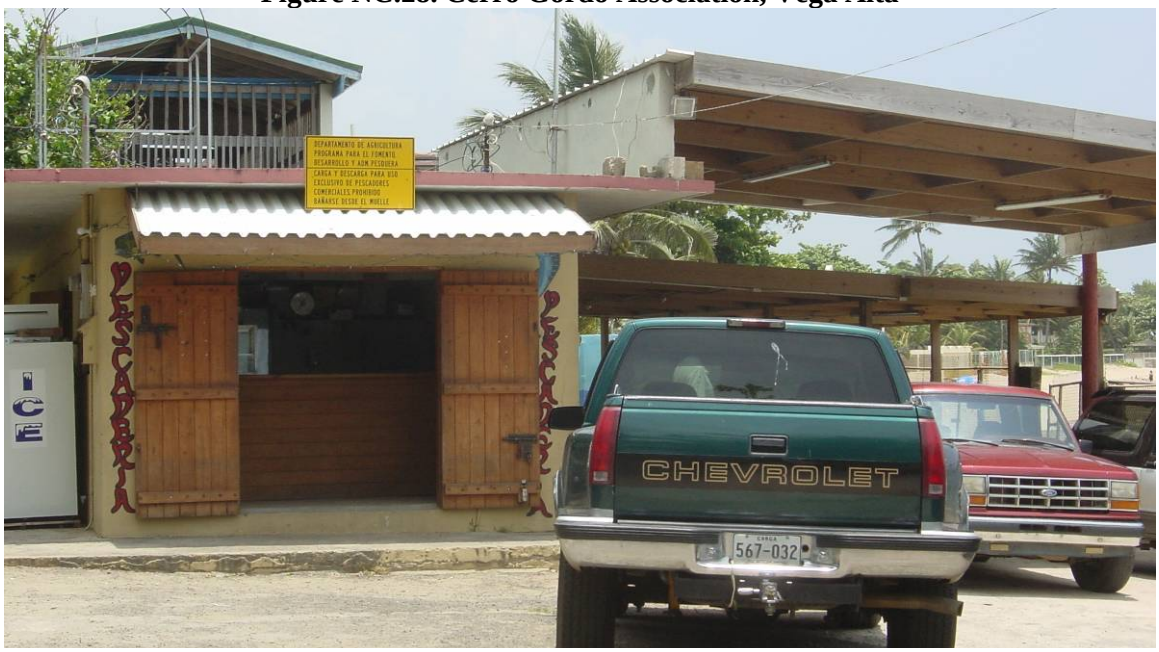
Vega Alta

Cerro Gordo

After stopping by the *Villa Pesquera* and receiving little help from those who were there, we happened upon the president of the association in a shop about five blocks from the *Villa* called J.E. Marine (La Casa del Pescador Comercial y Deportista). This shop is owned by his son and his daughter-in-law, and he was taking care of it while his son, a charter boat captain, was fishing. He was taking people near the waters of the Dominican Republic, and said that normally the fishers from this region fished the western shores, as far as around La Mona.

He said the number of commercial fishers in Cerro Gordo fluctuates between 18 and 22, some of which belong to the association and others who don't at any given time. Fishers have a tendency to come and go from the association, given the slightest little problem.

Figure NC.28. Cerro Gordo Association, Vega Alta



The association sits right on the beach. Fishers launch from a ramp that is gated when not in use, and they evidently allow recreational crafts to launch from this area as well, as one used the ramp when I was there today. They have to negotiate among bathers, however, particularly on weekends. It was a Saturday when we visited and the beach was packed.

Figure NC.29. Gated Ramp at Cerro Gordo Association

Despite that the fishers have a small area inside their pescadería that could serve as a bar and restaurant, taking advantage of the tourists, and that they have a glass box of the kind people use for empanadillas, this association was not serving food to the public during this busy weekend day. One informant said that most of the members were out fishing. However, I counted only 7 trucks in the parking lot, and one trailer. The president later told me that fishing was "mal" this time of year (June) and that the fish were small. He said that June and July tended to be poor months, but that things would pick up in August, when they would begin to catch big fish.

J.E. Marine

The familial link between commercial and recreational fishing is interesting, given Cerro Gordo's position as the only landing center in Vega Alta, an area that has been heavily developed and is continuing to develop (see photos, below, of neighboring Dorado). That the son, a fisherman's son, established a business that caters to both commercial and recreational fishers (as well as stocking a few items for the beach crowd) suggests that they are taking advantage of the new, changing conditions.

Dorado

Río de la Pla (Recreatonal Fishing Site)

We interviewed 5 recreational fishers near the downtown along the river. There's a small ramp and place where the boats tie up along water. They were mostly older men who said that recreational fishing was primarily good therapy. They weren't fishing today because the rains had made the waters muddy, but they said that the river would clear by the morning and that then they would fish again.

Figure NC.30. Ramp in Downtown Dorado

Dorado Villa Pesquera

We spoke with three different fishers here, one retired and the others active. The one who retired did so because the licenses got to be too cumbersome for him. They said there were 30 to 32 members in the association here. It sits next to a recreational fishing club site, where they host fishing tournaments. The youngest association member is around 17 and the oldest in his 80s.

The men we spoke with reported that there are around 300 boats in Dorado that use their facilities. Most of them are trailered here and stored at their homes. The men we spoke with fish to the west and east of

Dorado, never (or rarely) directly off shore. One, the president, fishes near the shore to the west, and another, a skin diver, fishes off Fajardo, between Fajardo and Culebra. The skin diver also works for the local park service.

Figure NC.31. Fishers Cleaning Fresh Fish, Dorado Association

The president said that the government hasn't helped them very much (all the assistance, he said, goes to Fajardo and Culebra), but in the absence of government assistance, they help one another, sharing bait and other things among the members. They say there is never a time that fisher is against fisher.

They fish off Río Manatí, but certain times of the year they run charters for marlin out of the association, fishing as far away as St. Thomas. Until September, they fish for sierra, colirubia, chillo, picua, pargo, etc.. They sell their catch individually, rather than through the association, out of their own freezers. The association does have an ice machine, which the members use and also they sell some ice to tourists, being so close to the *balneario*. The association is near not only the beach but a number of seafood restaurants, perhaps two blocks of them (at least five or six), that purchase fish from members of this association. They also sell to members of the community, but they said that they don't sell to the big hotels. Radisson, Embassy Suites, Hilton, and others have big resorts nearby.

Fishing varies considerably through the year. They use trasmallos, filetes, and chinchorros, as well as hooks and lines and traps, obviously engaging a number of gear types, but their primary problem along the north coast is that they can't fish through the year. Cabo Rojo and Fajardo, they said, are much better situated to have viable fisheries. Some times of the year they can't buy any more than beans with what they earn from fishing, they said.

The skin diver we interviewed fishes with a spear. His son and grandson are also skin divers. They fish for grouper, sometimes going as far as Costa Rica, vacationing, but fish primarily for food rather than income, selling only the surplus they can't eat. He was very environmentally conscious. The way he

fishes doesn't disturb the reef. He said there was a lot of contamination these days, which has led to a decline in fish. Griffith and Valdés (2002) report that north coast fishers mentioned contamination as a major problem. He mentioned, specifically, pharmaceutical and chemical companies, oil spills, growing coastal populations (human waste), and a lack of government punishments for contamination.

Mangroves, however, have been increasing. There have been some restoration efforts going on, but they have disappeared in other places, and he considered the *veda* (seasonal closure) for conch a good thing.

That this is an active, creative association is seen not only in their ability to tap into the tourist trade in a number of ways, but also in their expressed solidarity. They celebrate the Virgen del Carmen every year, reaffirming their identity as fishers. Along the north coast, they share many of the same characteristics as fishers from Isabela and Vega Baja.

Summary of the North Coast

With the growing importance of tourism on the north coast, fishers here have made in-roads into taking advantage of tourist economic activity, adapting their skills to charter boat fishing and providing services such as bait and ice to recreational fishers. With only a handful of functioning fishing associations across an area that spans more than half of the territory of the north coast, no community can be said to be dependent on fishing. Yet with the growing provision of services to tourists, an increasingly symbiotic relationship may develop that allows room for part-time commercial fishing, coastal development, and recreational uses of the coast to co-exist.

Appendix A:

Research Protocols & Survey Instrument

Contents:

- Open-Ended Interviewing Guide
- Questions for Charter Boat Captains
- Cultural Mapping Protocol
- Survey Form

Open-ended Interviewing Guide

Questions to ask individuals in municipalities:

Try to interview individuals who are familiar with either the fishing in the *municipio* or are familiar with the economy/ social make-up of the community (por ejemplo: mayors, civic leaders, etc.).

Questions for everyone:

Get some idea of what their role is in fishing and how long they have been involved in fishing.

How would you characterize fishing in your area?

For example, how many families in the community/ *municipio/ parcela* are dependent on commercial fishing? If not dependent, is commercial fishing important here?

Is commercial fishing important to the cultural heritage of this community/ *municipio* or to this neighborhood/ *parcela?*

Is commercial fishing an attractive part of the *municipio's* coastal landscape?

Is the economy of this neighborhood/ parcela, or are parts of the community/ municipio, dependent on recreational fishing (e.g. recreational fishing clubs, sportfishing charter boats, etc.)? If not dependent, is recreational fishing important here?

How many fishermen do you think there are in this community?

What are the most important jobs in the area?

What are common *chiripas/* informal sector jobs around here?

Would you describe the local economy as thriving, stable, stagnant, or depressed?

Do you know of festivals or events that celebrate fishing or the seafood industry in this community?

How important do you believe fish is to the local diet around here?

In what ways are marine resources important to the local economy? (e.g. diving, sportfishing, recreation, etc.)

Are there well-known or famous commercial or recreational fishers in this community? (e.g. *individuals known as local leaders, boat builders, artists or craftspeople who use marine resources, etc.*).

Could you list *parcelas* or neighborhoods where commercial fishers live? Where do most fishermen live in this community?

Questions for Fishing Association Members

How many members currently fish out of this location?

What kinds of gears do most of them use? Where do they fish, and for what species? [Here you want to ask about those territories of interest to NOAA managers: coral reefs, Tourmaline Bank, Buoy 6/ Abrir la Sierra Bank, and Bajo de Sico]

What kinds of businesses supply local fishing families? (*Elicit names of marine suppliers, gear manufacturers and dealers, ice distributors, boat builders, etc.)*

Are members of this association involved in any conflicts over fishing territories, gears, coastal development, or other factors? Are they between large and small vessels, different gears, and so forth?

Has the destruction of mangroves or pollution been a problem for commercial fishing in this area? Where is pollution a problem?

How has commercial fishing in this area changed in the past three to five years?

What are the relationships between tourism and commercial fishers in this area? Por ejemplo, how have tourists affected markets for seafood, land values, access points, etc.

Are young people from this area becoming involved in either commercial or recreational fishing businesses? Why do young people enter the fishery?

Questions for Sportfishers/ Club Nautico Members

How many members belong to the club?

How would you describe them? (e.g. as primarily local, from San Juan or other distant locations, well-educated, middle-class?)

Are the club's facilities used by commercial fishermen as well as sportfishermen?

Have the numbers or types of people using your facilities changed in the past three to five years? For example, more people from the metropolitan area, more seasonal visitors, more tourists, etc.?

What kinds of businesses supply or depend on recreational fishing around here? (*Elicit names of suppliers of gear, fuel, ice, etc.*).

Have members of the club been involved in any conflicts over access to dockage, launching facilities, crowding, or other issues?

Preguntas para Charter Boat Captains:

Cuánto tiempo ha estado envueltos en la pesca? *How long have you been involved in fishing?*

Cuál temporadas son mas importate para su negocio? *What seasons are most important for your business?*

Donde pesca? *Where do you fish?*

Cuantas clientes tiene por mes? Por año? *How many customers do you have per month? Per year?*

Especies pesqueras mas importantes, si esto ha cambiado en los ultimos años? Porque cambiaron? *What species (of fish) are most important, and have these changed in the past few years? Why did they change?*

Hay reglas particulares que son malas para su negocio? Porque? *Are there particular regulations/ laws that are bad for your business? Why?*

La economía de esta area o sector/parcela tiene lazos o depende de la pesca recreativa/deportiva? (Club de Pesca Deportiva, Club Nautico, Torneos de Asociaciones de Pescadores, Tiendas de efectos de pesca deportiva, T, etc.? *Is the economy of this area dependent on recreational fishing?*

De donde vienen sus clientes? Cuál estados, municipios, etc.? *Where do your clients come from? Which states, municipalites, etc.?*

Donde anuncia su negocio? *Where do you adverstise your services?*

Tiene información (p.e. precios) sobre su servicios? *Do you have information about your services (brochure, etc.)?*

Pesca en torneos? Cuales? *Do you fish in tournaments? Which ones?*

Lo ha mejorado, o no lo mejorado, su negocio? Porque o porque no? *Has your business improved or not? Why or why not?*

Tiene relaciones con pescadores comerciales (p.e. compra carnada de ellos, trabaja con ellos durante algunas meses, tiene amigos)? *Do you have relations with commercial fishers (e.g. buy bait from them, work with them some months, have friends)?*

Tiene relaciones con pescadores recreativas? *Do you have relations with recreational fishers?*

If associated with a club, ask the following questions too:

Preguntas para Pescadores Recreativos, Deportistas, Miembros de Clubes Nauticos:

Cuántos miembros hay en su club?

Usted conoce de alguien que se dedique a llevar a gente a pescar recreativamente?(Charters) Quien (es)?

Los miembros de su Club, son primariamente: 1)de clase alta, media, trabajadora, 2) Locales o de San Juan, 3) Extranjeros?

Ustedes organizan o patrocinan torneos de pesca o competencias pesqueras? Cuantas al año, como se llaman, que especies se persiguen? Cuales son los premios? De "pote" o con premios específicos?

Las facilidades de este club: Las usan también pescadores comerciales, o solo deportistas?

La gente que usan sus facilidades/club: ha cambiado en los últimos 3-5 años? Como?

Que tipos de negocios dependen de la pesca deportiva por aquí? (lista de nombres de suplidores de equipo, charters, hielo, sea tows, mecánicos de botes, etc.)

Los miembros de este club, han estado envueltos en algun tipo de conflicto por acceso al mar, ambiental, etc.?

Cultural Mapping Protocol
Site Name Municipio Location (directions) Nature of fishing facility (*Villa Pesquera, Club Nautico,* etc.) & activity
Type of site (landing center, marketing center, sportfishing location, etc.). *Frequented by tourists? Natives?*
Number and types of fishing vessels (include some description of condition, age, how well-maintained, how secure, etc.)
Gear present: types, numbers, etc. *Are there storage facilities for gear?*
Types and numbers of vehicles at the site (personal cars, trucks, vans, commercial vehicles, delivery vans, service vans, etc.) *Might any of these indicate linkages to other economic sectors?*
Marine Infrastructure/ type of access to marine resources (ramp, sheltered bay, beach, etc.). *Note numbers of docks, number of lockers to store fishing equipment, etc.*
Places people from this location fish (in-shore, off-shore, near mouth of river, etc.)

Cultural Mapping Protocol
Marine or fishing-related support services present (repair services, ice, gas, air for dive tanks, etc.)
Evidence of linkages to other sectors *(e.g. types of commercial vehicles doing business at site, others conducting business, alternative uses of the site such as for tourism, evidence of commercial fishers participating in alternative employment, etc.)*
Alternative employment in immediate vicinity

Perfil Socio-Economico de Pescadores/as y sus Comunidades en Puerto Rico

Entrevistador/a	Fecha	No. Contacts	Razón de rehúso	Núm. De Entrevistador/a	Sample*

***Important: Please note whether the interview came from random sampling or cluster sampling/ intercept.**

Se estima que en promedio se toma una hora en completar la entrevista contenida en este cuestionario, esto incluye revisar las instrucciones, identificar las fuentes de datos existentes, buscar y mantener los datos necesarios, y el proceso de completar y revisar la colección de la información. Envíe sus comentarios acerca de este estimado o cualquier otro aspecto o problema asociado a esta entrevista a Bob Walker, National Marine Fisheries Service, 75 Virginia Beach Drive, Miami, Florida 33149. Este informe es requerido y autorizado por 50 CFR 622.5(a)(1)(v). La información sometida será confidencial de acuerdo al NOAA Administrative Order 216-100. Sin embargo, ninguna persona será obligada a responder, ni sera Peñalizada por no hacerlo. El NMFS require esta información para la conservación y el manejo de los recursos pesqueros marinos. Estos datos se utilizarán para desarrollar un perfil socio-económico de las comunidades pesqueras.

Estamos llevando a cabo una encuesta entre pescadores/as del oeste de Puerto Rico para entender mejor los problemas que ustedes enfrentan, cómo trabajan junto a otros/as pescadores/as para resolverlos, cómo responden a cambios en los recursos pesqueros y a nuevas reglamentaciones de pesca, y qué le gustaría ver en el futuro. El estudio está diseñado para identificar comunidades en Dónde la pesca es importante, cómo la vida en estas comunidades está cambiando, y cómo distintas agencias y personas manejan esos cambios.

Todo lo que hablemos será confidencial. Cuando terminemos nuestras entrevistas y otros aspectos de este proyecto, escribiremos un informe en el que resumirá todo lo que hemos aprendido. No utilizaremos nombres de personas en este informe, tampoco escribiremos sobre temas sensitivos. Su participación en esta encuesta es completamente voluntaria y no tiene que contestar ninguna pregunta que no desee contestar. Si usted está de acuerdo con esto, y no tiene preguntas, me gustaría comenzar con la entrevista haciéndole algunas preguntas relacionadas a sus prácticas pesqueras.

Prácticas Pesqueras

Nos gustaría hacerle algunas preguntas sobre su historial de pesca y prácticas actuales, para identificar cambios en prácticas pesqueras a través del tiempo.

1. Actualmente, qué tipo de pesca realiza mayormente?
   - ☐ Es capitán de pesca comercial (o ☐ proel?)
   - ☐ Es capitán de un barco de pesca para fletar ("Charter boat") (o ☐ tripulación?)
   - ☐ Es capitán de un barco de buceo (o ☐ tripulación?)
   - ☐ Es capitán de un barco de pesca recreativa (o ☐ tripulación?)
   - ☐ Es usted alguien que pesca o bucea principalmente para comer?
   - ☐ Es usted alguien que pesca para obtener algún ingreso adicional para su hogar (los fines de semana, por ejemplo)
   - ☐ Otro (especifique):_____

2. ¿Quién lo introdujo a la pesca como profesión u ocupación?
   ☐ Padre ☐ Madre ☐ Esposa ☐ Esposo ☐ Hermano ☐ Hermana ☐Hijo ☐Hija
   ☐ Primo/a ☐ Amigo/a ☐ Suegro/a ☐ Otro/a _____

3. Por favor identifique en orden de prioridad las cinco artes o equipos de pesca mas importantes **hoy dia** y las especies que captura con estas (*1 sería el más importante y 5 el que sería el menos importante*):

Equipo:	**Especies (las 3 más importantes)**
__Chinchorro de Arrastre	_____
__Redes (filete/ trasmallo [], mallorquín [], attaraya []	_____
__Cajones (nasas para langosta)	_____
__Nasas de pesca	_____
__Palangre de fondo	_____
__Palengre vertical	_____
__Anzuelo(s) y linea	_____
__Buceo libre (sin tanque)	_____
__Buceo con tanque (SCUBA)	_____
__Pesca con figa	_____
__Otro (list): _____	_____

4. Por favor identifique en orden de prioridad las cinco artes o equipos de pesca mas importantes **hace cinco años** y las especies que captura con estas (*1 sería el más importante y 5 el que sería el menos importante*):

Equipo:	**Especies (las 3 más importantes)**
__Chinchorro de Arrastre	_____
__Redes (filete/ trasmallo [], mallorquín [], attaraya []	_____
__Cajones (nasas de langosta)	_____
__Nasas de pesca	_____
__Palangre de fondo	_____
__Palengre vertical	_____
__Anzuelo(s) y linea	_____
__Buceo libre (sin tanque)	_____
__Buceo con tanque (SCUBA)	_____
__Pesca con figa	_____
__Otro (list): _____	_____

5. Si encuentra que hay cambios en la composición del equipo, pregunte a qué se deben tales cambios (algún o cualquier cambio):

_____

_____

_____

_____

_____

_____

_____

6. ¿Cuán satisfecho/a se encuentra usted con la pesca como profesión?

☐ Extremadamente satisfecho/a ☐ Bastante satisfecho/a ☐ Satisfecho/a ☐ No muy satisfecho/a ☐ Insatisfecho/a ☐ No responde

7. ¿Cuán difícil es encontrar trabajo fuera de la industria pesquera?

☐ Extremadamente difícil ☐ Bastante difícil ☐ No es difícil ☐ Fácil ☐ No responde ☐ No se

8. Por favor, diganos cuales son las cuatro actividades no relaciones con la pesca mas importantes a las que se dedica:

1ra_____ 2da_____ 3ra_____ 4ta_____

9. Aproximadamenta ¿cuántos dias al mes usted pesca y cuántos días al mes realiza actividades que no están relacionadas a la pesca?

Mes	**E**	**F**	**M**	**A**	**M**	**Jun**	**Jul**	**A**	**S**	**O**	**N**	**D**
Pesca												
Trabajo no relacionado a la pesca #1: _____												
Trabajo no relacionado a la pesca #2: _____												
Trabajo no relacionado a la pesca #3:_____												
Trabajo no relacionado a la pesca #4:_____												

Información Demográfica, Sobre el Hogar y Sobre el Empleo

Ahora nos gustaría preguntarle sobre su hogar. Estamos interesados/as en entender la importancia de la pesca en comparación a otras actividades.

10. Cuál es su estado civil (o marital) actual?

☐ Soltero/a ☐ Casado/a ☐ Divorciado/a ☐ Viudo/a ☐ Otro_____

11. Número total de miembros del hogar (incluyendo el/la entrevistado/a): _____

12. ¿Cúantos miembros de su hogar (incluyendo a Usted) obtienen ingresos de la pesca? _____

13. ¿Cúantos miembros de su hogar (incluyendo a Usted) tienen otros trabajos no relacionadas con la pesca? _____hh

14.¿ Por favor, diganos cuales son las cuatro actividades no relaciones con la pesca mas importantes a las que miembros de us hogar se dedica:

1ra_____ 2da_____ 3ra_____ 4ta_____

15. Lazos comunitarios

a) ¿Su lancha/yola/bote/o barco fue construido localmente? (Sí/No)
Dónde (Pueblo/ciudad):_____ Nombre de la Compañía (si es posible):_____

b) ¿Le dá mantenimiento a su lancha/yola/bote/o barco localmente? (Sí/No)
Dónde (Pueblo/ciudad):_____ Nombre de la Compañía (si es posible):_____

c) ¿Usted le da servicio a su motor localmente? (Sí/No)
Dónde (Pueblo/ciudad):_____ Nombre de la Compañía (si es posible):_____

d) ¿Compra su equipo de pesca localmente? (Sí/No)
Dónde (Pueblo/ciudad):_____ Nombre de la Compañía (si es posible):_____

e) ¿Compra equipos electrónicos o de navegación localmente? (Si/No)
Dónde (Pueblo/ciudad):_____ Nombre de la Compañía (si es posible):_____

f) ¿Compra carnada localmente? (Si/No)
Dónde (Pueblo/ciudad):_____ Nombre de la Compañía (si es posible):_____

Composición de la tripulación

Ahora nos gustaría hacerle unas preguntas sobre su tripulación para poder describir completamente sus actividades pesqueras.

16. ¿Cúantas personas normalmente pescan con Usted durante un viaje de pesca tipico?

17. ¿Cuál es la etnicidad de la tripulación y su relación o parentesco con usted?

Miembro de la tripulación # 1: Etnicidad _____ Relación _____

Miembro de la tripulación # 2: Etnicidad _____ Relación _____

Miembro ¿de la tripulación # 3: Etnicidad _____ Relación _____

Miembro de la tripulación # 4: Etnicidad _____ Relación _____

18. Cuán difícil es encontrar una tripulación aceptable?

☐ Muy difícil ☐ difícil ☐ no es difícil ☐ muy fácil ☐ N/A ☐ No se

Disposición de la captura

Las siguientes preguntas son acerca de la captura, como esta se distribuye y se vende.

19. Cuál porcentaje de su captura es para… [si no sabe porcentajes, puede estimar como “la mitad, tercera, cuarta, etc.”]

___% Consumo en el hogar ___% para venta en el mercado __% Regalo a la tripulación.

___ % Regalos a la comunidad (iglesia, amigos/as, etc.). ___ % Regalo a clientes (e.g., capitán barco fletado) __ % Otro (especifique):_____ make sure matches 100

20. Dónde vende el pescado y qué porcentajes van a cada uno de estos sitios? [si no sabe porcentajes, puede estimar como "la mitad, tercera, cuarta, etc."]

Asociación de pescadores___%	compañía de pescado privada____%	mercado privado____%
Mercado público de pescado____%	comprador/a ____%	en casa ____%
Restaurante ____%	muelle o rampa____%	en la carretera ____%
otra (especifíque)_____ ____%		

Asuntos de Pesca

Ahora nos gustaría saber cuáles usted piensa que son los asuntos más importantes relacionados a la pesca local.

21. Por favor indique, usando la siguiente escala de 5 puntos, cuál cree que era el estado de los arrecifes de coral, recursos pesqueros, y mangles en su area hace 10 años, y hace 5 años? **Nota: si usted quiere contestar de manera específica a su area, no hay problema, aunque originalmente pensamos que su respuesta iba a ser global (de la isla completa) en lugar de ser tan específica.**

1=Arrecifes de coral muertos, ……., 5= Arrecifes de coral saludables,
1=Ausencia de peces, ……., 5=Abundancia de peces
1=Ausencia de mangles,…..,5=Abundancia de mangles

	Hace 10 años	*Hace 5 años*	*Hoy*	*Dentro de 5 años*
Arrecifes de coral				
Recursos Pesqueros				
Mangles				

22. Por favor expliquenos por qué cree eso acerca de los arrecifes de coral, peces, y mangles:

Arrecifes de coral:

_____

_____

_____

_____

Recursos pesqueros:

_____

_____

_____

_____

Mangles:

_____

_____

_____

_____

Reservas Marinas/ Temporada de veda

22. Ahora nos gustaría saber cómo usted se siente sobre los santuarios marinos locales y los cierres de temporada.

Area	¿Ha pesado allí? (Y/N)	Usted, ¿está de acuerdo o en desacuerdo con las siguientes aseveraciones sobre este tema, o diría que no sabe? (scale: 1= Fuertamente en desacuerdo; 5=Fuertamente de acuerdo; NS=No se; NC=No contesta)							
		Mantiene o aumenta araes de desove ("spawning aggre-gations")	Mejora cantidad de peces de arrecifes **adentro** reserva o veda.	Mejora cantidad de peses de arrecifes en áreas pesqueras **adyacentes de** reserva o veda	Protege espeecies explotatas en areas vulnerables (p.e. areas de vivero)	Restaura o mantiene la calidad del habitat (p.e. arrecifes de coral, mangles)	Crea problemas para sustentar a mi familia y a mi.	Crea problemas sociales o económicos en las comunidades que dependen de la pesca.	Mantiene y/o aumenta las oportunidades de empleo e inversión (p.e. charter, operadores de buceo)
Reserva Natural Canal de Luis Peña (Culebra)			Especies:	Especies:					
Laguna de Condado			Especies:	Especies:					
VI National Park & Coral Reef National Monument (St. Johns Park)			Especies:	Especies:					
Hind Bank MCD			Especies:	Especies:					
St. James Marine Reserve/ Cas Cay-Mangrove Lagoon			Especies:	Especies:					

Area	¿Ha pesado allí? (Y/N)	Usted, ¿está de acuerdo o en desacuerdo con las siguientes aseveraciones sobre este tema, o diría que no sabe? (scale: 1= Fuertamente en desacuerdo; 5=Fuertamente de acuerdo; NS=No se; NC=No contesta)							
		Mantiene o aumenta araes de desove ("spawning aggre-gations")	Mejora cantidad de peces de arrecifes **adentro** reserva o veda.	Mejora cantidad de peses de arrecifes en áreas pesqueras **adyacentes de** reserva o veda	Protege espeecies explotatas en areas vulnerables (p.e. areas de vivero)	Restaura o mantiene la calidad del habitat (p.e. arrecifes de coral, mangles)	Crea problemas para sustentar a mi familia y a mi.	Crea problemas sociales o económicos en las comunidades que dependen de la pesca.	Mantiene y/o aumenta las oportunidades de empleo e inversión (p.e. charter, operadores de buceo)
Grammanik Bank			Especies:	Especies:					
Veda a Boya 8/ Tourmaline			Especies:	Especies:					
Veda a Bajo de Sico			Especies:	Especies:					
Veda a Boya 6/ Abrir la Sierra Bank			Especies:	Especies:					
Veda a La Mona y Monito			Especies:	Especies:					

Area	¿Ha pesado allí? (Y/N)	Usted, ¿está de acuerdo o en desacuerdo con las siguientes aseveraciones sobre este tema, o diría que no sabe? (scale: 1= Fuertamente en desacuerdo; 5=Fuertamente de acuerdo; NS=No se; NC=No contesta)							
		Mantiene o aumenta araes de desove ("spawning aggre-gations")	Mejora cantidad de peces de arrecifes **adentro** reserva o veda.	Mejora cantidad de peses de arrecifes en áreas pesqueras **adyacentes de** reserva o veda	Protege espeecies explotatas en areas vulnerables (p.e. areas de vivero)	Restaura o mantiene la calidad del habitat (p.e. arrecifes de coral, mangles)	Crea problemas para sustentar a mi familia y a mi.	Crea problemas sociales o económicos en las comunidades que dependen de la pesca.	Mantiene y/o aumenta las oportunidades de empleo e inversión (p.e. charter, operadores de buceo)
Isla de Desecheo			Especies:	Especies:					

Temas sensitivos

Las siguientes preguntas buscan entender cuán dependiente es usted de las actividades pesqueras, en comparación a las demás actividades a las que usted se dedica.

23. ¿Cuánto le costaría reemplazar su embarcación/es y equipo de pesca y electrónico? $ _____

24. ¿Que porcentaje del ingreso total de su hogar (no ingreso personal) proviene de **actividades no relacionadas a la pesca**? ____ %

25. Compartando la situación economica de su hogar de hace cinco años con la de hoy, cómo describa su situacion económicamente? Diria que es:

☐Mucho Mejor ☐Mejor ☐Aproximadamente El Mismo ☐Peor ☐ Mucho Peor ☐ N.A.

Appendix B:

Glossary of Acronyms & Common Terms

Acronymns

CODREMAR	Corporación para el Desarrollo y Administración de los Recursos Marínos, Lacustres y Fluviales (Corporation for the Development and Administration of the Marine, Lake, and River Resources)
DOA	Department of Agriculture (Puerto Rican)
DRNA	Departamento de Recursos Naturales y Ambientales (Department of Natural Resources and the Environment)
EEZ	Exclusive Economic Zone
NOAA	National Oceanographic and Atmospheric Association (NOAA Fisheries was formerly the National Marine Fisheries Service).
RUM	Recinto Universario Mayagüez
UPR	University of Puerto Rico

Terms used frequently in text	*Meanings*
Anclas:	Anchors
Atarraya	Cast net
Buzos:	Divers
Cajones:	Lobster traps
Cala (La cala):	Hand-line; in some areas, a long-line on a spool.
Carnada:	Bait
Chinchorro:	Beach Seine
Chiripas:	Temporary jobs/ odd jobs/ casual employment
Club Nautico:	Nautical Club (recreational fishing/ boating club).
Colirubia	Yellowtail snapper
Colmado:	Small grocery & dry goods store
Cordel:	Type of hook-and-line rig
Dorado:	Dolphin fish (mahi-mahi)
Empanadillas:	Pastries filled with lobster, shrimp, meats, etc.
Filete:	Gill net
Fritura:	Fried pastries
Lancha:	Fishing vessel or boat
Langosta:	Spiny lobster
Malacates:	Diesel-powered rigs for pulling up fishing lines
Mallorquín	Trammel net (three-curtained net)
Mero:	Grouper
Muelle:	Pier or dock
Palangre:	Multiple hook-and-line stationary gear
Parcela:	Government-sponsored housing/ neighborhood
Pescadería:	Fish Market
Pinchos:	Shiskabobs (of fish, chicken, etc.).
Proel:	Crew member
Pulpo:	Octopus
Nasas:	Fish traps

Naseros:	Trap fishers
Sama:	Mutton Snapper
Sierra:	Kingfish or King Mackerel (also called *carite*)
Trasmallo:	Gill net
Villa Pesquera:	Fishing Association
Yola:	Typical fishing vessel (<25’ in length)

References

Notes on Data Sources

Landings Data: 1983-2003 Landings Data were provided by the Puerto Rican Department of Natural Resources, Mayagüez, Puerto Rico Laboratory.

- Average price: this is a weighted average.
- Pounds: this is the summation of the pounds.

Puerto Rican Census of Fishers, 2002. Fisher census data were provided by the Puerto Rican Department of Natural Resources, Mayagüez, Puerto Rico Laboratory.

Census Data Sources:

[1] http://www.censo.gobierno.pr/Censo_Poblacion_Vivienda/Datos_Históricos_1950_2000.htm
[2] http://www.censo.gobierno.pr/Censo_Poblacion_Vivienda/Datos_Históricos_1950_2000.htm
[3] US Department of Commerce. Bureau of the Census. US Census of Population: 1960-2000.
[4] The year 2000 also includes hunting.
[5] For 1990: US Department of Commerce. Bureau of the Census. 1990 Census of Population. Social and Economic Characteristics, Puerto Rico.
For 2000: http://fastfacts.census.gov/servlet/CWSFacts?geo_id=04000US72&_sse=on
[6] US Department of Commerce. Bureau of the Census. US Census of Population: 1960-1990 and http://factfinder.census.gov/servlet/DTGeoSearchByListServlet?ds_name=DEC_2000_SF3_U&_lang=en&_ts=113787863937
[7] Values are in current dollars. http://www.censo.gobierno.pr/Censo_Poblacion_Vivienda/Datos_Históricos_1950_2000.htm
[8] Values are in current dollars. http://www.censo.gobierno.pr/Censo_Poblacion_Vivienda/Datos_Históricos_1950_2000.htm
[9] http://www.censo.gobierno.pr/Censo_Poblacion_Vivienda/Datos_Históricos_1950_2000.htm

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Regional Profiles

We have ordered the regional profiles in this section with an eye toward describing the variety we find within Puerto Rico's fisheries as well as prioritizing the profiles, loosely, on the basis of dependence. For example, both the landings data and the dependency scores presented in table IV.2 place locations in Cabo Rojo and Lajas at the top of the lists regarding total landings and extent of dependence. Thus we begin the regional profiles with the Southwest Region that includes these two municipalities. From there, however, we move to the northeastern region because they too rank high in terms of landings and dependency scores, because they represent fisheries that have witnessed growing integration between commercial fishing and tourism (Fajardo), and because they include the two island municipalities of Vieques and Culebra. In the order below, we follow the northeastern profile with the remaining eleven regions, each of which is somewhat distinctive:

- Western Metro Region: Mayagüez, Añasco, Rincón: Another productive region, including the large science and education center of Mayagüez and the innovative fishers of Rincón, the Western Metro region represents fisheries that have been heavily influenced by their proximity to marine science and the University of Puerto Rico Sea Grant College Program.
- Northwest Region: Aguada and Aguadilla: This region includes one of the most well organized and powerful *Villas Pesqueras* in Puerto Rico, and is home to an artisanal boat building operation that supplies vessels to many west coast and north coast fishers.
- Southern Metro: Ponce and Juana Díaz: This region includes Ponce, where its La Playa Association has maintained and chronicled its history and identity in monuments along its shore and the Association at La Guancha has been innovative in taking advantage of the voluminous tourist trade that visits the neighboring beaches and park every weekend.
- Eastern Region: Naguabo, Humacao, Yabucoa, Maunabo: Stretching from Naguabo to Maunabo, this region includes important place-based fishing communities as well as the somewhat distinctive association that has managed to remain in business and even capitalize on the vast coastal gentrification taking place at Humacao's *Palmas Del Mar.*
- Southern Rural Region I: Guayama: Home to one of the most important place-based fishing communities in Puerto Rico, Pozuelo, this municipality-region is the heart of the islands' trap fisheries.
- Southern Rural Region II: Guanica, Guaynilla, Peñuelas: Incipient tourism alongside productive fisheries have defined this region since Griffith, et al. (1988) studied it in the late 1980s. It is also the site of Ricardo Pérez's 2000 dissertation and recent book (2005).
- Northern Metro: San Juan, Toa Baja, Cataño: This region includes the *Villas Pesqueras* of the capital, staying afloat among the cruise and commercial shipping of the busy port of San Juan.
- Southern Rural Region III: Salinas and Santa Isabel: This heavily rural region was once home to some of the most dominating sugar mills of Puerto Rico.
- Southern Rural Region IV: Arroyo and Patillas: Fishers in this region are primarily divers who neighbor regions where trap fishing is important; as such, they are involved in the age-old dispute between these two gear types.
- Northern Muncipalites I: Carolina, Loíza, Río Grande, Luquillo: Home to an African-Caribbean Heritage, the fishers of this region are involved in ongoing disputes with large coastal resorts over the health of its rich mangrove forests and wetlands.
- Northern Municipalities II: Isabela to Dorado: Most of the fishing communities and municipalities in this region rank low in terms of both landings and dependency scores.

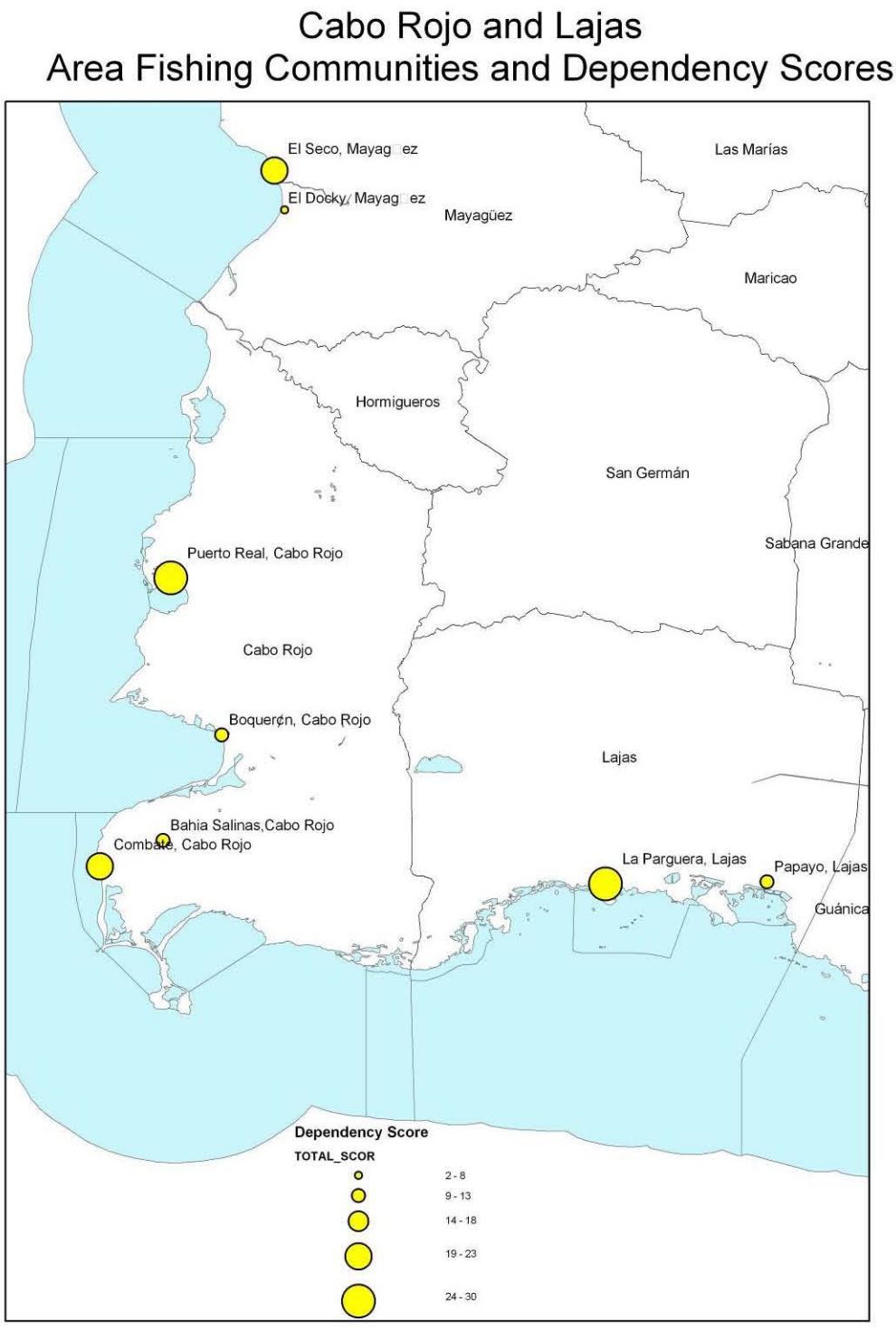
Southwestern Region:

Cabo Rojo and Lajas

There is little doubt that Puerto Rico's southwest coast has been and continues to be home to its most productive commercial fisheries, even in light of distinctive and elaborate developments in other municipalities, such as the increasing integration of commercial fishing and tourism in Ponce or Fajardo or efforts to professionalize fisheries in Rincón. Puerto Real, Cabo Rojo was the site of Valdés Pizzini's doctoral dissertation (1985), which was among the first anthropological studies of fishing in Puerto Rico and which encouraged and set the stage for several other related works on Puerto Rico's coastal communities (e.g. Valdés Pizzini, 1985, 1990; Valdés Pizzini, et al. 1988; Griffith, et al. 1988; Griffith and Valdés Pizzini 2002; Brusi 2004; Pérez 2005; García Quijano, forthcoming). Two other significant sites in Cabo Rojo, Boquerón and Combate, represent alternatives to the fishing styles of Puerto Real.

In addition, La Parguera in Lajas has tranformed, in the words of one its residents, from a fishing village to the capitol of Lajas, emphasizing the importance of this small coastal city in the regional economy. Its *casetas*—or houses built illegally into the mangroves and out over the bay—have been a point of contention among fishers and DRNA personnel at least since the 1980s (Valdés Pizzini 1990), yet collectively constitute one of the region's largest marinas and are occupied by professionals from as far away as San Juan. It has been the site of increasing gentrification, some of which has been spearheaded by long-term residents who have taken over public lands (Brusi 2003), and every weekend it attracts throngs of visitors from all over Puerto Rico. Finally, one of the largest of Puerto Rico's MPAs extends from the southern coast of Lajas.

Map SW.1. Southwest Fishing Communities



Cabo Rojo

Arguably the municipality in Puerto Rico most dependent on fishing, with the highest annual landings and the most productive fishers, Cabo Rojo has seven landing centers and at least as many significant sites where fishers congregate: four to five in Puerto Real, two in Boquerón, and one in Combate. The site of Valdés Pizzini's doctoral dissertation (1985), Puerto Real has long been the home port of deep water grouper-snapper fishers who fish the Mona Passage, as well as divers, many of whom sell to private fish buyers rather than to fishing associations.

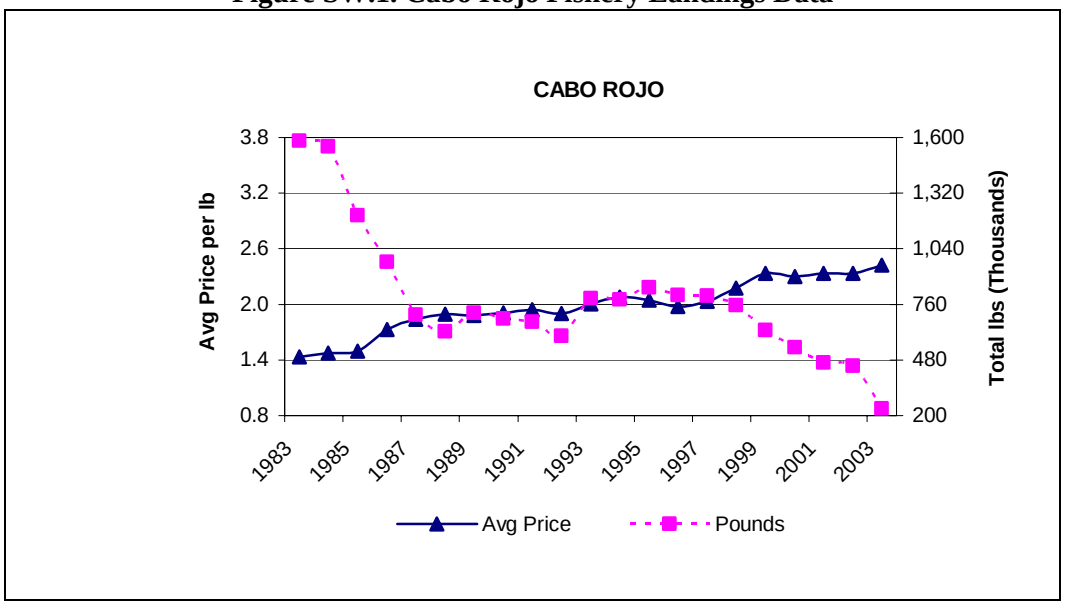
Table SW.1. Cabo Rojo Demographic Information

CABO ROJO	1950	1960	1970	1980	1990	2000
Population Characteristics						
Population [1]	29,546	24,868	26,060	34,045	38,521	46,911
Civilian Labor Force (CLF) [2]	9,311	6,220	7,395	10,040	13,483	15,701
CLF - Employed	9,174	5,948	7,041	8,934	10,501	12,801
CLF - Unemployed	137	272	354	1,106	2,982	2,900
Percent of unemployed persons	1.47	4.37	4.79	11.02	22.12	18.47
Industry of employed persons [3]						
Agriculture, forestry, fishing and mining [4]		2,516	1,649	690	608	388
Construction		228	624	636	749	1,118
Manufacturing		888	1,580	2,826	2,462	2,221
Retail trade		856	1,135	1,226	1,852	1,896
Socioeconomic Characteristics						
Mean travel time to work (minutes) [5]		N/A	N/A	N/A	20.3	24.6
Persons who work in area of residence [6]		4,908	4,630	4,887	5,762	5,957
Per capita Income (dollars) [7]			788	1,856	3,823	8,070
Median Household Income (dollars) [8]		844	1,994	4,478	7,832	13,580
Individuals below poverty level [9]			18,216	22,049	23,711	21,995
Percent of Individuals below poverty level			69.90	64.76	61.55	46.89

Despite its clear fishing community identity, for the past several years, Cabo Rojo's coast has been experiencing gentrification, with plans for major coastal development projects to the south and north of the town of Puerto Real, and already the growth of this nature has caused crowding in Puerto Real and elsewhere, where commercial and recreational boats often occupy slips side by side. Boquerón is somewhat ahead of Puerto Real in this regard, having witnessed massive construction projects for high-priced condominiums and an expansion of its tourist trade. Combate's growth, along with a part of Cabo Rojo across the bay from Puerto Real, has been somewhat distinct, with people using areas near the shore for mobile homes.

The above table shows trends similar to those in the other western municipalities: increased unemployment, declines in persons employed in the extractive industries, fewer individuals below the poverty line, and higher per capita incomes. Cabo Rojo lost about 10% of its manufacturing jobs from 1990 to 2000, while construction employment increased by nearly 50% (in part a function of gentrification) and retail trade increased slightly: again, a mixed economic picture not unlike the other municipalities.

Figure SW.1. Cabo Rojo Fishery Landings Data



Data from Cabo Rojo's landing centers, however, is less ambiguous. Landing over 2.2 million pounds valued at over $5.2 million from 1999 to 2003, fishers in Cabo Rojo ranked first among all municipalities, yet recent landings data suggest that this level of performance may not be sustained in the future. Dropping sharply from 1983 to 1989, landings remained relatively stable through the 1990s, with price reflecting supply (correlation coefficient = -.8705). The catch's value in 1990 was slightly more than $1.3 million, more than twice the 2003 value but only around 25% higher than the catch's value in 2002. In other words, falling catches have resulted in rising ex-vessel values, but 2003 was a particularly poor year.

Fishing remains a cornerstone of the economy of Puerto Real and a significant component of the economies of Boquerón and Combate as well. In each of these communities, seafood consumption is one of the principal draws for tourists, and weekend tourist traffic generates income for large and small businesses in all these areas. Joyuda, north of Puerto Real, is lined with seafood restaurants and beach hotels, and Boquerón is well known for its roadside oyster bars and booths that sell *pinchos* and *empanadillas* made with a variety of marine species of fish and shellfish, including octopus, lobster, trunkfish, and shrimp. Thousands of tourists visit the Cabo Rojo coast every weekend, and consuming local seafood is a significant part of its attraction. Despite this, fishers we interviewed find tourism and gentrification a mixed blessing, with fishers in Boquerón, where the process is furthest advanced, most likely to speak of these developments in negative terms.

Recreational Fishing from Cabo Rojo

In addition, sport fishing from Cabo Rojo has been robust in recent years. Some of the photographs that follow show that, combined with recreational boating, recreational fishing has created some slip space problems in Boquerón and Puerto Real, suggesting, at the same time, that recreational fishing has become more elaborate in Cabo Rojo. Along with its Clubs Nauticos, the municipality has at least two professional charter boat fishing boats, one of which has been in business for over a decade. Due to confidentiality issues, we discussed the charter boat business in more detail in an earlier, separate section, here simply mentioning that it comprises yet another dimension to Cabo Rojo's fishing profile, making it that much more dependent on fishing in all its forms.

Cabo Rojo History

Archaeological evidence suggests that humans have settled in Cabo Rojo since the time of Christ, and the municipality, primarily because of its salt resources at its southern end, was settled by Spaniards as early as 1515. At this time the seat of Puerto Rican government was in San German (east of Cabo Rojo), which dominated the entire southwestern coast and claimed Cabo Rojo's territory as its own until 1771, when Don Nicolás Ramírez de Arellano initiated plans to, and succeeded in, breaking from San German. Shortly thereafter residents began constructing its first Catholic church and a *Casa del Rey* (King's House)—two necessities for official recognition as a *pueblo* during the colonial period. Five years later they had completed both structures along with eleven houses and a handful of shacks, and they had over 1,200 inhabitants and a standing militia. Population growth was rapid thereafter, rising to over 10,000 by the 1820, about 8% of whom were slaves.

Early on Puerto Real became a bustling port, attracting foreigners and, as was common during the 18th and 19th centuries, first piracy and later contraband trade. Valdés Pizzini (1985) suggests that early commercial fishing from Puerto Real consisted of the export of marine turtle shells to San Juan. Through the 19th century the population became more diverse and grew to reach more than 16,000; by 1873 the enslaved population were freed and looked to Dr. Ramón Betances, an ardent abolitionist who achieved a level of heroism during the 1850s cholera epidemic in Cabo Rojo, as their leader. By the time the U.S. forces assumed control of Puerto Rico, in 1898, Cabo Rojo had eight schools.

Toro Sugrañes reports that the Masons were powerful in Cabo Rojo under the Spanish and that they became even more powerful there through the change to U.S. sovereignty, building a Masonic temple in Puerto Real in 1923 that was named after Dr. Betances (*Cuna de Betances*—Cradle of Betances). Shortly after this, fishing in Puerto Real began to take off. In the 1930s, Puerto Real fishers began selling fish up and down the west coast as fish dealers concentrated their efforts in this port city. These dealers, who eventually gained partial control of the fisheries of Puerto Real, established merchant capital ties to fishers, extending them credit and enabling fishing on the condition they sell to them. Eventually, through marriage, *compadrazgo* (ritual co-parenthood), and other cultural ties, dealers' families and fishers' families became intertwined, yet dealers continued to dominate the fisheries, investing in harbor infrastructure such as piers and ramps as well as in freezers. By the 1970s fish dealers organized the fisheries of Puerto Real, although fishing across the rest of Cabo Rojo, from ports like Boquerón and Combate, were smaller and less prone to the control of Puerto Real. Through the exploitation of the substantial grouper and snapper stocks in the Mona Passage, west of Puerto Real, however, Puerto Real fishers became the premier fishers of Puerto Rico in terms of landings and income.

Boquerón

The line of shops, booths, and small restaurants that runs along the waterfront in Boquerón is bordered on the north by Club Nauticó de Boquerón and on the south, across a narrow canal, by the Villa Pesquera of Boquerón. The Villa Pesquera adjoins a public beach and neighbors some of the most expensive real estate in town. Ten fishers fish from this Villa Pesquera, using trammel nets, gill nets, and long lines. They captain between 6 and 7 vessels. In addition to typical facilities (29 lockers, a pier for launching and mooring boats), the Villa also has facilities for repairing boats and, as usual, a *pescaderia.* Most of them fish to the south of Boquerón, off Point Guaniquilla. While none currently fish from Bajo de Sico, Abrir la Sierra, or Banco del Medio, they said that they did fish these areas previously, indicating they were negatively affected by the closures. Those we interviewed were not forthcoming regarding the times of year or the extent to which they fish these areas.

Figure SW.2. New Coastal Development in Boquerón

As in other places experiencing gentrification, Boquerón's growth, according to local fishers, has turned young people against fishing. Jobs in construction are plentiful in the area, with the construction of new high-rise condominiums, and construction is a typical area that absorbs fishers when they need additional income. The fishers of the association claim that they sell their fish in Cabo Rojo (the capital city) rather than to local restaurants, because, they believe, locals are "working to eliminate the small scale fisherman in order to attract [other] businesses." Instead of buying from local fishers, the restaurants bring in frozen fish. Even "for Lent," one fisher said, "it all comes from outside."

Among the problems that Boquerón fishers noted was the failure of the local fishing community, which is already small, to reproduce itself. According to one we interviewed, the young people in the area don't want to fish commercially, but instead want to catch fish as a game, without realizing that "one cannot play at sea" (that is, one must take fishing seriously).

Figure SW.3. Club Naútico of Boquerón

Playing at sea, of course, is exactly what members of the recreational fishing community of Boquerón are interested in. The above photograph depicts their Club Nautico, which sits in the heart of the busy coastal road of downtown Boquerón, nestled among the weekend oyster and pincho stands and a SCUBA diving school. Nearby are businesses that rent kayaks and other watercrafts and offer boat rides. The few recreational fishers we interviewed in Cabo Rojo were more or less split between SCUBA divers and hook-and-line fishers, with one of the former a captain of a dive boat and one of the latter fishing primarily for food. This reflects the range of recreational fishing in a place like Boquerón, where one is liable to encounter recreational fishers from all social classes and fishing from boats, piers, bridges, and the shore. These different fishing styles produce different results, and species that recreational fishers from Cabo Rojo reported landing include near-shore fish and shellfish like snook and conch as well as deep water snapper and grouper species.

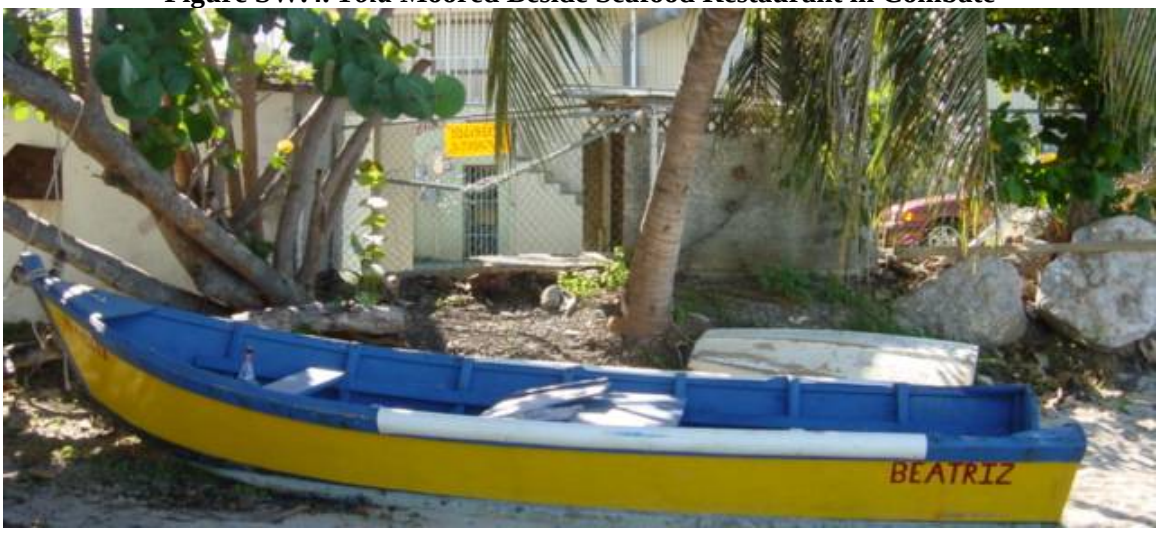
Combate & Bahia Salinas

The isolation of Combate (as well as Bahia Salinas, to the south) may factor into their dependence on fisheries, in that both of these places sit at the ends of dead-end roads, quite off the beaten track. Bahia Salinas consists of little more than a rutted road with a small hotel, a salt mining operation, and a few families who fish. Combate, however, is a different story. It is a community whose isolation has both costs and benefits. When we asked local fishers about marketing in Combate, one said that there was no competition from other fishers in Cabo Rojo (*"En Combate no hay competencia")*; at times, even, when Puerto Real fish buyers are having trouble keeping up with demand, they get fish from Combate. Yet its isolation may contribute to the perceived marginalization of its association and its utter lack of government assistance.

Combate has several seafood restaurants (5, at least) in the downtown area, and is also home to a phenomenon that is somewhat rare in Puerto Rico: mobile homes. There are hundreds of small mobile homes, slightly larger than campers but not quite as large as the single- and double-wides one sees across the rural South. These kinds of dwellings suggest that the community is home to many seasonal residents who, no doubt, enjoy local seafood when they're staying in town. Again, this is a town whose population and demand for marine resources fluctuates through the week.

There is an active fishing association in Combate, near the downtown, that is currently repairing a large pier in front of it facilities. Adjoining the association is a small beach with cabanas and other infrastructure, a place active on weekends. Although the association's facilities are less elaborate and older than those at Aguadilla, they nevertheless seem fairly complete: with 20 storage lockers, a *pescaderia*, at least two cleaning facilities, and a shaded area where the fishermen gather and talk when they aren't fishing. According to the president of the association, 24 fishers belong to this association, yet its viability as a functioning association was in question at the time we visited. Although you must be a resident of Combate to have a locker at the association, fishers who belong need not sell to the association. Instead, its main usefulness is that it is a place where fishers can repair vessels. The association could use two more vessels to be able to fish more effectively with beach seines (for bait) and gill nets.

Figure SW.4. *Yola* Moored Beside Seafood Restaurant in Combate



Currently, fishers from Combate use a combination of hook-and-line rigs, trammel nets, and diving. There are distinctions between the divers and those who use the other gears. The divers catch conch and lobster, which they sell to restaurants in Combate and outside of the community instead of to the association, and they also buy most of their equipment from outside the community.

The others fish primarily for parrotfish, snappers, groupers, and dorado, which they sell locally and to two or three buses that come to the association periodically from neighboring municipalities. One from Guayanilla (about thirty miles due east from Combate) buys around 100 pounds of fish from them each time it comes. They also sell to eight to ten local *colmados* (small grocery stores) and supermarkets, including Mr. Special and Pitusa (two large chains). Typically they fish six to seven miles off shore, or close to Abrir la Sierra and Boya 8. While fishing these areas, they often catch fish that they cannot sell and for which they may be fined. They mentioned several species, barracuda, *jurel*, and *madrigal*, that are candidates for ciguatera poisoning and hence off limits. With long-lines (*la cala*), they often accidentally catch sharks that they have to throw back. More troubling to thoughtful fishers, however, is that when they pull snapper and grouper from deep water (over 20 fathoms), the fish die from lack of pressure but the fishers have to throw them back or else they will be fined. These observations provide additional argument for incorporating fishers' environmental knowledge into the regulatory process.

One of the underlying reasons for the association's lack of viability is that it has received little to no help from the government through the years. The small shed where they process the fish needs between $10,000 and $12,000 in repairs. They can't afford these repairs in part because of recent licensing requirements, which have placed additional costs on fishing, with separate licenses required for some species. The president viewed himself and the others of the association as poor and powerless, and he believes that government funding has been unevenly distributed over fishing associations around the island. "All of the fishing programs," he said, "stay in Ceiba and Fajardo" (both on the Eastern side of the Island and common recreational destinations for people from San Juan). Other than these programs, the government has, according to Combate fishers, cut benefits for most fishers and fishing communities. One said, "We are 2,000 fishermen [in Puerto Rico] and we can neither knock the government down or raise it up," reiterating the powerlessness this fisher perceives. We emphasize that these are fishers' *perceptions*, which may not be 100% accurate yet do reflect the reality of fishing folk in Puerto Rico. As such, fisheries managers need to pay close attention to them, initiating educational programs if they find them at odds with their perceptions of reality.

Puerto Real

Few would dispute the notion that Puerto Real is, if not the most, one of the most fishing dependent communities in Puerto Rico. Since Valdés Pizzini wrote his doctoral dissertation in the mid-1980s, the community has changed in significant ways while still managing to maintain a heart of commercial fishing. Our interviews in Puerto Real elicited mixed reactions concerning the ways the community has been changing, particularly regarding the proposed developments to the north and south of town, with some viewing these as adding to current problems of adequate space for boats and others seeing them as potential benefits to fishers in particular and the community at large: "*Si viniera una nueva marina vecinos de nosotros pues sería positivo porque viene más turismo y más ingreso.*" ["If a new marina becomes our neighbor, well, it would be positive because it brings more tourism and more income."]

Figure SW.5. Chapel of the Virgen Del Carmen, Puerto Real

La Villa

La Villa is an association with 20 firm members who sell to its market, and others who sell to the association but are not considered members. Its facilities include a small bar, which they rent to a private individual, and other typical association facilities. The majority of the members (12 of the 20) are bottom-fish line fishers, who fish primarily for snappers and groupers for sale principally to local restaurants; one of these fishes the Mona passage with a large vessel outfitted with a winch and the others fish from smaller vessels with hand lines (*cordel)*. Six divers and two trap fishers make up the remaining members. It may be somewhat unique to have fishers fishing these two gears in the same association, given the fact that trap fishers often accuse divers of stealing from their traps, yet diving has assumed a more prominent role in Puerto Rican fishing over the past few years, while trap fishing has declined (Matos 2002). The mix here may reflect this island-wide trend. The divers fish around the bouys off shore, including Boya 6, as well as Tourmaline.

Map SW.2. Puerto Real Bay

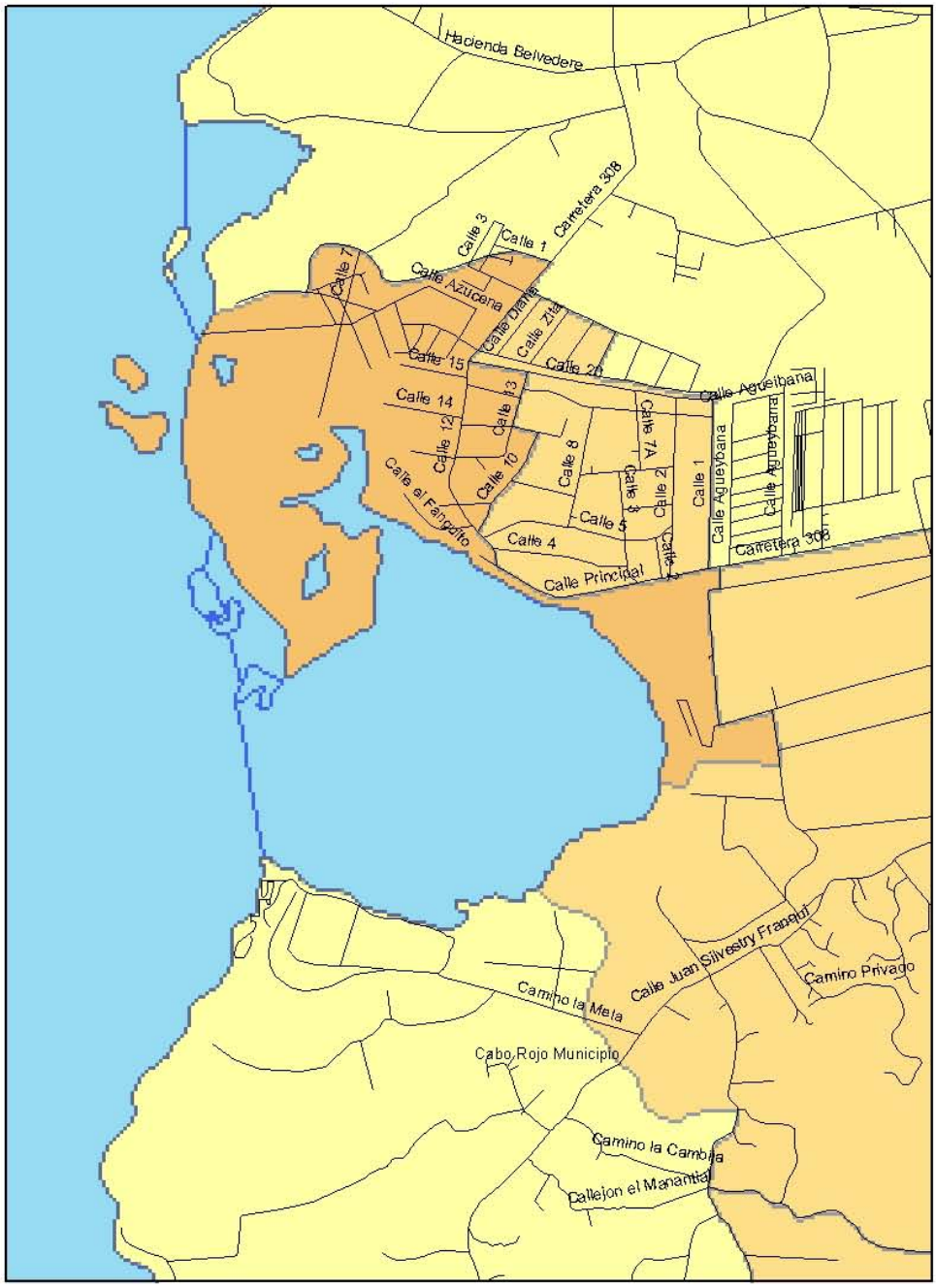


Figure SW.6. Repairing Recreational Vessels at *La Villa*

They sell most of their catch locally, to at least three local restaurants and a seafood company, as well as to the general public from their market, but mentioned that they tend not to sell to hotels. We heard from others the hotels tend to buy cheaper imported fish, though this is not always the case. The fish they don't sell locally they sell throughout Cabo Rojo and into Mayagüez, but they have considerable local competition from at least two other major seafood dealers and others who fish. Many fishers in Cabo Rojo do not belong to fishing associations; Valdés Pizzini found that they tended to be tied to private fish dealers instead, something the census data suggest may still hold true today.

Table SW.2. Marketing Behaviors of Cabo Rojo Fishers (n=103)

Variable	Percent
Private	0.0
Fish Buyer	51.5
Association	8.7
Walking	18.4
Restaurant	18.4
Own Business	3.9
Gutted	65.0
Ice	29.1
None	17.5

This association, like other places where fishers congregate in Puerto Real, has already begun sifting some of the tourist business into their traditional services. They have repair services, including a crane and space to make repairs, and they routinely maintain or repair boat hulls (although not motors). In addition to benefiting from the high demand for local seafood in Puerto Real's restaurants, they derive income from renting the bar to a third party. Most of those we interviewed here believe that growth will lead to more income for them, more opportunities, and they haven't experienced some of the problems other fishers have experienced, or at least not to a great degree, such as the growth of jet skiing. While one fisher we interviewed here said that they had no problems from jet skis because they fished so far from shore, this same fisher also commented that they used to fish near the shore around Combate but had

to quit this because of jet skis. While they may not have had problems with gentrification yet, one fisher did mention that, "The regulations are driving us crazy!" blaming them for changes in fishing more than changes in the social composition of the coast. [*"El reglamento nos tiene locos. La pesca en los últimos diez años ha cambiado por las diferentes nuevas reglas."*] They mentioned, specifically, the problems with bringing up undersized fish from great depths, killing them in the process, along with the cost of licenses, the perceived bias of government programs toward east coast fisheries, and the lack of restrictions on imported fish.

Regulators are as common a source of frustration as regulations. Another fisher interviewed at La Villa mentioned that they were attempting to acquire funds for a ramp and a new pier, intending the ramp to be available to the general public. He said that they perceive the need for these facilities because of a shortage of slip space and because they need to pull their boats from the water during hurricane season. He added that the difficulty of accomplishing this was in part due to the apathy of the community and their indifference toward fishermen. Other fishers who entered this discussion added that there had been problems with the Department of Natural Resources over the question of ramps and other facilities. Again, like fishers across the island, the DRNA staff and practices tend to be viewed in negative terms, in this case not helping them acquire a ramp, fining them for using DRNA ramp, and showing some favoritism to the big developments going in to the north and south of town. When hurricanes destroy fishing infrastructure, including piers but also including some of the locals' *casetas* along the shore, the DRNA often refuses to issue permits to rebuild. They added that, "Houses along the shore are part of the history of a fishing community that is Puerto Real." [*"Las casetas en la orilla son parte de la historia de una comunidad Pesquera que es Puerto Real."*]

As just noted, however, most fishers in Cabo Rojo neither belong to nor sell to associations, and the opinions of those who do belong to associations may not accurately represent all fishers. The following table does show, however, that fishing activity is nonetheless heavy, with just short of one-third of the population fishing 40 hours per week or more and over two-thirds fishing over 20 hours per week. The wide variation in fishing activity, as reflected in the high standard deviation, may be a function of the nature of recent growth in the municipality, with work in construction and other work associated with gentrification taking time away from fishing. At the same time, the conditions off the Cabo Rojo coast and Puerto Real's tradition as a commercial fishing center may be encouraging fishers to keep one foot in fishing even if they are engaging in other activities as well.

Table SW.3. Association Membership and Hours spent Fishing, Cabo Rojo (n=103)

Variable	Response
Percent Affiliated to Association	39.8
Hours engaged in fishing activity	
0 – 20	29.1
21 – 30	25.3
31 – 39	14.5
40	16.5
> 40	14.6
Mean hours	32.36 (sd = 26.763)
Minimum	0
Maximum	192

Cabo Rojo's varied coast line and its varied experiences with gentrification are also reflected in the wide range of fishing gear that are used across the municipality. Similarly, fishers in Cabo Rojo fish a number of different environments, with fishing the continental shelf and the reefs the most widely practiced. The following two tables, which include data from all Cabo Rojo (Boquerón, Combate, Puerto Real, and other areas), present the census data concerning fishing territories and gear.

Table SW.4. Fishing Gear Used in Cabo Rojo (n=103)

Variable	Percent
Beach Seine	3.0
Trammel Net	10.7
Long Line	2.9
Troll Line	3.9
Fish Trap	19.4
Gill Net	14.6
Cast Net	22.3
Hand Line	50.5
Rod and Reel	10.7
Lobster trap	1.0
Snapper Reel	5.8
Winch	9.8
Spear	41.7
Lace	37.9
SCUBA	29.1
Gaff	27.2
Basket	1.0

Table SW.5. Fishing Territories of Cabo Rojo Fishers (n=103)

Variable	Percent
Shore	9.7
Continental Shelf	81.6
Shelf Edge	11.7
Oceanic	8.7
Reef Fishes	86.4
SCUBA Diving	5.8
Skin Diving	3.9
Pelagic	2.9
Bait	15.5
Deep Water Snappers	7.8

Figure SW.7. Map of Proposed Development in Cabo Rojo (colored section; Puerto Real is above)

Pesquedería Fortuña [1]

This private fish market relies on eight to ten fishers to supply it with fish regularly. It is a family business, run primarily by Fortuña and his wife, with the help of their granddaughter. During Lent, which was the time we visited, they were specializing in grouper, but they have a good deal of fish on hand and this year have been catching more lobster. Fortuña said that those who fish for him fish in a variety of locations, none of which include areas that are restricted due to seasonal closures or, more recently, Marine Protected Areas.

He fishes with traps daily, every day but Sunday, but he is careful not to set his traps on coral reefs, because he perceives that this damages them, despite that many of the lobster live around coral reefs. Instead he sets them in places he knows that the lobster will eventually venture. He has one boat dedicated to snapper fishing, catching as much as 170 pounds per trip by attaching lines to buoys and fishing 30 hook at a time. Still, he spends most of his time with his traps. To protect them from theft, he described a method of triangulating them from Boya 4.

From his fish market he sells to at least four restaurants, which were none of the same restaurants named by the association members, and also has a bus for selling fish along the street. He said that almost no people come to his seafood market to shop: he has to go to them. Unlike some of the other fish dealers in town, he doesn't provide services to tourists, such as selling them fuel or ice.

[1] Unlike the names of the fishing associations, which are matters of public record already, we have given this private business a pseudonym, as we have with all of the individual fishers we interviewed.

He claimed that they almost always sell their fish at the same price (a claim the landings data seem to support) and that their fish almost always sells for more than fish sells in other areas. This is primarily a quality issue. He mentioned a fish dealer in a neighboring municipality who sells his fish in a less fresh state, adding that this made the other fish dealer's fish difficult to clean. He also mentioned imports, saying that it was impossible to try to compete with *pescao' Americano* (a reference to imports via U.S. distributors). Instead he said, "I defend myself with lobster," suggesting that the only way he can compete is by specializing in species that are both expensive and only locally available in a fresh state.

Regulations, he claimed, have created a black market for seafood, and many of them make no sense from a biological point of view. He said that any regulation beyond the seasonal closures at the buoys is unjust. The closures there had a reason, especially regarding the protection of grouper, but the problem was that they extend to other species as well. They agreed with the closures for protecting grouper, but not so many other species indiscriminately. Besides, in other areas where there are no restrictions, such as Guánica, they are able to catch grouper, and some fishers, notably divers in his view, still fish in the restricted waters. (It should be noted, however, that as a trap fisherman, Fortuña may be biased against divers because of the widespread belief that divers steal from traps and even steal the traps themselves). He said that people were going to continue fishing, violating the laws, because some of the more influential fish dealers in the area have suggested, like him, that the current regulations are unjust. They have been encouraging, that is, civil disobedience.

Perhaps his most telling statement, however, concerned the landings data. He said that fishers in Puerto Real have been catching fish consistently over the past five years, at relatively the same levels. "*Hay pesca,"* he said: "There are fish. What happened is that they [the fishers] don't report the statistics." In other words, the landings data, on which many of the regulations rest, he believes, are flawed.

Pescadería Montalvo

This fish market organizes a fleet consisting of four fishing vessels and ten fishers, all of whom are primarily divers. Some fish with long lines during some times of the year, at which time they fish around Boyas 4 and 6. When they are diving, they fish around four miles off shore, which puts them close to these areas as well.

Montalvo believes that the demographic and qualitative changes taking place within the fishing community may undermine his ability to stay in business many more years. Every day he sells as much as can, but there are fewer and fewer *good* fishers all the time: many have already died or retired. The DRNA, he believes, is no longer interested in maintaining the fisheries for the support of fishers and their households, but is instead interested, he said, primarily in reforestation. During another part of the interview, however, he said that most of the fishers were young, which is consistent with diving.

He sells primarily to restaurants in the area, listing seven of them by name, none of which were listed by fishers at either of the other two marketing centers discussed above. This may suggest that restaurant owners come to rely on specific fishers for their supplies, developing ties of loyalty. Montalvo said that he sells to only one *guagüero* (person who sells fish from a *guagua*, or bus) who buys his first class fish, avoiding the others because they only buy second class fish. His most popular selling species are conch, lobster, and grouper.

Montalvo mentioned a number of other suppliers of services and materials in Puerto Real, including some of his competitors, listing those that sold, filled, and serviced tanks and those that sold ice, adding that some of the divers have complained about the quality of the tanks and the quantity of the air they receive from the supplier. At times, too, supplies of certain products become scarce. During January, when grouper fishing is heavy, they sometimes have to go as far as Ponce and Aguadilla for ice.

Juan Guzman & La Bellena

La Bellena is a vessel that several independent divers in Puerto Real use in association with other gear, including traps, beach seines, gill nets, lines, and harpoons. Its captain, Juan Guzman, owns a marine supply store and, in good weather conditions, operates and 4 vessels in all with 3 fishers per vessel. His vessels fish Boya 6, 8, 4, and 2 and sometimes, very occasionally, they venture into Bajo de Sico. The principal species they fish for are lobster, conch (in season), grouper, and trunkfish.

They sell their fish to a single buyer: a seafood restaurant in the area. (An interview with the owner of that restaurant confirmed that he was the only person he sold his catch to). Again, this conforms to the marketing strategies of other Cabo Rojo residents who organize fleets, with evidently loyal ties having developed between restaurant owners and those who organize fleets. Juan sells nearly nothing to the general population, saying that he rarely receives visits from either internal (Puerto Rican) or external tourists.

During the interview, he volunteered his environmental knowledge about the marine resources, which is among the most common doorways into a critique of regulations. Juan was no exception. After explaining about the conditions of fish and other marine species, pointing out in particular that sea turtles, protected forever now, were plentiful in many areas, he went on to say, "People who don't know anything of the sea, they put them to work in Natural Resources. They neither understand nor know anything. The resources lose." Table SW.6 shows the opinions of Cabo Rojo fishers regarding fishing resources based on the census data:

Table SW.6. Opinions of Cabo Rojo Fishers (n=103)

Variable	Percent
Status of Fishery Resources	
Better	4.9
Same	23.3
Worse	64.1
Source of Problems	
Pollution	12.6
Habitat Destruction	9.7
Overfishing	24.3
Government regulations	5.9
Weather	14.6
Seasonal factors	3.9
Other	4.0

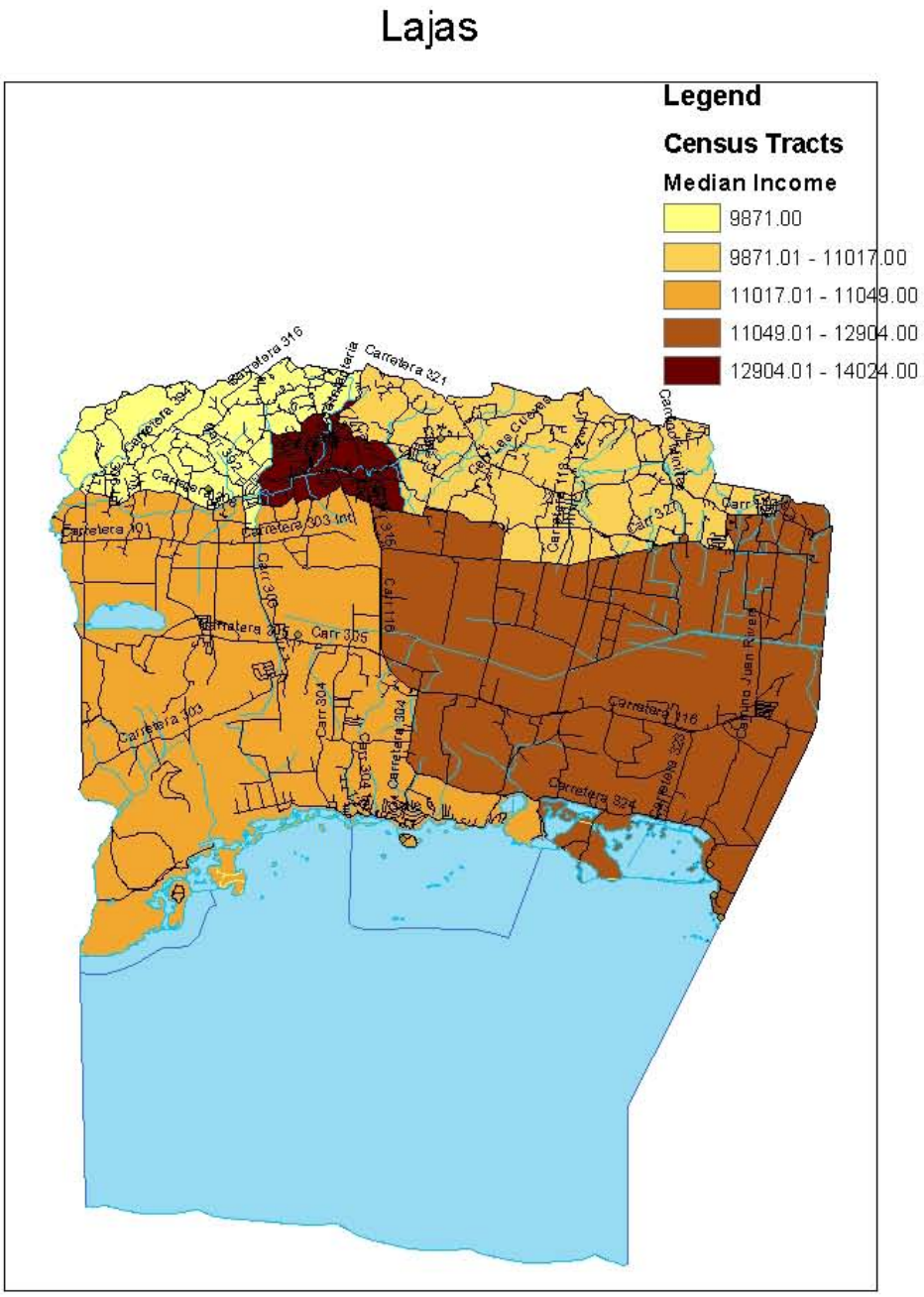
Cabo Rojo Summary

Cabo Rojo presents a unique case in the fisheries of Western Puerto Rico, but not only for its productivity and the size and diversity of its fishing community. The importance of fish dealers and marine suppliers in organizing fishing fleets in Cabo Rojo is a phenomenon worth further investigation, in that the dealers/ suppliers occupy potentially powerful positions vis-à-vis other fishers in the community, restaurant owners along Puerto Rico's west coast, and Department of Natural Resources personnel. That they supply primarily restaurant owners, with sales to *guagüeros* and the general public secondary in their operations, suggests that they are deeply tied into the restaurant trade and that a larger part of the west coast tourist trade depends on them for fresh fish.

Again, these are full-time fishers, supporting families from fishing resources while contributing to local society in ways that transcend mere economic calculus. The fish they catch enhances visitors'

experiences up and down the west coast of Puerto Rico. Well-known seafood restaurants in crowded weekend destinations like Joyuda, La Parquera, and Boquerón depend on fish from the lines, traps, spears, and other gear of Cabo Rojo fishers. While imported fish have cut into their markets, they maintain that they have been able to compete because of the high quality of local, fresh seafood, particularly highly prized species such as lobster and conch, as compared to imported fish. Revising slightly the words of one fish dealer quoted above, the fishers of Cabo Rojo defend themselves with quality.

Map SW.3. Lajas Coast



Lajas

La Parguera (or, simply, Parguera), one of the two significant fishing sites we profiled in Lajas, has been the focus of much social scientific work in recent years, primarily because of the changes the community has experienced over the past two decades, evolving from a quiet fishing village to one of the major Southwest centers of tourism and seasonal residence. In contrast to La Parguera, the nearby town of Papayo, a former site of salt manufacturing, is a small community to the east whose members have been attempting to benefit from spillover tourist trade from Parguera; Papayo remains, however, the sleepier fishing village that Parguera used to be.

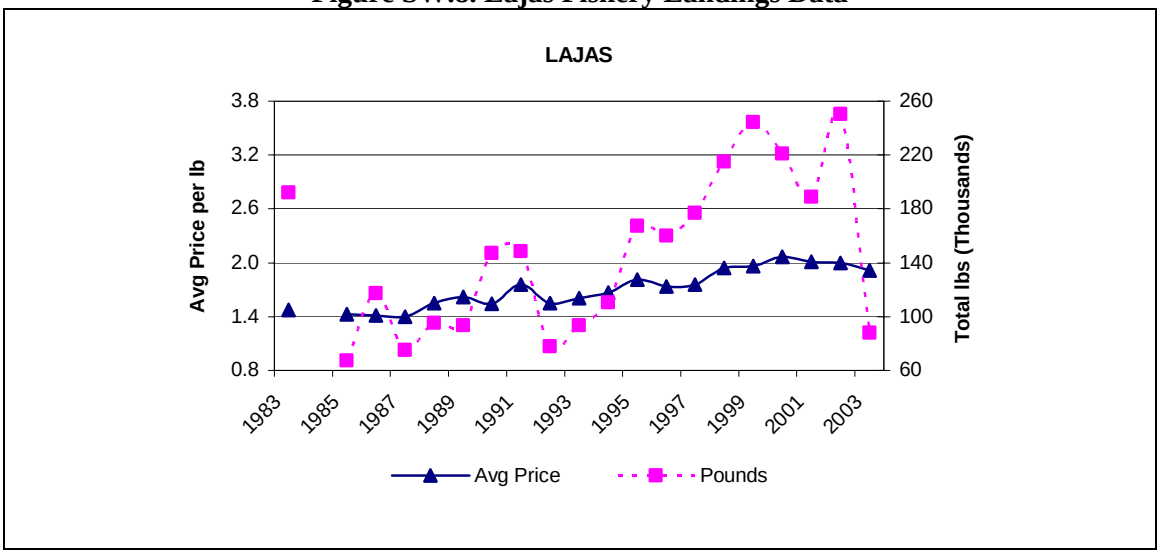
La Parguera's growth has, in the words of local residents, made it the *de facto* capital city of Lajas. They are referring to the popularity of the community among visitors from across the island, yet Lajas includes several other communities and manufacturing plants that have, like its neighbors, emerged from the ruins of the sugar industry.

Table SW.7. Lajas Demographic Data

LAJAS	1950	1960	1970	1980	1990	2000
Population Characteristics						
Population [1]	16,326	15,375	16,545	21,236	23,271	26,261
Civilian Labor Force (CLF) [2]	5,297	3,864	4,621	6,341	7,795	7,689
CLF - Employed	5,212	3,716	4,327	5,197	6,030	5,662
CLF - Unemployed	85	148	294	1,144	1,765	2,027
Percent of unemployed persons	1.60	3.83	6.36	18.04	22.64	26.36
Industry of employed persons [3]						
Agriculture, forestry, fishing and mining [4]		1,772	993	521	559	230
Construction		240	603	508	467	654
Manufacturing		520	1,018	1,402	1,532	1,154
Retail trade		348	415	589	810	611
Socioeconomic Characteristics						
Mean travel time to work (minutes) [5]		N/A	N/A	N/A	19.9	25.8
Persons who work in area of residence [6]		2,940	2,288	2,568	3,174	2,433
Per capita Income (dollars) [7]			742	1,832	3,388	7,691
Median Household Income (dollars) [8]		854	2,130	4,906	7,675	11,384
Individuals below poverty level [9]			11,410	13,993	15,264	14,829
Percent of Individuals below poverty level			68.96	65.89	65.59	56.47

The municipality's statistics reflect a somewhat more robust economic picture than neighboring Guánica's, with a lower unemployment rate and a smaller proportion of people below the poverty line. It fares somewhat less well, however, than Cabo Rojo, its other neighbor to the north and west. The manufacturing sector in Lajas continues to provide some employment, and construction employment, some of which is fueled by the growth in Parguera, has increased over the past decade. The picture is still similar to that of other western municipalities, with double digit unemployment and over half the municipality living in poverty.

Figure SW.8. Lajas Fishery Landings Data



Fishing provides income and employment for significant portions of the communities of Parguera and Papayo, and the landings data from Lajas place it among the top three western municipalities. Its catches increased steadily through most of the 1990s but, like all other municipalities, have fallen recently. Nevertheless, fishing occupies a central place in the both communities of Parguera and Papayo. Rema Brusi's thesis (2003) argues that fishing is a central part of Parguera's identity; even many of the new and seasonal residents, who live in different parts of the town, consider the town a "fishing village," viewing this as a valuable part of its attractiveness. Similarly, the community of Papayo greets passerby with a large sign advertising its fishing heritage, although Papayo has not experienced nearly the level of gentrification that Parguera has.

Lajas History

Like Cabo Rojo, early in colonial times Lajas was under the jurisdiction of San German, and perhaps because it was closer it didn't separate from San German until well into the 19th century, in 1878. Prior to that time, its history was bound up with San German's, which exercised authority over most of western Puerto Rico. In 1514, the two municipalities of San Juan and San German dominated most of Puerto Rican territory, although highly unevenly. Settlers from San German, for example, attempted early settlements in the mid-16th century in what is today Añasco, only to be repelled by native Caribs and forced to move south and concentrate in and around what is today the bay of Guayanilla.

The settlements in Lajas were more secure than those further away, in part because San German officials considered them important territories. Fishing played no small part in this. Prior to the late 19th and early 20th century development of water control systems, Lajas's dry climate was not conducive to large scale agriculture. Animal husbandry and fishing, however, were important activities during the 18th and 19th centuries. With the development and sophistication of irrigation systems, however, Lajas began sugar and pineapple production, slowly marginalizing fishing as an important activity. La Parguera remained the core of the fishing industry, and Brusi's thesis records several historical narratives that testify to the importance of fishing to the town's identity.

Gentrification & Marine Resources in La Parguera

Despite the claims of many long-time residents and newcomers to the community, Parguera is hardly a sleepy little fishing village. The town has become a tourist center with a substantial number of temporary or seasonal residents. The latter tend to be professionals or upper middle class families who have either bought houses in the areas or built, illegally, *casetas*, the wooden houses extending from the mangrove forest into the bays around Parguera. Similar to places on the North Coast, gentrification is far advanced in Parguera. Rima Brusi's thesis, Living the Postcard: Place, Community, and the Production of La Parguera's Landscape, addresses the distinctly different images that people use to discuss Parguera: as a sanctuary, haven, and tranquil fishing village on the one hand, and as a site of "work, struggle, and contestation" on the other. Generally, the neighborhoods to the east of Parguera's downtown and primary road linking it to the rest of Lajas comprise its older, working class (fishing family) neighborhoods, while its neighborhoods west of the downtown have witnessed the most development oriented toward wealthier residents. An exception to this has been the fringe of *casetas* lining the coast—most of which are owned and occupied (at times seasonally) by wealthier families. Fishing remains an activity in Parguera, though there are signs that fishing households are deeply intertwined with, even while they are being marginalized by, the tourist industry.

La Parguera and Las Parcelas

Most of the fishing families in Parguera live in the parcelas on the eastern end of the community, but evidence of their integration into the tourist/ seasonal resident economy is seen in the ubiquity of recreational crafts stored in the parcelas residents' yards and drives, often beside commercial vessels or gear. Vessel storage has become a major part of the Parguera landscape. Not only do year-round residents, many of whom are fishers, store vessels for seasonal residents, but on the road leading to Parguera there are boat storage (dry dock) facilities and recent observations of the *casetas* lining the mangroves have found that they constitute one of the largest marinas on the island (Valdés Pizzini, personal communication). Whether for commercial purposes or recreation, Parguera's attachment to the sea is deep and unmistakeable.

In her dissertation on Parguera, Brusi relates local historical accounts in which long-time, year-round residents suggest that Parguera began as a working class fishing community during the land redistributions of the early 1940s. The original *parcelas* program, designed to provide the working poor of Puerto Rico with house lots and housing, in part to free them from a state similar to serfdom, was also a program oriented toward community formation: along with housing, parcelas programs often created schools and *colmados* (small stores) to generate a sense of community.

Today the eastern section of Parguera remains the neighborhood of the working class, with many fishing families, despite that some of the families have sold their lots to people from outside the community. Much of western Parguera has been developed into condominiums and other housing units for seasonal residents, and much of the infrastructural development lining Parguera's shoreline has been oriented towards tourism. These include seafood restaurants/ bars, boat rentals, excursions to the phosphorescent bay, dive shops that give dive lessons, a weekend crafts market, and several hotels and other temporary accommodations. All of these cluster around a five- to six-block area along the Parguera waterfront, the center of which is a long pier where the vessels leave every night to view the phosphorescent bay. Outside of the main cluster of these amenities lie the commercial fishing infrastructure of landing centers and seafood markets.

Villa Pesquera of Parguera

West of the center of town, this Villa Pesquera includes two monuments to fishing in Parguera and Papayo: a statue of a fisher and mural about fishing, both of which include text suggesting that fishing is a noble occupation, with moral economic significance and deep roots in the community. Beneath the fisher is a sign that reads (in translation): "*The Fisher. This monument is dedicated to all the fishers who day by day encounter the sea's adventures for the sustenance of their families." [*"Este monumento está dedicado a todas las pescadores que dia a dia se entregan a las aventuras de la mar para el sustento de sus familias."*]*.

"The Pescador" monument faces a mural that is visible from the sea and from the association's pier, but not visible from the neighborhoods of Parguera or the road, which depicts two fishers—one old, one younger, one standing on the dock and the other wielding a knife (perhaps cleaning a fish)—and reads: "Parguera and Papayo: the cradle of fishers."

Figure SW.9. *"El Pescador,"* La Parguera

Figure SW.10. *"Parguera y Papayo, Cuno de Pescadores"*
Parguera and Papayo, Cradle of Fishermen

These two artistic celebrations of fishing resonate with Brusi's thesis—and the words of those she interviewed for her thesis—that Parguera traces much of its identity to a fishing heritage. This heritage, indeed, is something that Brusi suggests the tourists, newcomers, and seasonal residents wish to preserve, viewing it as adding value to the community's ambience. However charming or quaint these images may seem, they are not mere tourist attractions but reflect a working waterfront and a viable, highly productive fishery with slightly under half affiliated to an association and about 40% full-time fishers.

Table SW.8. Association Membership and Hours Spent Fishing, Lajas (n=62)

Variable	Response
Percent Affiliated to Association	45.2
Hours engaged in fishing activity	
0 – 20	19.4
21 – 30	35.4
31 – 39	3.2
40	33.9
> 40	6.5
Mean hours	31.31 (sd =10.094)
Minimum	8
Maximum	49

Fishers here use a wide variety of gear and fish for a wide variety of species; on the association's dock are gill nets (*filetes*) and traps, and the vessels that tie up there have winches for lines or hauling traps. The census data show that, in fact, the fishers of Lajas are among the most versatile in terms of their use of gear:

Table SW.9. Gear Used by Lajas Fishers (n=62)

Variable	Percent
Beach Seine	14.5
Trammel Net	25.8
Long Line	9.7
Troll Line	48.4
Fish Trap	46.8
Gill Net	71.0
Cast Net	54.8
Hand Line	83.9
Rod and Reel	48.4
Lobster trap	1.6
Snapper Reel	14.5
Winch	8.1
Skin	0.0
Spear	37.1
Lace	16.1
SCUBA	11.3
Gaff	57.4
Basket	6.5

Similarly, fishers in Lajas fish a wide range of territories, with the fishing reefs and the continental shelf the most widely used:

Table SW.10. Fishing Territories of Lajas Fishers (n=62)

Variable	Percent
Shore	11.3
Continental Shelf	85.5
Shelf Edge	38.7
Oceanic	21.0
Reef Fishes	93.5
SCUBA Diving	0.0
Skin Diving	17.7
Pelagic	16.1
Bait	40.3
Deep Water Snappers	17.7

Given the range of fishing territories, styles, and gears used in Lajas, it is not surprising that in Parguera should live one of the most well-known fishers and seafood dealers in Western Puerto Rico, a man we call here Antonio Hernández (pseudonym). Antonio is an assemblyman as well as an active voice for the two fishing associations in Parguera, and our interview with him revealed not only the ways in which Lajas fishers exploit the marine environment, but also many of the problems facing the fishery. Like fishers in other fishing communities around the United States, Antonio complained about excessive regulations, imports, and protecting fish stocks to the point of driving fishers out of business. Twice he said, adamantly, that he realized that they needed to preserve fish stocks for future generations, but the current wave of regulations seemed to him hostile toward commercial fishers. He said that he saw king mackerel for 79 cents a pound in Pueblo (the large Puerto Rican supermarket chain). They sell local *sierra* (king mackerel) for $2.00. They also import *chillo* (snapper) from Taiwan.

This was part of his general disagreement with imports from Mexico and Taiwan, which he complained were killing them. He said that some of the size-limit regulations were just ridiculous, repeating what other fishers had told us: if you pull up Yellowtail snapper under 12", Chillo, or Nasau Grouper under 26" (which you aren't supposed to keep), you're pulling them up from a depth of 1000 or more feet and hence you have to kill them (their eyes pop out).

Mesh size restrictions, he believes, are fine, but most of the regulations are no longer in the best interests of commercial fishermen. He has been fishing commercially for 40 years and has three children, at least one of whom (a 35-year old) he hopes will be able to make a living fishing.[2] He also said that he fishes with his nephews (they are his *proeles*). His youngest, a daughter, is 28 and on the police force (he mentioned this to make clear that his fishing had helped to produce a public servant).

He also complained about the costs of fishing/ boating licenses. He claims to pay:

- $100 for a boat registration.
- $50 for a commercial fishing license.
- $25/ species for certain species (like a duck stamp).
- $35/ year for another, undesignated expense.

He said he also needed to have a license for several species.[3] In nearly the same breath Antonio spoke of recreational fishermen coming into Parguera, charter boat captains as well as average sport fishermen, selling fish in Parguera. "This affects the market," he said, and at a time when imports are already depressing the prices of fish. He said that the unlicensed recreational fishers are bringing conch from Jamaica, Santo Domingo, and St. Croix.

He is a member of the association as well as an operator of the fish market. The association has a *muelle* (pier) and there are two associations in Parguera, one right across the road and parking lot from his market.

In terms of changes in Parguera in the past ten years, he first said that boats are now larger, *mas grande*, and *mas rápido tambien* (faster, too). Everything has changed. Now they can fish further from shore and in deeper water. The *trasmallo* (trammel net) is now plastic, and the *nasa* (trap), *chinchorro* (beach seine), all gear have changed, making fishing easier with more sophisticated equipment.

At the same time, the importance of species have changed, in part due to the ability to travel farther from shore. He said, "*Parguera fue una villa pesquera*: Parguera was a fishing village… Now it's the capitol of Lajas." Among the new regulations he mentioned the one barring public consumption of alcohol: drinking in the street. He also said that Parguera used to be a calm (*tranquilo)* town… Now they have new jobs, new local markets for seafood, citing the wealth of seafood restaurants as well as the smaller stands and businesses where they sell *empanadillas* and *pinchos.*

Annual Round:

January – March: "The first five to six months of the year are the most productive."
All of the following species they catch with rods & reels & hand lines:

[2] This is, in short, a moral/ traditional claim on fishery resources & his desire to participate in the design and implementation of regulations—fishing as part of family and community, as part as the continuity of Parguera; this may be why defining community at least with reference to places is important.
[3] DRNA dispute these figures, claiming that they are overestimated.

- #1 species: Dorado, which they catch 30 to 35 miles from shore with lines. He added an ecological knowledge comment that the migrations of Dorado range as far away as the Dominican Republic, this time of year, but during other times of the year, they circle close to the African coast. Pelagic species feed 24 hours a day, he added, and sometimes they are fished with harpoons. During this time of year, fishers make 4 to 5 trips per week. They fish for Dorado from the drop-off out (deeper waters). To catch Dorado, sometimes they keep the male in the water and the females will school around it and strike. They will also feed around a floating gill net (which may act as a fish aggregation device). They have caught 750 pounds on one gill net.
- #2: Colirubia (yellowtail snapper). These are fished closer to shore, only 3-4 miles out, over the platform.
- #3: Sama (mutton snapper).

January & February, they catch Red Hind over the platform with handlines. Landings are highly variable and difficult to relate with any accuracy. Besides, he said, 75% of the fishers don't report landings.

June/ July/August through October: #1 species is *sierra* (king mackerel), but because it's hurricane season they stay closer to shore. Fishing season drops. They fish for *sierra* at the drop off, in around 200' of water. He said that fish depend on the lunar cycle and so the fishers fish for *sierra* during the first few days of a moon. Many fish are caught with changes in the moon. It is also easier to fish during the moon. *Sierra* go deep down during daybreak, rising at night to feed. Four days after the new moon is the best time to fish for sierra. In addition, many second-class fish, selling for around $1.25/ pound are consumed during the summer.

September/ October to November/ December: Fishing slows down during these months, particularly during Nov-Dec, and they change gears, to traps, and fish nearer the reefs. They get lobster during this season. In December, during Christmas season, people eat pork *pasteles*, so fishers need to keep fish in the freezer. They're tired of eating pork and switch to fish in January.
Other reef fish they target include: Parrot fish, porgy, and grunt.

Fishing Practices

Why do the Parguera fishers shift among gears? It depends of the availability of fish and the kind of fish. For example, during the times of year pelagic species such as Dorado school through the area, they are more likely to use troll lines, shifting to deep water rigs when they target snapper-grouper species. It also depends on the time of day and the amount of bait he has on hand. If he has a lot of bait, he will fish differently, targeting those species that hit on whatever kind of bait he happens to have (e.g. ballyhoo for pelagics). He gives fish to his neighbor because she brings him cups of coffee from time to time. Many of the fishers who sell to Antonio fish at night and bring their fish to him before he is awake, putting them into his freezer themselves. Obviously, these relationships involve trust; the fishers stop by the following afternoon for their money.

Antonio also speaks on behalf of the fishing community, both as fisherman and assemblyman. He said that he knows that many fishers have turned to smuggling, drugs and illegal immigrants from the DR, but he reports these offenses (this is similar to fishers in the Gulf of Mexico reporting toxic waste dumping). Nevertheless, he does support civil disobedience in the case of the regulations released in July, 2004, saying that he believes that most of the fishers will resist the new licensing requirements by not filling out the trip tickets.

Many of the women who are in fishing households have found work cleaning rental houses, and as noted earlier many of the houses store boats for recreational boaters and other temporary residents. In addition,

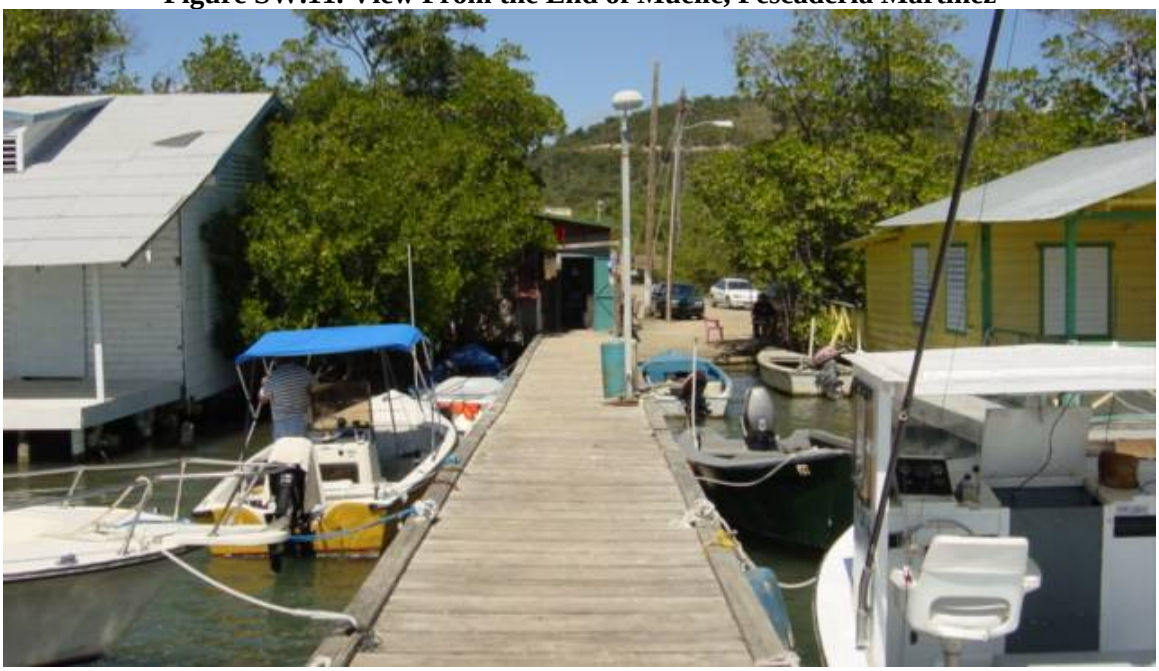
people will buy fish directly from fishermen, at a high price, and then carry these fish to restaurants to have them cooked. These are three economic benefits of gentrification.

Pescadería Martínez

This is a relatively new landing center where from 8 to 10 fishers land their catches. It sits on the water. One of the freezers was full of *carnada* (bait), which was ballyhoo, and the others with dorado and a few jacks that looked like crevalle Jacks or amberjacks, but they were difficult to identify because they were wrapped in plastic. In addition to the freezer facilities, the landing center has a nice pier and sells ice and fishing supplies.

Like Antonio, Martínez reported that *sierra* were the most important species caught here during the summer months, usually with a *cordel* (hook-and-line rig). At certain times of the year, however, he said that they rely on trammel nets, but most of the time they use either *cordeles* or traps. He said that the fishers who sell to him have lockers in the Villa Parguera, but that membership in the association is weak because the government has given them so little assistance besides building the piers and other facilities.

Figure SW.11. View From the End of Muelle, Pescadería Martínez



He listed several species that were important to his market, in addition to *sierra:* snook, yellowtail snapper, other snappers, and grouper; with nets they catch primarily trunkfish and lobster. They fish in front of El Faro (west), Playa Santa (in Guanica, to the east), and outside the cays along the southern shore. Some of the fishers who fish for snapper go to Bajo de Sico, Boya 6, and Abrir la Sierra.

In former times, when he had a larger vessel, he used to fish in the Mona Passage for deep water snapper, but has since gotten rid of his vessel. He said during those times he was able to catch around 300 lbs. and sell them for $1,000. Now his best market are the seafood restaurants, but most of those he sells to also buy seafood from outside of Parguera; sometimes he sells to restaurants as far away as San Juan, when he has a large supply of fish. The rest he sells directly from his shop, at retail prices.

According to him, the association in Parguera really isn't functional. He said they haven't been able to agree on much of anything regarding the business of the association, and that their assistance from the government has been haphazard. Currently, he claimed, instead of the Department of Agriculture helping them, the Department of Natural Resources is hassling them. In response, many fishers have learned to rely on one another; he commented that he helps fishers because they are good people and they help him as well.

Papayo

One of the main roads in Papayo ends at a pier that typically has about 20 boats moored on either side of it. This is a Department of Agriculture/ Villa Pesquera site, and therefore a potential association, but we spoke with some fishers who said that there had been a continuous lobbying effort to get more facilities than a pier. This pier is the "property" (in the sense of usufruct rights) of commercial fishers, and there is a locked chain across the entrance to the parking lot.

Figure SW.12. Papayo Muelle

Many of the boats have nets in them, and in the community one can see men sitting around freshly repaired boats outside a small workshop and repairing nets. Fishers here claim that the fishers of Papayo were attempting to get more attention from the government. The sign at the entrance to the town suggests that this is a fishing community, and recently the community in general has been attempting development aimed at some of Parguera's tourist trade.

One informant, Rudolfo, told us that there were around 30 fishers using the pier who lived in Papayo, but that these thirty invite friends of theirs to use the facility and people come from other locations as well, leaving to fish with diving tanks, nets, traps, and lines. Rudolfo himself used to have a large boat, but he sold it to a German. All 20 boats moored around the *muelle* were the typical 18' to 20' yolas you see everywhere, most laden with filetes (gill nets) and mayorquines/ trasmallos (trammel nets):

Figure SW.13. Yolas in Papayo with *Redes*

Figure SW.14. Yolas in Papayo & Net Platform

The fishers of Papayo, according to Miguel, sell independently to people in the neighborhood or to people who happen to know they have fish, sometimes to the fish markets in Parguera. The following table shows that Lajas fishers in general market fish themselves, usually, and secondarily to associations and fish dealers. The Papayo association has no fish market.

Table SW.11. Fish Marketing Behaviors in Lajas (n=62)

Variable	Percent
Private	0.0
Fish Buyer	22.6
Association	21.0
Walking	41.9
Restaurant	9.7
Own Business	6.5
Gutted	71.0
Ice	59.7
None	17.7

Finally, we present data from the census concerning Lajas fishers' views about the resource, which show that about a third attribute changes to overfishing but a higher proportion to crowding, reflecting gentrification.

Table SW.12. Lajas Fishers' Opinions of Fishery Resources (n=62)

Variable	Percent
Status of the Fishery Resources: better	3.2
Status of the Fishery Resources: same	21.0
Status of the Fishery Resources: worse	74.2
Pollution	12.9
Habitat Destruction	11.3
Overfishing	30.6
Lots of vessels	38.6
Weather	11.2
DRNA Regulations	1.6
Lots of fishermen	17.7
Noise	3.2
Tourism	1.6
Water quality	1.6

Northeast & Island Municipalities:

Fajardo, Ceiba, Vieques, Culebra

Many parts of northeastern Puerto Rico, as well as the two island municipalities of Culebra and Vieques, were settled slowly and sporadically, with the region's past development almost opposite current demographic trends. Today, it is primarily the region's coastal zones (including near-shore waters) that are witnessing the most rapid growth, development, and crowding, with new marinas and oceanfront villas nearly always under construction, yet during the first centuries of colonization, in his brief historical account of Ceiba, Toro Sugrañes writes, *"Toda este litoral este de nuestro Isla estuvo muy escaso de población"* (1995: 109) ("All of the eastern coast of our island was scarcely populated"). The reasons for this are varied, but derive in part from the reputation of coastal zones, noted earlier, as dangerous, unhealthy, and hazardous places, full of smuggling, piracy, and disease. Primarily because of a lack of sources of fresh water, Culebra was the last of these municipalities settled, despite that it was used as temporary port and source of wood for Taínos, pirates, and others prior to permanent settlement (Iranzo 2004).

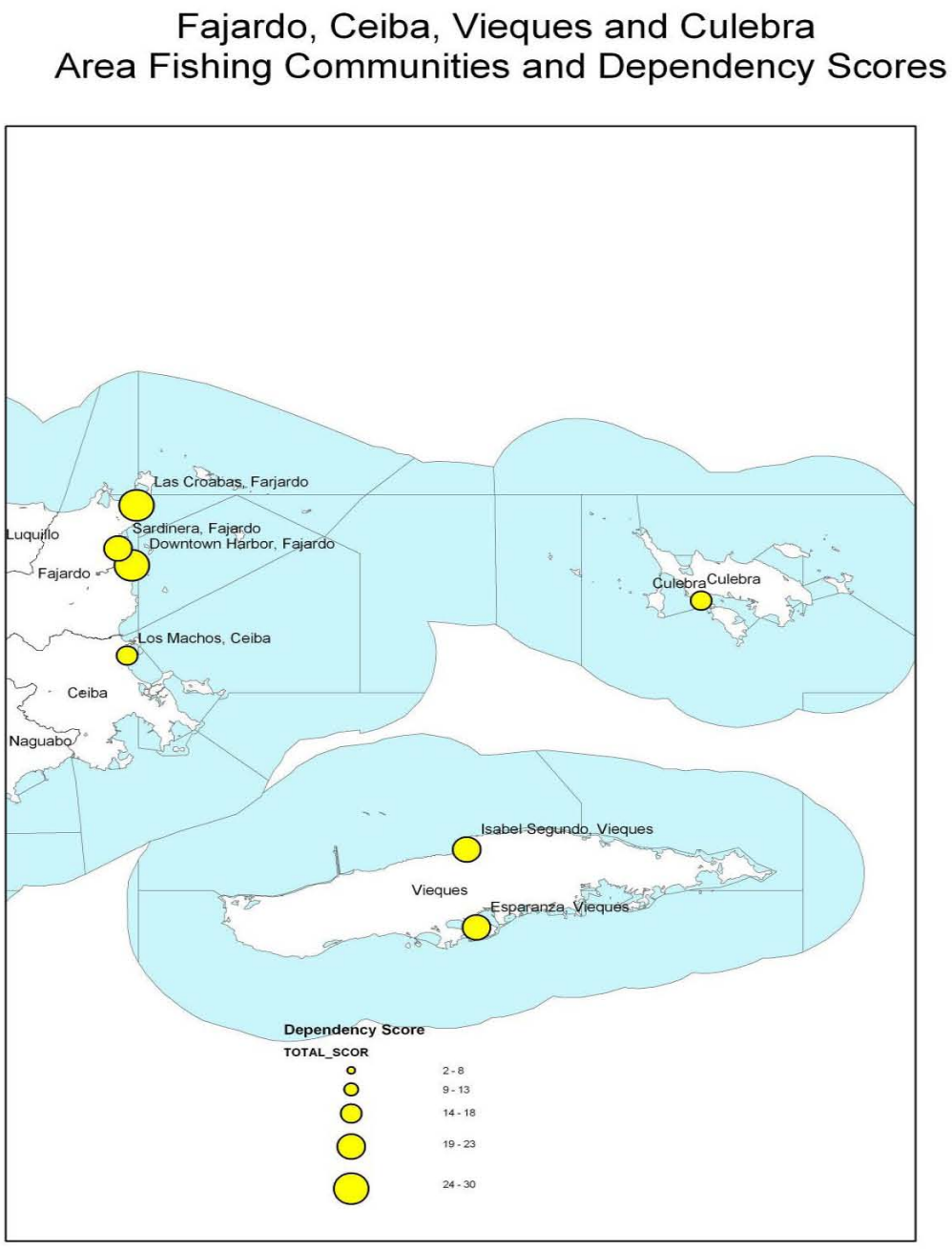
Among the early stimulants to population growth in this region was its strategic importance in the sea-lanes. From the mountains of Fajardo, one can easily spot ocean-going traffic from Europe; Vieques and Culebra serve as gateways to the Lesser Antilles. Iranzo notes that the two island municipalities constitute the nexus between the Greater and Lesser Antilles, adding that the two archipelagos have experienced distinctly different ethnic and cultural histories (2004). The fact that these municipalities span the territory where Greater and Lesser Antilles meet has been important in both their development and in how they differ from one another, including the participation of their residents in fishing. In many ways, Culebra and Vieques share more with the smaller islands to the east and south, including the U.S. and British Virgin Islands, than with Ceiba and Fajardo. Families of fishers and merchant seamen have historically moved among St. Croix, Culebra, and Vieques, resulting in intermarriage between Spanish-speaking Puerto Ricans and English-speaking Afro-Caribbean peoples (Griffith and Valdés Pizzini 2002).

Despite close historical ties among the outer islands, Ceiba and Vieques share the presence of U.S. military bases, and U.S. troops relied heavily on Fajardo as a military staging area during the Spanish-American War (Toro Surgañes 1995). Ceiba's military base, Roosevelt Roads, which is currently being phased out as a military installation, covers much of Ceiba's coast line and is responsible for keeping much of the original marine habitat, particularly the mangrove forests, intact. Local fishers interviewed in Ceiba during the summer of 2005 claimed that their mangrove forests were in nearly pristine condition. By contrast, the bombing of Vieques by the U.S. Navy has been severely environmentally destructive, ruining marine substrates, as well as dangerous and deadly to humans. The bombs have also destroyed fishing gear that fishers have not had time to remove.

The waters of this region attract fishers, divers, and boaters from the four municipalities, yet also many from the north coast, from farther south along the east coast, and from the Virgin Islands. We encountered fishers in Dorado, west of San Juan on the north coast, who routinely fished the waters between Culebra and Fajardo. As noted in the historical section above, Jarvis lamented the contrast between this area's rich sportfishing resources and the lack of tourism infrastructure. Since the 1930s, Farjardo in particular has developed as one of the principal tourist and boating destinations for the people of the San Juan metropolitan area. Its lodging facilities now range from exclusive resorts/ resort communities to small, inexpensive guest houses, and its dozens of seafood restaurants are equally diverse, with roadside stands selling cups of conch salad and seafood fritters for under $2.00 neighboring establishments where diners easily spend $30.00 to $50.00 per meal. On weekends the traffic between San Juan and the east-northeast coast is thick nearly around the clock. The boat storage and service

facilities in both Fajardo and Ceiba ensure that a good deal of this traffic is oriented toward recreational uses of the waters, its small islands and islets, and the two island municipalities of Culebra and Vieques.

Map NE.1. Northeastern & Island Municipalities



Fajardo

Situated within an hour and a half drive of San Juan, on the main island's northeastern tip, Fajardo has long been a tourist destination for Puerto Ricans and others, attracting recreational boating traffic from across the Caribbean and the U.S. mainland and providing infrastructural support for at least two commercial fishing communities, three Villas Pesqueras, several recreational fishing sites, and some of the most elaborate marinas in Puerto Rico. Seafood restaurants abound. In the downtown harbor, the Port Authority maintains a ferry terminal for trips to Vieques, Culebra, and St. Croix, and smaller ferries use a second pier for shorter trips to nearby small islands. At least two other piers in the downtown are used for commercial and recreational fishing. Commercial fishing from the downtown alone, between the ferry terminals and a narrow river that the government plans to canalize, supports two private fish markets, a Villa Pesquera, and a well-known restaurant that sits on the border between two parcelas, Maternillo and Mansion del Sapo, that, together, form a commercial fishing community.

Table NE.1. Fajardo Census Data

FAJARDO	1950	1960	1970	1980	1990	2000
Population Characteristics						
Population [1]	22,116	18,321	23,032	32,087	36,882	40,712
Civilian Labor Force (CLF) [2]	5,605	5,080	6,518	8,202	12,712	12,448
CLF - Employed	5,183	4,776	6,209	7,096	9,886	10,131
CLF - Unemployed	422	304	309	1,106	2,826	2,317
Percent of unemployed persons	7.53	5.98	4.74	13.48	22.23	18.61
Industry of employed persons [3]						
Agriculture, forestry, fishing and mining [4]		1,076	326	99	123	68
Construction		380	500	519	796	896
Manufacturing		892	1,109	1,158	2,048	1,305
Retail trade		592	795	1,139	1,692	1,277
Socioeconomic Characteristics						
Mean travel time to work (minutes) [5]		N/A	N/A	28.4	20.7	23.9
Persons who work in area of residence [6]		3,800	3,964	4,365	6,902	6,325
Per capita Income (dollars) [7]			1,160	1,925	4,148	7,852
Median Household Income (dollars) [8]		1,114	2,917	4,783	9,465	15,410
Individuals below poverty level [9]			12,903	20,565	19,771	17,045
Percent of Individuals below poverty level			56.02	64.09	53.61	41.87

Fajardo's comparatively low (for Puerto Rico) unemployment rate and the low commuting time suggest that most of its residents are finding work within or near the municipality, rather than commuting to San Juan. Like other coastal municipalities, however, most economic sectors besides construction have experienced decline. The 100 jobs added to construction between 1990 and 2000 were off-set by job losses of over ten times that in the other sectors. Given continuing marina and other development in the area, the construction sector is likely remaining robust.

Figure NE.1. Fajardo Landings Data, 1983-2003

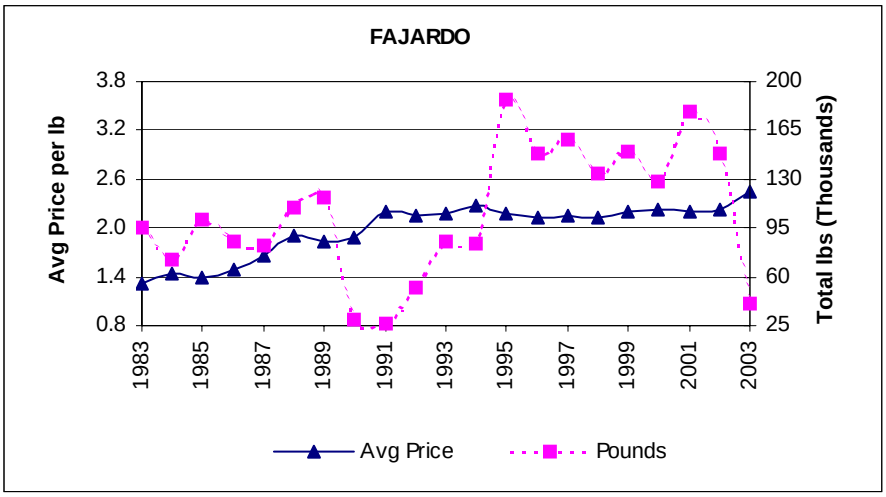
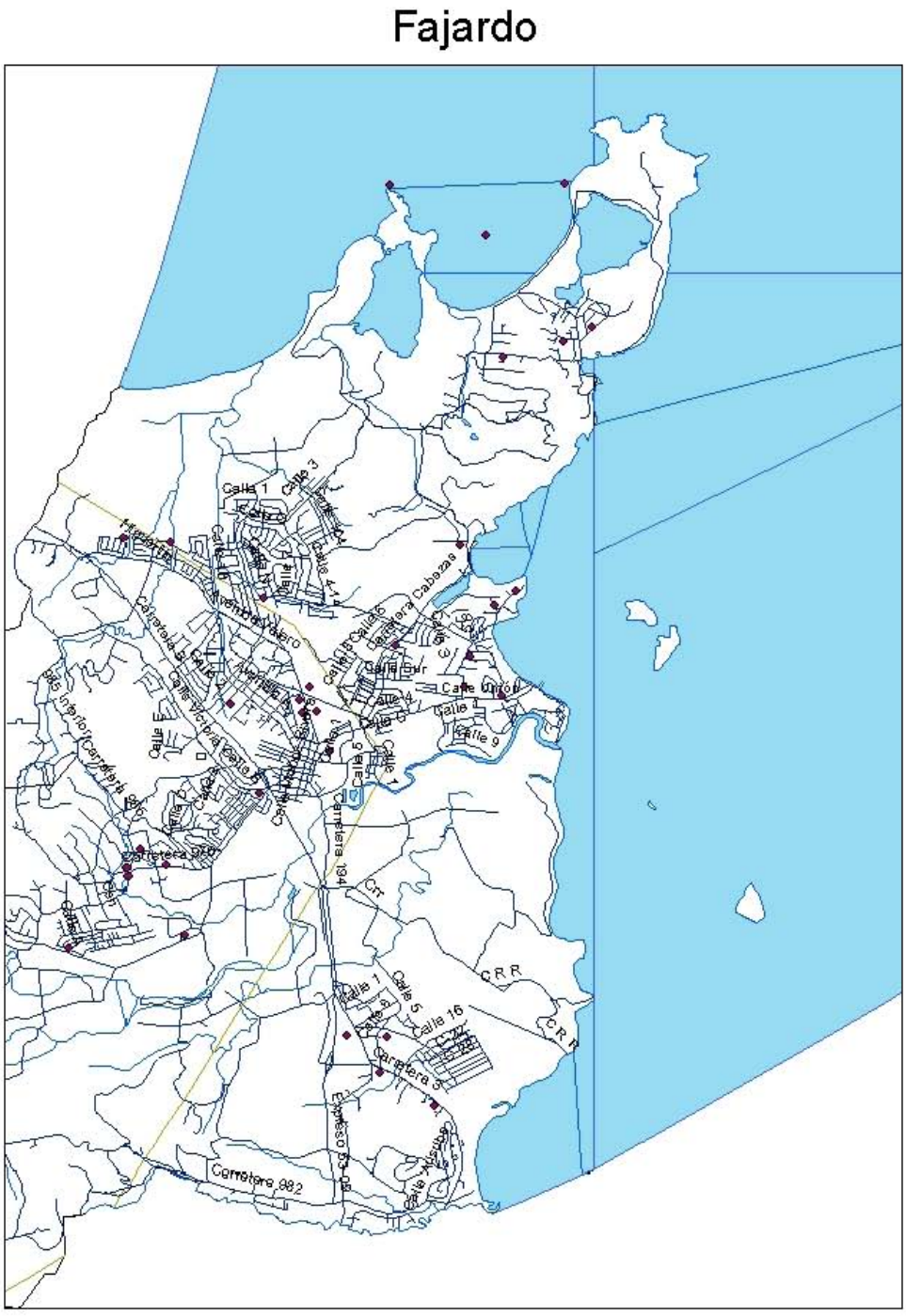


Figure NE.1 shows that fishing from Fajardo has fluctuated dramatically over the past twenty years, rising early in the 1990s to its high in the middle part of that decade and, thereafter, remaining relatively stable until 2002, before a precipitous drop. Amazingly, price during these swings in supply rises relatively slowly, by an average of a dollar per pound over the 20 year period shown (correlation coefficient = .2029).

The map below illustrates some of the natural features responsible for Fajardo's popularity with the boating public. Blessed with several natural harbors and the estuarine *Rio Fajardo*, and facing several small, inhabited and uninhabited islands with highly desirable beaches, Fajardo's boating population enjoy shelter and access unlike most of the north coast and much of the rest of the main island. Fishing from Fajardo takes advantage of these features, the local and visiting fishers hailing from marinas, ferry piers, seafood markets, and Villas Pesqueras.

Map NE.2. Fajardo



Commercial fishers from Fajardo benefit from the tourists through their consumption of seafood, of course, yet some also supplement their fishing incomes by providing water taxi services to tourists visiting its outer islands. Such activities have made Fajardo's fishing families a crucial part of the local tourist trade, influencing the time fishers can devote to fishing, the species they target, and the characters of their local associations. Similar to Ponce's La Guancha, connections between commercial fishing and tourism in Fajardo have created a new type of fishing community, one that enhances local tourism and increases access to marine environments among the general public.

Fajardo's importance extends beyond the robustness of its tourist industry or the character of its fishing fleets. Historically, Fajardo has enjoyed (and suffered) a strategic location in the sea-lanes, on the cusp of the waters that join the Greater and Lesser Antilles with long-term connections to Culebra, Vieques, and the U.S. and British Virgin Islands. Of Fajardo, Toro Sugrañes makes the same observation that Iranzo made of Culebra and Vieques, writing that Fajardo is: *"un punto de paso entre Puerto Rico y sus Islas al este y entre nuestra Isla y las Antillas Menores"* (a point of passage between Puerto Rico and its eastern islands and between our island and the Lesser Antilles—1995: 148). Fajardo's location has resulted in its being occupied by foreign invaders, including the United States, on more than one occasion, and this history remains a significant force in the municipality's heritage today.

Fajardo History

Like most coastal municipalities, Fajardo's economic tie to the sugar industry shaped much of its history, and Fajardo's status as a port made it doubly important for commerce involving agricultural products. Historically, Fajardo shipped sugar and calcium carbonate to the United States.[4] Of the four municipalities of this region, Fajardo was the first that was permanently settled, primarily due to its advantageous location on the island's northeastern corner. Toro Sugrañes reports that Fajardo had around 13 sugar mills at the end of the 19th century, yet through the 20th century sugar production became more concentrated. By 1950, La Central Fajardo, owned by Eastern Sugar Company, had monopolized sugar milling in the region, and in that year produced 126 tons of cut sugar cane. Following this, however, sugar production began to decline; La Central stopped production altogether in the 1970s, leaving behind several abandoned buildings on the southern edge of the municipality's principal town and two distinctive towers near the ferry terminals.

Even as sugar production was declining, tourism was beginning to grow. In the 1960s, El Hotel Conquistador opened, becoming a major resort in 1993 with an investment of $200,000,000. During this same time period other, smaller hotels and guest houses, along with seafood restaurants, were established. On one of the outer islands visible from shore, developers built two condominium towers with 30 floors apiece—at the time the highest residential dwellings in Puerto Rico. Today eleven marinas enhance this tourist and luxury residential infrastructure.

Fajardo also took advantage of the 936 tax laws—or the laws that granted tax breaks to companies who produced in Puerto Rico—creating three principal industrial zones with 30 factories that produce primarily medical supplies, pharmaceuticals, and electronics. Toro Sugrañes reports that these factories created "hundreds of jobs" and that their value surpasses that of the investment in El Conquistador. He views Fajardo as one of Puerto Rico's rising stars, believing that it will become a major port city in this century.

[4] This is a crystalline compound that occurs naturally as chalk, limestone, and other forms that has commercial uses in medicine and dentistry.

Downtown Harbor: Puerto Real, Maternillo, and Mansion de Sapo

Fajardo's historical importance as a sailing and shipping port, with its large and small ferry terminals and eleven marinas, has complemented the three waterfront neighborhoods that, together, constitute one of its two fishing communities: Puerto Real, Maternillo, and Mansion de Sapo. Together, these three neighborhoods combine their marine infrastructure, fish markets, seafood restaurants, and commercial and recreational fishing families to create a community dependent on fishing and marine resources. Physically, the three neighborhoods are located at the end of a single road leading to the downtown harbor and ferry landings; this one road into and looping through the community serves as its principal link to the rest of the municipality, yet it also acts as a kind of border that unites the three neighborhoods into one community. A second border, the Rio Fajardo, meanders along the edge of Mansion de Sapo and Maternillo. The third border enclosing and defining this community is the sea.

Puerto Real

Of the three neighborhoods, Puerto Real is less clearly tied to fishing than either Maternillo or Mansion de Sapo. Puerto Real is organized around the commercial ferry traffic and the boat launching, storage, and other marine infrastructure serving the boating and shipping traffic. Nevertheless, we include Puerto Real as part of this fishing community because its multifaceted infrastructure complements and offers support to the recreational and commercial fishing families living in the three neighborhoods.

We include Puerto Real for other reasons as well. First, for example, during one of our visits to Puerto Real, we spoke with two recreational/ subsistence fishers from the area who used one of the smaller ferries to Palimino (a small island near the Fajardo coast), departing from a municipal jetty, to transport several reel rigs and other fishing gear to spend the day fishing from the island's shores. They were a man and his son, the man around 55 and deeply tanned, weathered, from much time in the sun, and the son around 30. They were using long-lines on spools—gear they called *carretes*—filling two five gallon buckets with these rigs, which amounted to between 8 to 10 such rigs, each fitted with many hooks. When asked what they caught, they said "*todo*" (everything) specifying that they caught primarily *tiburón*, *pargo*, and *sama*. Both the volume of gear and the range of species caught suggests that these figures are primarily subsistence fishers, most likely included in that group that fish for food as well as supplemental household income. The symbiosis that has developed between such recreational/ subsistence fishers and the water transport systems and infrastructure suggests that some infrastructural development, when open to the public at least, can benefit the fishing community, improving access rather than reducing it, as much marina development does.

The marina/ recreational boating traffic in Puerto Real is heavy, particularly on the weekends. Some fishers supplement their fishing incomes by ferrying passengers to the small outer islands of Palimino, Isleta, and Icacos. The latter is an uninhabited island known for its beaches and snorkeling, and the others are also popular daytime locations for bathers and recreational fishers. Puerto Real has three commercial piers and a jetty that ends in a ramp where tractors from a boat storage facility launch vessels. Another wooden pier extends out into the bay between the jetty and the pier for Isleta ferries. The commercial piers are for the ferries and cargo vessels. At least two ferries travel between Isleta and the second pier, though the pier nearer to the customs house are for ferries to Culebra and Vieques or cargo vessels. The jetty is private, where they charge $30 to launch vessels and $25 to launch jet skis (including parking).

As noted earlier, Puerto Real, Maternillo, and Mansion de Sapo all adjoin one another in the area more generally known as Fajardo's downtown harbor and waterfront. Here the guesthouses, hotels, restaurants, and ferries to Vieques and Culebra draw tourists and others who store their boats in Marina Puerto Real. While some of these visitors have little to do with the fishing families of the area, others filter down the

road along the bay to eat from restaurants or buy from fish markets that Maternillo and Mansion de Sapo supply. Puerto Real businesses supply ice and other supplies to fishers throughout the area. Finally, developments in Puerto Real affect its residents and those from Maternillo and Mansion de Sapo. Proposed expansions to Puerto Real Marina, for example, will affect all fishers in the area, and many fishers oppose this growth.

Figure NE.2. Recreational/ Subsistence Fisher Loading Gear onto Small Ferry for Palimino Island, Fajardo

Recreational boating is more popular than recreational fishing from Puerto Real Marina. Of the around 108 boats currently using the marina, only six, according to the marina administrator, are used as recreational fishing crafts regularly. We encountered this five to six percent figure at other Farjardo marinas as well. The cost of slip space in the marinas may prevent all but fairly well off recreational fishers from using them in any case: monthly cost for a 20' vessel at Puerto Real Marina ranges from $100 to $175, and up to $200 or more for larger vessels. The marina owns a pier and helps its clients launch and land their vessels with a tractor.

Despite opposition from local fishers, the owner of the marina, with the support of the mayor of Fajardo, is currently planning to develop dry stacks for 400 boats, an additional 192 slips (for a total of 332), a parking ramp with two levels, a 200' pier, and five commercial lots for restaurants, shops, and other stores. The owner also promotes classes for study leading to the licensing of captains at Fajardo's vocational school, hoping to professionalize maritime industry in the municipality. Those who support the plan argue that it will generate employment, enhance access to the coast, and create a more tourist-friendly environment, thereby contributing to the region's economic growth.

Figure NE.3. Puerto Real Marina Tractor Assisting Recreational Boaters, Fajardo

It is unclear how the expansion of the marina will affect the downtown harbor area or its commercial and recreational fishing communities. Puerto Real Marina is on the edge of Puerto Real that joins Maternillo, and Maternillo and Mansion del Sapo form the heart of the commercial fishing community. This proximity may underlie fishers' opposition to the expansion, as the pier the marina currently uses is private and future marina infrastructure, presumably, would be private as well.

Maternillo and Mansion del Sapo

Both bordering parts of Puerto Real, these two neighborhoods—especially Maternillo—form the heart of Fajardo's downtown fishing community. They are less integrally tied to the commercial shipping and transportation systems than Puerto Real and more directly dependent on marine resources to supply their seafood restaurants, private fish markets, the Villa Pesquera called *Pescaderia Maternillo*, and their own kitchens. As a testament to the depth of fishing history that characterizes this community, one fisher in Maternillo builds boats using caulking methods that have been displaced nearly everywhere with fiberglass.

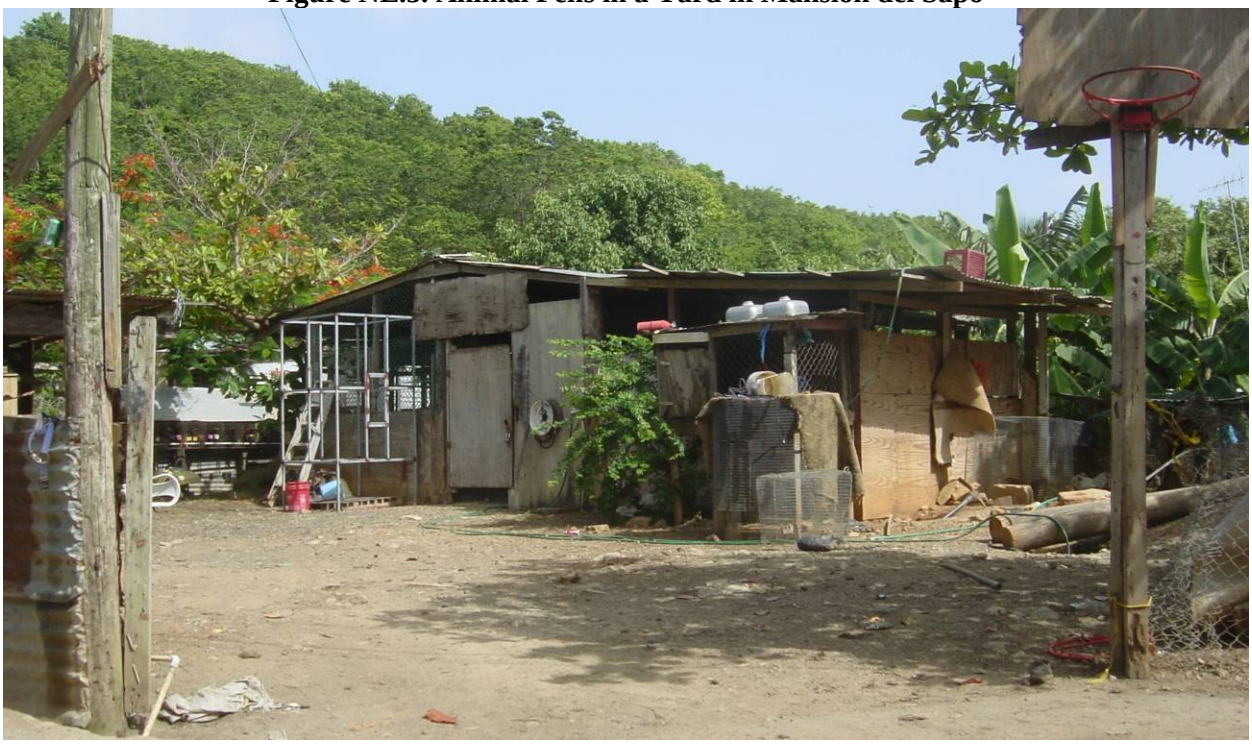
During most days, fishers gather at *Pescaderia Maternillo* and its nearby restaurants and bars. On weekends and after they have landed their catches on weekdays, their family members join them in folding chairs under palms lining the concrete walk along the harbor. During this time, as well, recreational and subsistence fishers use the *Pescaderia's* pier, indicating links between commercial fishing infrastructure and recreational fishing that are similar to those between recreational fishing and shipping infrastructure.

Figure NE.4. Maternillo Fishers Cleaning *Colirubia* (yellowtail snapper) across from *Pescaderia Maternillo* (note the recreational/ subsistence fishers using the association's pier in the background)

Further inside the community, following the Rio Fajardo, fishers and seafood consumers meet at two private fish markets: *El Relincho* and *La Recogida.* Strung out along the river are several vessels, natural ramps or other access points, private docks, and small and large houses with vessels and gear in their garages and yards. As one follows the road meandering along the river, moving inland from the harbor *Pescaderia Maternillo*, especially beyond a well known seafood restaurant called Rosa's, the houses and yards come to resemble poorer, peasant dwellings with attachments to agricultural and animal husbandry as well as fishing. This is *Mansion del Sapo*—Toad Mansion—a parcela that straddles livelihoods, its residents raising chickens and horses and engaging in subsistence and commercial fishing from the community's many access points.

Of the two neighborhoods, Maternillo is more explicitly engaged in commercial fishing. Its *Villa Pesquera* has 12 full-time and 12 part-time fishers. Three of the 12 full-time fishers are divers from the Dominican Republic. Fishers from both Maternillo and Mansion Del Sapo reported fishing for colirubia (yellowtail snapper) through the year, but also routinely catch kingfish, cojinua (blue runner), conch (which they believe is currently in decline), and baitfish (sardines, ballyhoo, etc.). Landings data from the two landing centers in the community, Puerto Real and Maternillo, confirm that yellowtail snapper is their most frequently caught species accounting for 28.2% of the catch over the 1983-2003 period. King mackerel account for another 13.4%. These were the only two species caught more than 10% of the time. Well over half (64.9%) of the fishers used bottom lines during this same time period, and 11.6% used SCUBA equipment. Most of their catch is sold locally, to the numerous seafood restaurants in the area and out of the three fish markets, but a small bus visits the community to buy their catch as well.

Figure NE.5. Animal Pens in a Yard in Mansion del Sapo



Annually, every June, the fishers from these neighborhoods gather to celebrate fishing, holding the *Festival de Pescado,* and in July they celebrate the Festival of the Virgen del Carmen, marching her statue through town and out on the water from the chapel where she resides through the year. Previously the seafood festival had been a three-day festival, supported in part by the municipality, but in 2005 the municipality withheld funds and the festival lasted only a day. This may reflect the municipality's backing of the marina expansion, which many commercial fishers oppose.

Las Croabas

The second fishing community in Fajardo, Las Croabas, sits out on a spit to the north and east of the central town of Fajardo. Two fishing associations, Sardinera and Villa Pesquera Atlantic Caribe, are important gathering and marketing centers for commercial fishers in Las Croabas; both are tied into the area's tourism in important ways. The associations share the community with a nature reserve, *Las Cabezas de San Juan (El Faro)* (The Heads of San Juan (the lighthouse)), a 316-acre park on the northeastern tip of Puerto Rico that the Conservation Trust of Puerto Rico acquired in 1975. The park is important to the fisheries of the region, and the island in general, for its research and educational efforts, some of which focus on the importance of mangroves and lagoons: "This community [mangrove forest and lagoons] plays an important role in the transitional zone between the land and sea," park officials write in their brochure. "Together, the mangrove forest and lagoons protect Puerto Rico's shores from natural disasters, create water purification filters and serve as both a refuge and nursery for wildlife, supporting over 40 species of fish and even more species of birds." The park is also important locally for directly preserving habitat within its walls, which support local fish populations.

Asociacion de Pescadores de Sardinera

Located on the main road between Fajardo's downtown harbor and Las Croabas, *Sardinera* has become a popular location for tourists and municipality residents to find fresh, high quality seafood, particularly on

the weekends. To the immediate north of the Association is the Sea Love Marina, and another, large complex (described in more detail below) is being built to their west. A fence separates their grounds from the neighboring marina, Sea Love, and they have, in turn, fenced in their own area. Fishers interviewed there reported that the Department of Agriculture has attempted to assume control of their facility, which is a prime coastal location, but that they have been able to maintain some autonomy with the backing of the local mayor of Fajardo.

The association has 17 members. Of these, three are Dominicans who dive, and seven to eight are bona fide fishers from Fajardo. The rest are from the greater San Juan metropolitan area—again testifying to the connections between Fajardo and the capital city. One of *Sardinera's* fishers still builds boats of fiberglass as well as of wood, indicating the presence of craftsmanship that not all fishing associations can boast.

Most of the fishers reported use lines, fishing around 13 nautical miles from Fajardo for colirubia, capitán (hogfish), grouper, and snapper. The Dominican divers leave port with, on average, six tanks apiece, targeting primarily high valued lobster and conch. Conch fishers complain that they aren't making as much money as they used to, in part because of the closed season for conch from July through September. This season, they claim, Peñalizes them while failing to adequately protect the conch, whose breeding season, according to fishers here, occurs in December.

Even without the seasonal closure, according to *Sardinera* fishers, expenses for catching conch and other species are rapidly catching up to sales figures. Divers claim that they leave port with the intention of catching at least 75 pounds of conch, which they can sell for $3.50/pound (or $262.50). However, to catch this amount they use up to six tanks of air, filled at a cost of $5.00 each ($30.00) and another $50.00 or more on gas for their boats and miscellaneous other expenses such as ice and maintenance. At the end of a long day they may have around $150 to $200. As with other seasonal occupations, such as farmwork in the United States, hourly wages under these conditions may seem high, ranging in this case from around $15.00 to $25.00/ hour, depending on the number of hours worked. Yet fluctuations in species abundance, weather, and human factors such as seasonal closures limit the amount of days per year that fishers can earn such hourly pay. Similarly, agricultural workers, working piece rates, can make what seem to be high hourly wages in fields thick with vegetables and fruit, yet field conditions vary from day to day and week to week through the year and their accumunated annual incomes can be quite low, usually below federal poverty levels (Griffith, et al. 1995).

Sardinera fishers cling to their hold over their association even as around them Fajardo continues to develop with ever greater recreational interests in mind. Despite new marina developments, they benefit from this traffic, selling three-fourths of their catch to local seafood restaurants and the other 25% to other parts of the island. Enhancing local seafood sales is the fact that the current association treasurer is a former head chef at a nearby seafood restaurant. Restaurants, many upscale and most featuring seafood, line the roadway to the north and south of the association, and the association itself sells cooked seafood to tourists and other visitors. They are tied into the community in other ways as well: consuming up to 110 bags of ice weekly, helping to support a local Gulf station with their fuel purchases, and having their tanks filled at a dive shop in Fajardo. Together with Atlantic Caribe, they endow Las Croabas with a commercial dimension to its attachment to the sea.

Atlantico Caribe

This association is larger than most, including *Sardinera*, with the typical lockers, an office, and pescadería yet also equipped with a large open-air, covered pavilion, a smaller (but still substantial) shaded sitting area with benches near the muelle, and a pier that is used not only for launching fishing excursions but also for ferrying bathers and snorklers out to Icacos island or any of the smaller islands off

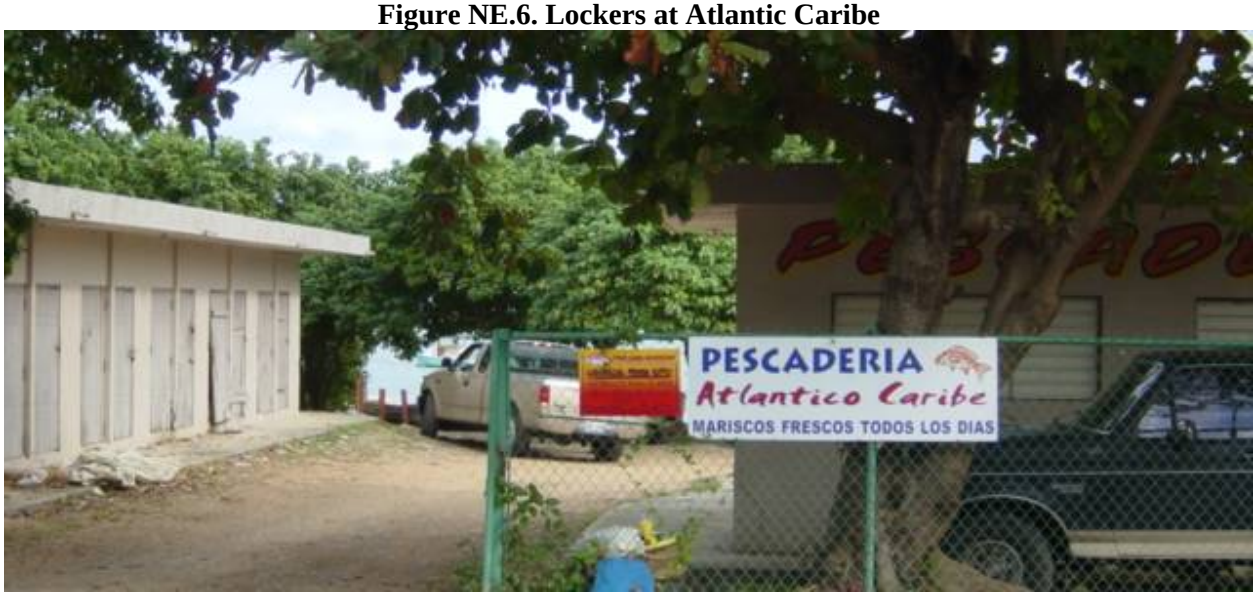
the coast of Fajardo. On weekend days, fishers from the association typically ferry between two and three family groups per hour; the families queue up at the shaded area described above, where they have the opportunity to interact with fishers. On each trip they can carry up to 15 individuals.

Forty fishers belong to the association, 25 of whom are bona fide fishers and 15 part-time. Two of these are divers, fishing with tanks and harpoons, and another 7 call themselves *naseros* (trap fishers). Formerly, they claim, there were up to 80 *naseros* at *Atlantico Caribe*. Currently they sell most of their catch directly to the public, adept at dealing with the public through their ferry services, yet when on the rare occasions that they have fish left over, they sell them to the restaurants in the area. There is one exception to this: *El Bohio,* a local family-owned and -operated restaurant, well known among visitors to Fajardo, purchase all the seafood they use in their restaurant directly from them. They claim that they sell only local catch, and that usually fresh instead of frozen, buying over 200 bags of ice per week to this end. A small portion of this ice they resell to tourists.

This association, like Maternillo, is an active gathering place for fishers, clearly central to their family life and their solidarity. Several old men seem ensconced in the place, and other fishers and ferry captains, all males, come and go, sharing their space happily with the tourists queuing up at the dock. Occasionally their children and grandchildren come by, lending credibility to the members' claim that the association is reproducing itself. Among their members we had the good luck to interview were two members of a family where the man has six sons, three of whom fish from this association. Another works in the United States, near New York. The sons are middle aged; the father can neither read nor write.

The family fishes with traps, fish and lobster both, with *cajones* and fish traps being the most important and *cordel*, for pelagic species, more or less second. Most other fishers in the association use lines, primarily, for species such as *colirubia, sierra, mero, sama,* and other deep water and pelagic species. They fish primarily in the waters north of Culebra to the waters north of Luquillo: an east west line along the edge of the shelf.

Figure NE.6. Lockers at Atlantic Caribe



Regarding the resource, fishers here reported viewing it worse than 10 years ago, yet better than 5 years ago: this was because of Hurricane Hugo, which tore through the area, destroyed reefs, and damaged mangrove forests. In addition to infrastructural damage, this made the fishing worse. Their economic situation, over all, is worse than it was five years ago, however. They practice their own conservation

methods in relation to reefs, careful to place their traps in the sand around reefs, rather than on the reefs themselves: this is in part due to the trap's efficacy: one of the gear changes they mentioned was to strengthen the bottom of lobster traps so that they lay flat on the bottom, which seems to improve their ability to catch. To do this they want flat, not rocky, bottoms, although they also want to take advantage of the reef's aggregating properties.

Fishers here, like fishers elsewhere, also mentioned the problems with pulling up fish from deep water—fish they aren't supposed to be catching—and finding them dead in the traps from the lack of pressure. This is wasteful and immoral to them, in part because they view the resource as something to be passed on to their family—their patrimony. The Jiménez (*pseudonym)* family, as three middle-aged brothers and a father, are indicative of the familial dimension of Villas Pesqueras: the older men gather at the Villa's space, playing dominoes and with their grandchildren, as well as exchange information about fishing and *las reglas.* In the Jiménez family, the father doesn't fish with the sons, but with *amistades* (friends), and then only one at a time, suggesting that the family overlaps with others from other families rather than keeps to itself.

Inside the Association grounds, while they share their space in the shaded area with tourists, there are clearly some places that are more or less "fisher space." The walk between the road and the muelle leads to a small patio-like area, shaded, where the tourists wait to be taken to Icacos and some of the fishers sit on short benches, talking and playing with the grandchildren, but the pavilion, the parking, the office, lockers, and other areas are clearly fisher spaces, more or less off limits to tourists. We witnessed one of the tourists, in fact, quite self-consciously violate this space, nervously, to ask about rides to Icacos: she stepped into the pavilion only briefly, because the fisherman waved her to the dock, where he said he would meet her in a moment.

Fishers' attitude to the state, here, as elsewhere, is ambivalent: on the one hand they appreciate working with groups like the Coast Guard Auxiliary, who give them safety training and provide them with licenses, and they have appealed to the state for resources (currently they are appealing to government agencies for funds to build a cement dock to replace their wooden one), but they have had major problems with DRNA enforcement personnel. They tell a story about this in pitched tones of voice, vehemently: how one of their sons was detained at sea the moment a woman on board began experiencing piercing pain in her side that she believed was appendicitis. The fisherman said that they could board his boat, but only after he reached the safety of the dock, where he could see to the woman's emergency. They were waiting for him at the dock, angry that he hadn't let them board him at sea, and again they detained him before he had a chance to help the woman to safety. A shouting match ensued, and slowly fishers from the association began converging on the DRNA vessel, coming to their fellow fisher's defense. The DRNA rangers then backed off. This show of solidarity, directed against the DRNA, underscores the mistrust fishers have for the DRNA, particularly for their enforcement personnel. Many times during the relating of this story they said that the DRNA personnel—one individual in particular—was *"anti-pescador."*

Summary

Fajardo's two commercial fishing communities—the downtown harbor and Las Croabas—are both tied into the municipality's tourist trade through not only seafood sales but through other ways of taking advantage of the boating and foot traffic through the area. Yet seafood restaurants comprise a central part of the Fajardo tourism experience, and the associations and private fish markets of the two communities continue to provide diners a range of high quality, fresh seafood. The tables below, from the Puerto Rican census of fishers, show that of the 50 fishers responding to the census (between 60% and 70% of the total reported to us in Fajardo), reef and continental shelf fishing account for most of the fishing effort. This is in line with the species listed as most important: conch and lobster, which tend to

be captured along the shelf, and the snapper-grouper species that are captured from reefs—*colirubia* in particular, which many fishers stated was their most important species, available all year. A majority (70%) also reported fishing for pelagics, primarily *sierra* (king mackerel).

Table NE.2. Fishing Locations and Styles, Fajardo (n=50)

Fishing Location	Percent Reporting
Continental Shelf	96
Oceanic	32
Reef	94
Shore	6
Shelf Edge	20

Source: Puerto Rican Census of Fishers, 2002
Totals do not add up to 100% because fishers typically fish multiple locations

Fajardo fishers reporting in the census were primarily affiliated to associations; our ethnographic work supports this in the downtown harbor area as well as in Las Croabas, yet in Masion de Sopa many fishers sell to private fish dealers without any affiliation to an association. Nearly half are full time fishers, fishing at least 40 hours a week, and the average of 30.52 hours suggests that most spend a good portion of their week fishing, with only 2% reporting fewer than 20 hours (an additional 28% didn't report hours).

Table NE.3. Selected Fajardo Fisher Characteristics

Variable	Response
Association Member	84%
Hours used for Fishing	
< 20 hours	2%
20 – 30 hours	18%
31 – 39 hours	4%
40 hours	32%
> 40 hours	16%
Mean hours	30.52
Standard Deviation	12.911
Minimum hours	0
Maximum hours	06

Source: Puerto Rican Census of Fishers, 2002

Table NE.4. Gear Used by Fajardo Fishers

Gear	Percent Using
Hand Lines	86
Snapper reel	14
Long line	12
Rod & Reel	36
Troll line	54
Beach Seine	8
Gill Net	30
Fish trap	26
Spear	22
SCUBA/ diving	6
Trammel Net	2
Lobster trap	2

Source: Puerto Rican Census of Fishers, 2002

The gear listed in the table above also conforms to our ethnographic interviews and observations. Despite that 30% use gill nets (likely for bait), this is clearly not primarily a net-based fishery, most likely due to the sheer numbers of recreational and other boats in the water, which would interfere with navigation and result in net loss. Instead, most commonly, fishers here use lines first, and other gears second, including traps and diving equipment.

Table NE.5. Marketing Behaviors of Fajardo Fishers

Marketing Behaviors	Percent Reporting
Fish dealer/ buyer	26
Association	58
Street vending	8
None	8
Sell fish gutted	16
Keep fish on ice	90

Source: Puerto Rican Census of Fishers, 2002

Table NE.6. Opinions of Fajardo Fishers Regarding Fishery Resources

Opinion	Percent reporting
Status of Fishery Resources	
Better	2
The same	37
Worse	61
Reasons for problems in fisheries	
Pollution	28
Habitat Destruction	14
Overfishing	12
Laws, regulations, and licensing	0
Crowding	10
Seasonal factors	2

Source: Puerto Rican Census of Fishers, 2002

Not surprisingly, one in ten fishers in Fajardo listed crowding as one of the principal problems facing the fishery. Again, the large number of vessels using the marinas of Fajardo and neighboring Ceiba, as well as visiting traffic from other Caribbean islands through these passages where the Greater Antilles and Lesser Antilles meet, make crowding a constant factor in fishing from the eastern shore. Because of this, marinas in Fajardo demand some special attention.

Marinas and Marina Development in Fajardo

Marinas currently occupy much of Farjardo's coast and are critical to the local economy and future growth trajectories. Most of the eleven marinas currently in the area have plans for expansion, and a new marina is well underway, much of it expected to be finished in the coming year or two. Marina development is likely to impact Fajardo commercial, subsistence, and recreational fishers in some fashion, if only because, currently, marina development is one of the primary economic activities taking place in Fajardo. For this reason, we visited other marinas to assess their role in the region's fisheries. As with Puerto Real, the number of fishers, either recreational or commercial, utilizing the marinas of the area, is very low compared to those using the marinas for recreational boating.

Marina Puerto Chico

One of Fajardo's established marinas, Puerto Chico has been in existence since 1966, or nearly four decades, and over that time has grown to include slip space for 266 vessels and dry stack space for 370 more, thus serving 636 boat owners. The vast majority of the vessels stored here are from San Juan, again testifying to this region's close ties to the metropolitan area. Similar to Puerto Real's marina, few commercial or recreational fishers use Puerto Chico as their base, although one of its 27 employees is a commercial fisher who sells his catch to the association at Maternillo. Of those who use the marina, the director knew of only six (or < 1%) who were directly involved in fishing: four recreational and two commercial. Two of the recreational fishers also routinely fish in fishing tournaments, and the commercial fishers sell their fish to restaurants in San Juan.

Like other marinas, Puerto Chico provides a number of services to the community that both boating and fishing traffic can take advantage of, selling ice and fuel, maintaining a freezer for fish storage, and keeping a boat mechanic on hand for minor repairs. The marina's ties to the fishing industry cannot be said to be strong, however, and the boating traffic they encourage is likely more damaging to the region's marine resources than beneficial.

Nevertheless, marina development continues in Fajardo. Currently, in Las Croabas, there are at least two elaborate marina-condominium complexes being built, both advertising upscale accommodations with prices far beyond the reach of most Puerto Rican families. Indeed, as the photo of the billboard below shows, advertisements for these developments are less likely to depict Puerto Rican than whites from the U.S. mainland. That this particular advertisement is written in English is further evidence that they are attempting to attract families from outside the area.

Figure NE.7. Advertisement for New Condominium Complex in Fajardo

Fajardo's economic dependence on marinas may overshadow the contributions that fishers make to the local economy and society, yet Fajardo's two robust fishing communities—both fishery-dependent communities—combined with the popularity of the municipality's seafood to residents of the San Juan metropolitan area, make fishers' attachments to the sea a central part of the Fajardo experience. Without continued work on the part of fishers from Las Croabas and Downtown Harbor, the quality of the visitor's experience in Fajardo would suffer and the alternatives available to him or her for transportation, good food, and the general ambiance that fishing vessels and association facilities lend coastal landscapes would diminish. In addition, the continued vigilance with which fishers observe the near-shore natural

environment, objecting to ecologically destructive dimensions of marina and other coastal development, add voices and perspectives to processes that, though they seem inevitable, need not be.

Ceiba

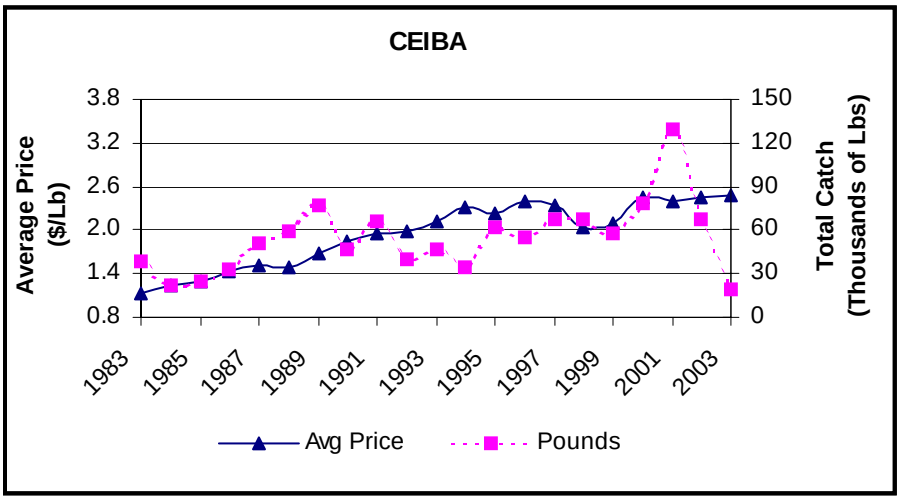
Roosevelt Roads, a U.S. military base, dominates much of Ceiba's coastline and has, very likely, contributed to the relatively low (if rising) unemployment rate that Ceiba enjoyed from 1950 to 1970. In addition to lower rates of unemployment, the percentage of people below the poverty level is also lower in Ceiba than in most of the coastal municipalities.

Table NE.7. Ceiba Census Data

CEIBA	1950	1960	1970	1980	1990	2000
Population Characteristics						
Population [1]	9,199	9,075	10,312	14,944	17,145	18,004
Civilian Labor Force (CLF) [2]	1,926	1,808	2,157	3,288	5,090	5,084
CLF - Employed	1,847	1,672	2,046	2,817	4,150	4,151
CLF - Unemployed	79	136	111	471	940	933
Percent of unemployed persons	4.10	7.52	5.15	14.32	18.47	18.35
Industry of employed persons [3]						
Agriculture, forestry, fishing and mining [4]		584	126	43	55	22
Construction		192	327	206	449	367
Manufacturing		52	273	592	631	317
Retail trade		156	278	378	756	576
Socioeconomic Characteristics						
Mean travel time to work (minutes) [5]		N/A	N/A	18.3	15.7	18.1
Persons who work in area of residence [6]		2,704	2,152	3,204	4,576	3,386
Per capita Income (dollars) [7]			1,233	2,817	5,119	9,256
Median Household Income (dollars) [8]		1,702	3,203	6,983	11,817	16,440
Individuals below poverty level [9]			5,330	7,243	7,353	6,479
Percent of Individuals below poverty level			51.69	48.47	42.89	35.99

Ceiba's landings place it 16th among the 41 reporting municipalities, in line with municipalities, such as Mayagüez, where fishing plays an important symbolic role in the local setting. Experiencing a gradual rise, in both landings and price, through the 1990s, fishers seem to have witnessed a series of declines early in the 21st century, with pounds landed dropping from a high of over 120,000 to a low of under 30,000. Prices have risen, more or less steadily, over the 20 years reported here, regardless of supply, except during the mid-1990s (correlation coefficient = .4363).

Figure NE.8. Ceiba Landings Data, 1983-2003



Ceiba History

Like Fajardo, Ceiba was populated slowly, through fits and starts, suffering particularly devastating crises during the 1850s. A cholera epidemic, virulent in Ceiba during 1855 and 1856, was followed a year later by Hurricane San Ciriaco, leading Fajardo to annex the territory. Fajardo's control of Ceiba lasted until 1914, when the territory reverted to its original autonomous status.

Their autonomy lasted fewer than three decades. During the Second World War, Ceiba again lost control of territory. In 1942, the federal government appropriated a large stretch of land, much of it coastal, to construct a naval base. The base transformed the municipality's economy. Prior to the war, Ceiba's inland region was agricultural, known especially for animal husbandry. What little sugar was produced in Ceiba found its way to the mills of Fajardo. Along the coast, animal husbandry was "complemented by fishing" ("*se complementaba con la pesca en los pueblos costeros*" —Toro Sugrañes 1995: 110)—a phrase implying it remained somewhat marginal to coastal livelihoods. "Ceiba faces fishing grounds that are counted among the best in Puerto Rico, but very special political conditions haven't permited the development of this industry to its full potential" ("*Ceiba está frente al mejor espacio pesquero con que cuenta Puerto Rico, pero las muy especiales condiciones políticas no han permitido el desarrollo de esta industria en toda su potencialidad*"—ibid.).

While Toro Sugrañes views the development of the Marina del Rey—one of the largest in the Caribbean, with the benefit of the close proximity of Fajardo's marine traffic—as one of the most significant marine related developments along the coast, interviews and a focus group with fishers at Ceiba's *Villa Pesquera Los Machos* revealed that his views are not shared among Ceiba's fishing families.[5] They complained that the development of the marina significantly increased contamination and decreased water quality.

Los Machos

The military base Roosevelt Road, currently being closed, takes up much of the coastline of Ceiba, Fajardo's neighbor to the south, but just north of the base, beyond the massive marine and boat yard complex of Puerto del Rey, a nice road curves east to the sea and the facilities of the *Asociación de*

[5] Puerto del Rey, according to Fajardo official sources, is in Fajardo, yet it is near enough to the fishing association in Ceiba that it infringed on their fishing lifestyles.

Pescadores de Playa los Machos. A public beach neighbors the association to the south, where there are small wood and corrugated zinc shelters and a large parking lot.

Figure NE. 9. Sign at Entrance of Ceiba *Villa Pesquera*

The association sits facing a peaceful bay that is bordered on the north, inside the military base, by healthy-looking mangrove forest and on the south by a long, cement, public pier that people use for recreational fishing. Recreational fishers fish too from the shore near the association, with rods and reels as well as hand lines. Frigate birds join the recreational and commercial fishers in their fishing, diving along the shore and in the bay among the fishing vessels.

During our first visit to *Los Machos*, in March, 2005, fishers we interviewed mentioned that they were working to open the restaurant within three or four weeks, hoping to attract some of the trade from the beach and possibly the military base. During our second visit, in June, the restaurant was indeed open, with steady business from the proximity of the beach and the popularity of the area for fishing. *Villas Pesqueras* with seafood restaurants, as noted in elsewhere in this work, generally convey a different image of the fishing community than those that are merely locations where fishers gather and launch their forays at sea. Perhaps most importantly, the presence of a restaurant often means that more women and family members are working on the premises, becoming a critical part of the enterprise. The association in Ceiba is no exception to this, presenting itself as well organized, with a woman secretary who is married to one of the members and who manages the restaurant. Much of the association's organization may be attributed to her. The signs posted on the walls, neatly (see below), are due to her efforts.

Women often lend an important dimension to fishery politics. In North Carolina, for example, women became important activists/ advocates in the state's marine fisheries, drawing on shore-based networks that were often based on common affiliations with school systems (some as teachers, others as parents), churches, and jobs in local government (Griffith 1999). Women were instrumental in organizing a concerted response to new fishery regulations in the Northeast groundfishing industry as well (Griffith and Dyer 1996). In these and other settings, women often link, very publicly, threats of economic declines due to regulatory changes to crises in patterns of consumption within households, endowing their protest with a familial quality that often assumes a moral character (Nash 1994). Griffith and Valdés

Pizzini (2002: 164-65) documented one instance where a woman's determination enabled her husband to use fishing to resist the authority of sugar company *mayordomos,* or foremen, who were treating the sugar workers poorly.

The women at *Los Machos* may be similarly important political resources. During our second visit, the secretary lined up several men to interview, apparently having some influence over them. She was considerably more verbose and animated than most of the men, although her presence in the focus group stirred up both the young and old men, who agreed with her opinions completely. She handles much of the association's finances, manages the restaurant, and keeps activity orderly within the *pescaderia* and fish cleaning rooms of the association. Some of this is aided by signage, one of which reads:

Figure NE.10. Sign Reading, "The fish processing area remains restricted only to members working and donating hours. Others should keep out of this area."

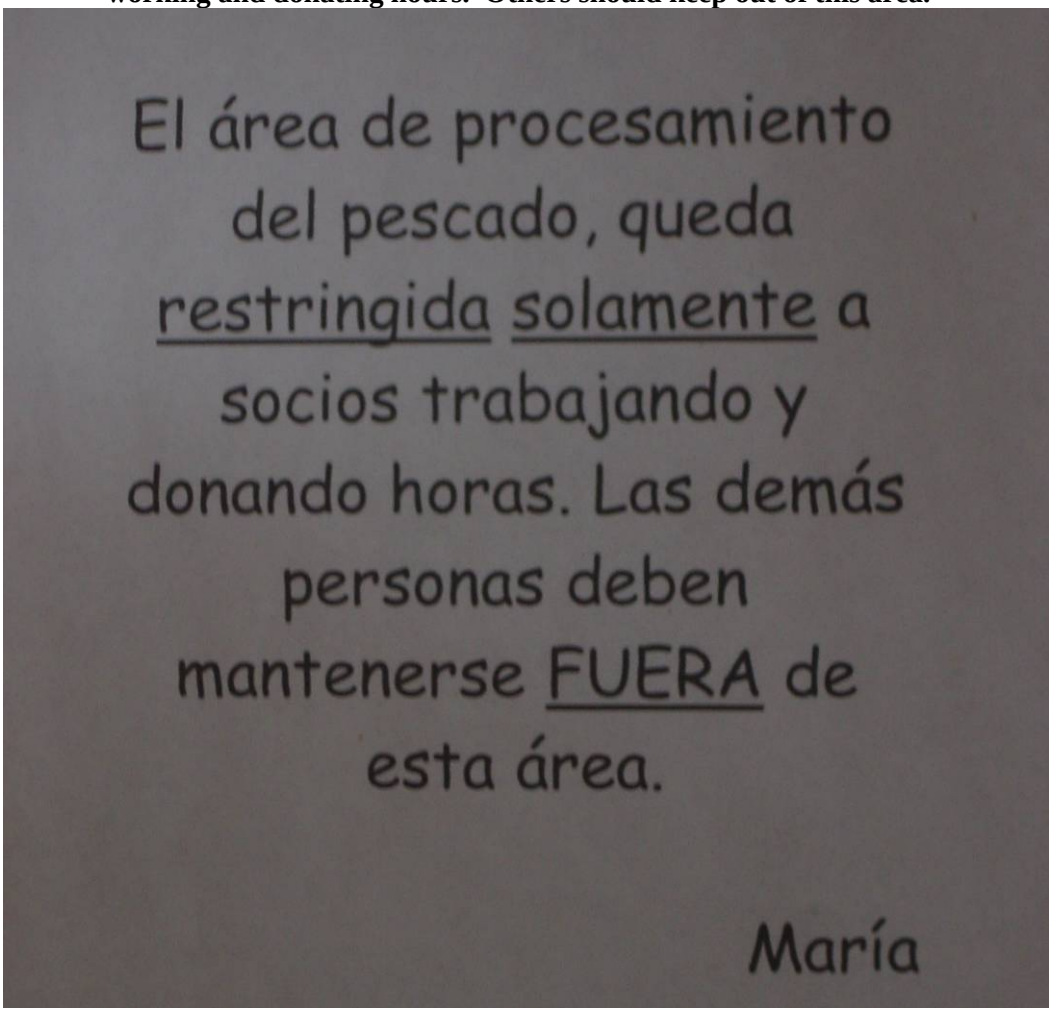
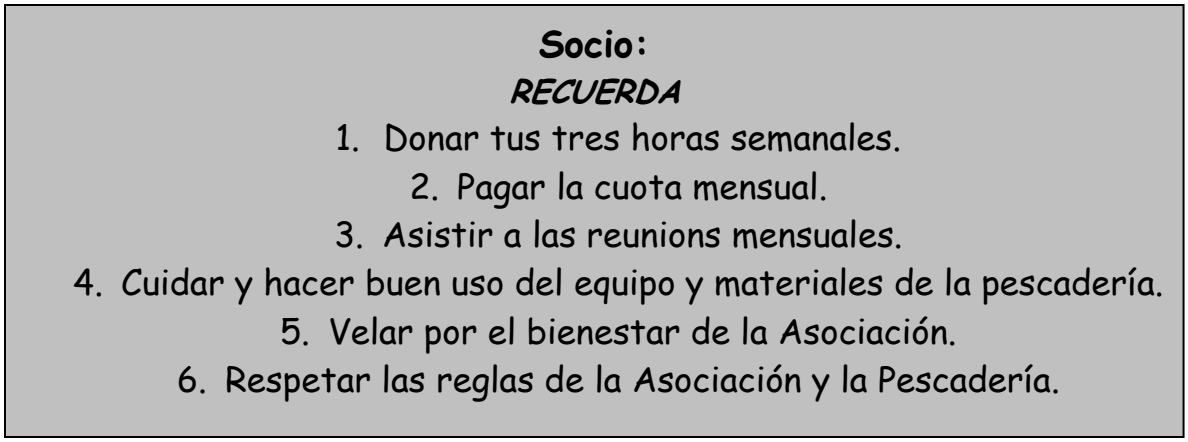


Figure NE.11. Sign Reading, "Member: Remember: 1) donate 3 hours per week; 2) pay monthly dues; 3) help with monthly meetings; 4) take good care of the equipment and materials in the fish market; 5) watch over the well-being of the Association; 6) respect the rules of the Association and the fish market."



Our interviews with fishers at *Los Machos* revealed a vibrant fishing community that is actively reproducing itself through family ties. One fisher who participated in the focus group, 19 years of age, mentioned that his father had taught him the craft of fishing and that, now, he was teaching his young son. He added that he considered fishing a family heritage, and the others at the agreed. While they do hire non-family members from the community from time to time, their most reliable crew come from their families; they find that crew hired from the community at large are usually interested in target earning (earning a specific sum and then quitting until they need another sum). In all, we interviewed seven fishers and one fisher's wife at *Los Machos*. The census indicates that 80% of fishers in Ceiba are members of its association, although the census failed to capture all of Ceiba's active fishers.

Table NE.8. Selected Fisher Characteristics, Ceiba (n=15)

Variable	Response
Association Member	80%
Hours used for Fishing	
< 20 hours	46.7
20 – 30 hours	26.6
31 – 39 hours	6.7
40 hours	20
> 40 hours	0
Mean hours	23.87
Standard Deviation	11.044
Minimum hours	8
Maximum hours	40

Source: Puerto Rican Census of Fishers, 2002.

According to our interviews, currently there are 16 bona fide members in the fishery and another 10 to 12 (total 26-28) who fish part-time; even the part-time fishers, however, must comply with the above rules to use the facilities. Fishers reported using a variety of gear, including fish and lobster traps, lines, diving equipment, and trammel nets, shifting in gear use through the year according to the availability of species, ideas regarding resource health, and regulations (such as the seasonal closure, beginning July 1, for conch). They build, repair, and maintain boats on the association grounds and

build their own traps, although the trammel nets they have made for them, providing specialists from outside the community with cord they purchase at Wal-Mart. They rely on Puerto Del Rey to fill their air tanks, taking 6 per trip, as well as a marina in Culebra. Culebra's prices are somewhat higher, however, for air as well as gas. When they know they are going to fish near Culebra, they usually take extra tanks of gas because fuel prices are high there. The following table shows that, in fact, use of traps is high in Ceiba, and that somewhere between one-third and one-half of fishers there dive.

Table NE. 9. Gear Used by Ceiba Fishers (n=15)

Gear	Percent Using
Hand Lines	73.3
Snapper reel	13.3
Long line	0
Rod & Reel	20
Troll line	26.7
Beach Seine	0
Gill Net	40
Fish trap	80
Spear	53.4
SCUBA/ diving	33.3
Trammel Net	6.7
Lobster trap	73.3

Source: Puerto Rican Census of Fishers, 2002.

Knowledge of substrates is critical to their fishing strategies and to their assessments regarding the health of marine resources of the area. Like fishers from Fajardo, they fish a triangular area that extends from the western tip of Vieques to the western tip of Cuebra and to Las Croabas, Fajardo, making sure they avoid the Luis Peña marine reserve near Culebra. This area includes the waters near Vieques, Palomino Island, Fajardo, Culebra, Cayo Norte, La Cordillera (Lobo, Lobito, etc.), and La Cordillera de la base. They shift from place to place over this broad area in the same way, they said, that farmers move from field to field, letting some lie fallow, so the resource can recover. The two main substrates they exploit are grass beds, where they dive for lobster and conch, and coral reefs, where they fish for many of the same species that Fajardo fishers target, such as the snapper-grouper species. They also target pelagics such as dorado and sierra. Divers here report that the substrates are generally in good condition, although occasionally there are contamination incidents and sedimentation whose source is a mystery to them. These incidents tend to negatively impact the conch population. The following table confirms the importance of reefs and the shelf in Ceiba fishing behaviors.

Table NE.10. Fishing Locations and Styles, Ceiba (n=15)

Fishing Location	Percent Reporting
Continental Shelf	93.3
Oceanic	46.7
Reef	93.3
Shore	0
Shelf Edge	0

Source: Puerto Rican Census of Fishers, 2002.
Totals do not add up to 100% because fishers typically fish multiple locations

They fish for conch in different locations depending on the moon, finding them closer to shore during a new moon and in deeper water during a waning moon. They also wait for changes in subsurface currents

to move sand enough to see the conch. The disposal of conch shells is something whose significance is debated among fishers. Some believe that piles of conch shells repel conch, creating the image of a conch cemetery, while others believe that piles of conch shells attract live conch. Fishers in *Los Machos* believe that whether conch shells repel or attract conch depend on where you dispose of them: if you dispose of them on coral reefs, they will attract more conch, but if you dispose of them in grass beds it creates the conch cemetery image. The impact of this on reefs is an issue for others to decide, although, as just noted, divers here reported that the reefs in their fishing territory are in good condition. They also reported recognizing that coral reefs are important to the health of the fisheries, and so limit their interactions with them.

They reported selling about half their catch to the association, much of it for use in its restaurant, and sell the other half through various channels, including one client from as far away as Santa Isabel (on the south coast), whom they have been selling conch for over eight years. The table below indicates that, for those reporting to the census, the association is the primary marketing outlet. They also reported that fish was an important part of their diets and the diets of their neighbors, with whom they often shared fish they couldn't sell and weren't going to eat themselves. This sharing is reflected below, in their attitudes toward wasting fish under current DRNA regulations.

Table NE.11. Marketing Behaviors of Ceiba Fishers (n=15)

Marketing Behaviors	Percent Reporting
Fish dealer/ buyer	6.7
Association	86.7
Street vending	6.7
None	20
Sell fish gutted	0
Keep fish on ice	86.7

Source: Puerto Rican Census of Fishers, 2002

The extensive knowledge base of fishers in Ceiba, as with professional fishers across the islands, qualifies them to critique current regulatory initiatives, as well as the behaviors and activities of regulatory agencies. Everyone we interviewed here agreed that the DRNA is their principal problem, repeating complaints that are common among fishers everywhere in Puerto Rico:

1. Licenses and permits have become overwhelming and costly, with too many species-specific licenses. Fishers here added that some of the elderly fishers of the association, who had been fishing for more than 50 years, were sometimes issued "beginners" licenses because they didn't have proper tax documents. They said that having this designation on their license was very humiliating for some.
2. When you pull up fish from the deep, they are already dead. Interestingly, however, one of the fishers at the focus group said that, many years ago, they used to deflate the bladder of the fish with a needle, so that they would quickly sink back to the bottom and revive. Now they waste so many of the fish that they no longer practice this. You can't help killing these deep-water species. This wasteful practice is immoral to them, and one of them suggested that at least they should be able to give the dead fish to the elderly.
3. The DRNA officials have little to no experience on the water; whoever is developing and enforcing the regulations should come learn from those who are on the water *"dia por dia."*
4. Licenses for such things as dredging and coastal development are given out unfairly, more often to large developers like the contractors building and maintaining Puerto Del Rey than to small organizations like *Villas Pesqueras*. Fishers here were denied a dredging permit even after Puerto Del Rey was granted the same type of permit to dredge where manatees visited every year.

Despite Ceiba fishers' problems with wasteful regulations and the DRNA, those interviewed in the census were more likely than not to view the fisheries as the same as previously; most of those we interviewed during our ethnographic phase, however, agreed with the 40% who said that the resource was worse off today than previously. It is interesting that no Ceiba fishers listed habitat destruction as among the problems threatening fisheries, perhaps because the military's presence kept coastal development in check.

Table NE.12. Opinions of Fishery Resources, Ceiba (n=15)

Opinion	Percent reporting
Status of Fishery Resources	
Better	0
The same	60
Worse	40
Reasons for problems in fisheries	
Pollution	6.7
Habitat Destruction	0
Overfishing	20
Laws, regulations, and licensing	0
Crowding	0
Seasonal factors	0

Source: Puerto Rican Census of Fishing, 2002

Summary

Despite their virulent opposition to DRNA, members of Las Machos fishing association are perhaps buffered from the effects of MPAs and other regulations by their traditional practice of moving among fisheries and fishing territories in the way a farmer moves among crops and fields, letting some lands lie fallow while working others. This has preadapted them to responding to seasonal and area closures, yet has also exposed them to a variety of fishing territories and, hence, has given them extensive knowledge of the region between Puerto Rico's east coast and a line extending from the western tip of Vieques to the marine sanctuary at Culebra. From this knowledge, they continue to criticize, while abiding by, current fishery regulations.

Vieques

For several weeks during the last months of the 20th century, Vieques achieved more attention than any other place in Puerto Rico, the *viequenses* (people of Vieques) entering the homes of their fellow U.S. citizens through televisions and radios as they protested the U.S. Navy's use of the island's marine and terrestrial territory for bombing practice. The protest began following the accidental bombing death of a civilian guard, but its broad support among Puerto Ricans living at home and abroad drew from a deep well of resentment toward the Navy. Naval commanders ruled Puerto Rico during the initial years of U.S. occupation, and together with the appropriation of Puerto Rican territory for military installations in Ceiba, Vieques, and elsewhere, its disproportionate use of Puerto Ricans in military campaigns around the world, military violations of Puerto Rican sovereignty have left many Puerto Ricans feeling as though they have been abused by power in one of its most raw forms.

For viequense fishers, this has been an especially disruptive experience. Annually, the waters, substrates, mangroves, reefs, sea grass beds, and other marine and littoral environments have been bombed, at times with fishers' vessels and gear. Resentment and resistance among viequenses, long a common form of interaction, has predisposed them toward suspicion of the state and its representatives, whether arriving in naval uniforms or carrying landing sheets and other tools of reporting. Indeed, within our first five minutes of fieldwork in Vieques, we were called "*camarones*"—the slang term for undercover police in Puerto Rico.

Recent history in Vieques makes the typical ethnographic challenge of establishing rapport all the more difficult. Luckily, however, the attention Vieques has received in recent years has resulted in several scholarly and popular works that enhance our limited ethnographic observations and interviews. Most important among these is the work, Vieques en mi Memoria: testimonios de vida, by Ana M. Fabián Maldonado,[6] a work eliciting life histories from 15 viequenses, most of whom, like most native viequenses, are in way or another attached to the marine resources surrounding the island.

Despite military claims that they have added to Vieques's economy, census data suggest otherwise. Its high levels of unemployment and poverty compare unfavorably to those in most other coastal municipalities. Again, all sectors displayed below, except construction, have been experiencing losses of jobs.

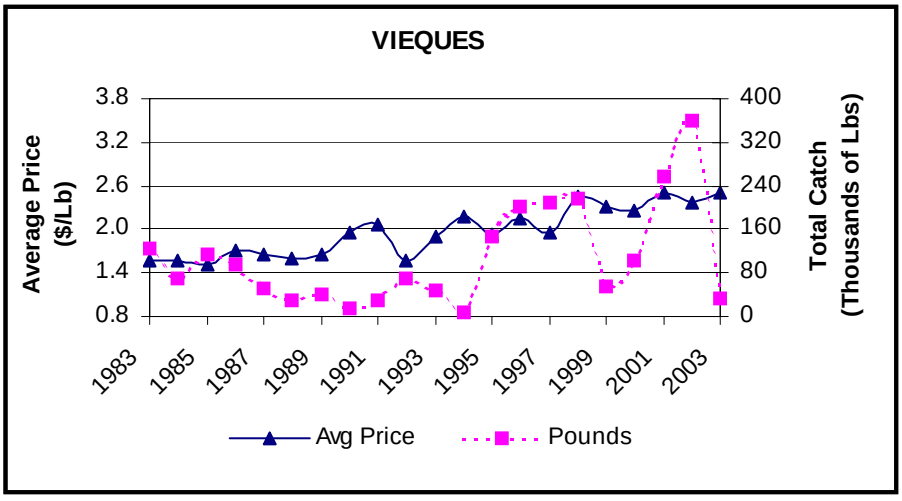
[6] This text has been useful here for its detailed chronology of Vieques history as well as for its in-depth look into the lives and families of Vieques residents.

Table NE.13. Vieques Census Figures

VIEQUES	1950	1960	1970	1980	1990	2000
Population Characteristics						
Population [1]	9,228	7,210	7,767	7,662	8,602	9,106
Civilian Labor Force (CLF) [2]	2,163	1,820	1,812	1,793	2,620	2,386
CLF - Employed	2,118	1,776	1,658	1,371	1,932	1,712
CLF – Unemployed	45	44	154	422	688	674
Percent of unemployed persons	2.08	2.42	8.50	23.54	26.26	28.25
Industry of employed persons [3]						
Agriculture, forestry, fishing and mining [4]		752	121	33	51	29
Construction		164	168	129	175	249
Manufacturing		124	497	278	227	117
Retail trade		220	205	124	364	172
Socioeconomic Characteristics						
Mean travel time to work (minutes) [5]		N/A	N/A	15.1	13.5	17.0
Persons who work in area of residence [6]		1,688	1,667	1,307	2,032	1,626
Per capita Income (dollars) [7]			812	1,480	2,997	6,562
Median Household Income (dollars) [8]		792	1,855	3,143	5,864	9,331
Individuals below poverty level [9]			5,356	6,030	6,192	5,880
Percent of Individuals below poverty level			68.96	78.70	71.98	64.57

In this economic climate, fishing provides a cushion against unemployment while also endangering the viability of fishing as a full-time lifestyle. Full-time Vieques fishers—those who have dedicated their lives to fishing—complain that part-time fishers flock to the sea with upswings in unemployment. Landings data from Vieques reflect heavy use of the resource, by both part-time and full time fishers. Of all coastal municipalities reporting landings, Vieques ranks third.

Figure NE.12. Vieques Landings Data, 1983-2003



Fairly stable through the 1980s, landings from Vieques rose during the 1990s and then again, after a drop from 1999 to 2000, in the early 21st century. The decline from over 320,000 pounds to around 40,000

pounds from 2002 to 2003, seen all around Puerto Rico, may be more of a reporting error than an actual decline in landings.

Vieques History

The largest of two island municipalities, Vieques shares with several other Caribbean islands the mixed honor of being among the first islands that Columbus, in 1493, encountered. The Spanish crown, through communiqués from Pope Alejandro VI, claimed Vieques as its territory four years later. At that time, Taino caciques occupied leadership positions on the island, organizing the Native American population into a ranked society dependent on a mixed economy of agriculture, fishing, and hunting. The Spaniards left this system more or less alone, operating under its own administration, for nearly four decades. In 1514, this autonomy changed when two caciques, Cacimar and Yaureibo, attacked the main island's east coast (likely Fajardo), initially forcing the flight toward San Juan of several colonists. Retaliation, however, was swift and ultimately more comprehensive, leading to the establishment of a Spanish foothold in the typical form of a church.

The island's strategic position in the sea lanes—midpoint between the Greater and Lesser Antilles—made Vieques a prized and contested possession, one the Spaniards lost control of to the English in 1647, only to retake control later that same year. Forty years later, the French took control of Vieques for a decade, losing it to Spain in 1697. Such transfers of power continued through the 18th century and into the 19th, with pockets of English and French living on the island and the Spanish consolidation of its political power and economic control uneven and incomplete. As a symbol of its turbulent history, viequenses still relate that, for five days in August of 1816, the American liberator-general, Simón Bolivar, found sanctuary on Vieques, retreating from defeat along the Venezuelan coast. Not until a third of the way into the 19th century, in 1832, did the political and economic situation in Vieques begin to stabilize.

Over the next ten years, until the early 1840s, the fist sugar haciendas and mills were established, laying the foundation for subsequent economic development based on export agriculture and the subordination of rural people to the rhythms of sugar and other agricultural commodities. Griffith and Valdés Pizzini profile Vieques fishers who, over a century later, struggled to free themselves from this subordination through fishing:

> "In 1955, Santos 'became independent from sugarcane' when he bought a small boat, a motor, and fifteen traps. He founded a fledgling fishing operation that, with the help of members of his household, enabled him to gain at least temporary independence. Santos was not alone. Another Vieques fisher named Victor became disengaged from sugarcane production through a similar route" (2002: 165).

The desire to get out from under the authority of *mayordomos* and the sugar industry in general may have been responsible for Vieques's reputation as link in contraband trade routes in the Caribbean. This dimension of Vieques history, similar to many other coastal locations, continues to present those with seafaring skills, such as fishers, opportunities to engage in drug trafficking and other illegal activities, an option that both enhances and in enhanced by the adversarial stance of many viequenses toward the state.

Against a background of smuggling and other illegal activities, Spanish authorities continued to take steps to assume control over the viequenses. Among the peaceful methods of control was the expansion and deepening of moral authority through the construction of the Catholic *Iglesia Parroquial de Vieques*, in 1855, and, in 1870, the first Episcopal Church. Military and legal authority accompanied attempts of enforce conformity through religion, with the quelling of worker protests and, in 1871, the regulation of

peonage, requiring all peons to live on the haciendas where they worked as well as to show obedience to *hacendados* and the authorities.

Three years later these draconian measures led to an uprising at the hacienda Playa Grande, in which many workers were wounded and one was killed. The governor of Vieques, Juan Luján, ordered those who participated in the uprising imprisoned in the Fort Conde de Marisol. The tense stability these measures secured was shattered in 1898, when the United States took the island and, in 1903, established an observatory at the same fort where Luján incarcerated the rebels.

These developments set the stage for drawing Vieques into expanding U.S. hegemony, with its naval power at the helm, ushering in a new era of expanded sugar production, labor unrest, and immigration to the island. Strikes in the sugar cane fields and mills occurred in 1915 and again in 1920. The former succeeded in reducing the workday by six hours, from 14 to 8 hours, and increasing wages. The latter succeeded in improving conditions as well, yet was stimulated by increased immigration of sugar workers, many from Louisiana, to Puerto Rico, where viequenses accused them of taking jobs from Puerto Ricans. As through much of the Caribbean, strikes in particular and labor unrest in general often coalesced political leadership and party development, and this occurred in Vieques coincidentally with increased U.S. military interest in the island. In 1924, as the local branch of the *Partido Nacional* was beginning to organize, the first military maneuvers were conducted off the coasts of Vieques and Culebra, and two years later the military expressed an interest in building naval bases on Vieques; the *Partido Nacional* held its first meeting four years later.

Over the next two decades, the military presence spread in Vieques, culminating, in 1940, when the Navy began expropriating lands for military purposes, eventually assuming control of all but the central 4,640 acres, where the two principal cities—Isabel Segundo and Esperanza—are located, the former on the north coast and the latter on the south. Construction of the base caused yet another wave of immigration into Vieques, tightening the social connections between the Virgin Islands and Vieques to the east and Ceiba/Fajardo and Vieques to the west. Construction of Roosevelt Roads base, in Ceiba, began around the same time. These developments also resulted in increased passenger ferry traffic across the region, an economic development still important to Vieques today. Passenger ferries between Fajardo's downtown harbor and Isabel Segundo arrive in and depart from Vieques several times a day. Mid-century Vieques also witnessed the growth of cattle ranching and expansion of agricultural production away from a concentration on sugar, including the development of pineapple plantations.

Despite the work and development that the construction of the military bases stimulated or enhanced, relations between the military and native viequenses were strained from the beginning. Following World War II, problems erupted every few years. In 1947, for example, an organization called the *Hijos de Vieques* (Children of Vieques) publicly opposed the military presence after succeeding in moving the government of Puerto Rico to establish a rum distillery on the island. Similar protests occurred in 1948. Through the 1950s, fights and related violence broke out periodically between native viequenses and military personnel, including a riot in 1959 at the Recreational Social Club of Vieques, resulting in several injured. In 1961, viequenses protested the storage of nuclear weapons on their soil. In response to this, Robert McNamara proposed clearing the island completes of viequenses, including in his proposal a plan to relocate bodies from cemeteries, to avoid people returning to the island to visit the dead.

Such proposals, hotly contested, were indicative of the lack of sensitivity on the part of U.S. administration after U.S. administration toward the viequenses' desires to take control of their island. Continuing through the remainder of the 20th century, stained with the occasional riot, murder, or accidental death, they eventually led to the occupation of the base in 1999. Importantly, the commercial fishers of Vieques were at the forefront of these struggles, suing the U.S. government in 1979 in an attempt to force the navy to curtail their maneuvers and their shelling and actively backing the various

protests against the military. Prominent fishers were named as plaintiffs in such cases as well as occupied positions on the special commission that convened in 1999 to resolve the crisis of the occupation.

Fishing in Vieques

> "*Pesca no es sobre vivir, es sobre sobrevivir.*" ("Fishing isn't about living, it's about surviving"). —Vieques fisher, June, 2005

Ironically, given their adversarial relation to the federal government, Vieques fishers' relationships with local branches of the state, especially the Department of Agriculture and its extension office on the island, have been at once beneficial and a source of division within the fisheries. Geographically, Vieques is positioned with its length oriented in an east-west direction, with the eastern and western ends the navy's territory and a central corridor running from the two population centers—Isabel II on the north coast to Esperanza on the south. Both of these communities host fishing associations as well as unaffiliated fishers. Currently, however, two principal factors confound any attempt to determine the number of full-time and part-time fishers in Vieques: 1) a Navy program that compensates fishers for loss of habitat due to fishing; and 2) attempts by four groups to establish fishing associations, in part as vehicles to garner resources from the state. The former initiative had led to over 300 people claiming to be Vieques fishers, attracting even people from Fajardo and Ceiba. The latter has led associations to inflate their numbers and compete for the memberships of unaffiliated fishers, making accurate counts of current members difficult.

Fishers attempting to organize have been working closely with the local agricultural extension office, whose personnel have been attempting to negotiate among various interests to distribute funds for fishing vessel purchase and to assist in such things as keeping up with changing regulations, licensing requirements, and association memberships numbers. Information from the extension agency lists the four associations as follows:

- Associación de Pescadores de Vieques
- Asociación Soberana de Pescadores Isabel Segunda, Inc.
- Nueva Alianza de Vieques, Inc.
- Associación de Pescadores Unidos de Sur

Each of these is associated with powerful figures on the island. Their leaders have had extensive experience with mobilizing people politically, engaging and taking advantage of the press, and otherwise demonstrating astute leadership abilities. While they may come together when facing a common enemy, as with 1999 colonization of naval lands, in the founding and management of fishing associations they often find themselves in conflict. Further complicating the fishing profile in Vieques is the fact that the association facilities in Isabel II are currently being rented by several unaffiliated divers for the use of their pier, market, and other infrastructure. Census data suggest that the majority of Vieques fishers, in fact, do not belong to an association, although much of the growth of associations may have taken place since the census was taken.

These data also show that Vieques fishers spend considerable time at sea. Just under two-thirds spend between thirty and forty hours per week fishing, and none reported fishing less than 20 hours per week. Nearly six percent fish more than forty hours per week. Most of this fishing is done along the continental shelf and neighboring reefs.

Table NE.14. Selected Fisher Characteristics, Vieques (n=52)

Variable	Response
Association Member	32.7
Hours Spent Fishing	
< 20 hours	0
20 – 30 hours	32.7
31 – 39 hours	30.8
40 hours	30.8
> 40 hours	5.7
Mean hours	34.46
Standard Deviation	6.357
Minimum hours	20
Maximum hours	45

Source: Puerto Rican Census of Fishers, 2002

Table NE.15. Fishing Locations and Styles, Vieques (n=52)

Fishing Location	Percent Reporting
Continental Shelf	96.2
Oceanic	23.1
Reef	96.2
Shore	21.2
Shelf Edge	23.1

Source: Puerto Rican Census of Fishers, 2002
Totals do not add up to 100% because fishers typically fish multiple locations

In terms of fishing practices, however, there is consensus that Vieques is a microcosm of a larger change that Matos, in his reports from the fisher census, had documented for Puerto Rican fisheries in general: an increase in diving and a decrease in other gear types, particularly traps, despite that traps remain important in Vieques. This process has not been uniform. In general, younger fishers migrate toward diving, often without proper instruction in the use of tanks and other gear, while elder and more experienced fishers tend to utilize a variety of gear, changing through the season.

Figure NE.13. Diver Weighing Conch, Isabel II, Vieques, on the Eve of the *Veda* (Seasonal Closure)

We visited the island near the beginning of the seasonal conch closure, which begins July 1, and the potential problems that this time of year poses for inexperienced divers became obvious as we watched divers land their catch. First, the closure had stimulated a rush to catch as much conch as possible prior to the season closing, encouraging fishers to engage in risky behaviors as they hurried to dive, capture, shell, and land conch. In his field notes, Garcia Quijano makes the following observations regarding what he calls a "diving derby":

> *"This makes three times in three years that I have observed a 'diving derby' happen as a side-consequence of the moratorium. This is worrisome because during 'derby' conditions fishers have been known (in many places) to engage in more hazardous activities. Hazards related to unsafe diving come to mind because conch fishermen are divers and collecting conch is a very time-consuming endeavor. It is more so than spear fishing in my opinion: to find conch the divers do an lengthy underwater scan of sea grass prairies and sand flats and then collect conch as they see them. This contrasts with reef spear fishing, where fishers instead go to a place where many species of fish are geographically concentrated (the reef). The work is still hard but a lot less time is spent just searching for game. The ecological knowledge of conch obviously plays a role in knowing where to look (it is not easy to find conch in the endless underwater open spaces, as novice doesn't have a chance to make a living without expert help!), but according to my first hand experience during underwater participant observation, even the most expert conch fishermen have to spend a lot of time scanning the seafloor" (Garcia Quijano field notes, July, 2005).*

Other than diving, fishers in Vieques use fish and lobster traps primarily, along with lines for catching deepwater snapper and grouper species. Vieques fishers also, on occasion, capture juvenile fish, octopus, and shellfish for the aquarium trade. Fishers interviewed in Vieques mentioned that fish and lobster traps were the most significant gear, followed closely by diving, which is rapidly competing with traps as the most significant gear. Vieques fishers also use trammel nets for bait.

Data from the census do confirm the importance of diving and the widespread use of traps, although none in the census said that they used trammel nets. Moreover, the census data show that hand lines and other line fishing (Rod & Reel and trolling) are the most widely used gear, and that gill nets are an important gear as well.

Table NE.16. Gear Used by Vieques Fishers (n=52)

Gear	Percent Using
Hand Lines	83.7
Snapper reel	9.6
Long line	7.7
Rod & Reel	36.5
Troll line	15.4
Beach Seine	1.9
Gill Net	36.5
Fish trap	28.8
Spear	50
SCUBA/ diving	46.2
Trammel Net	0
Lobster trap	26.9

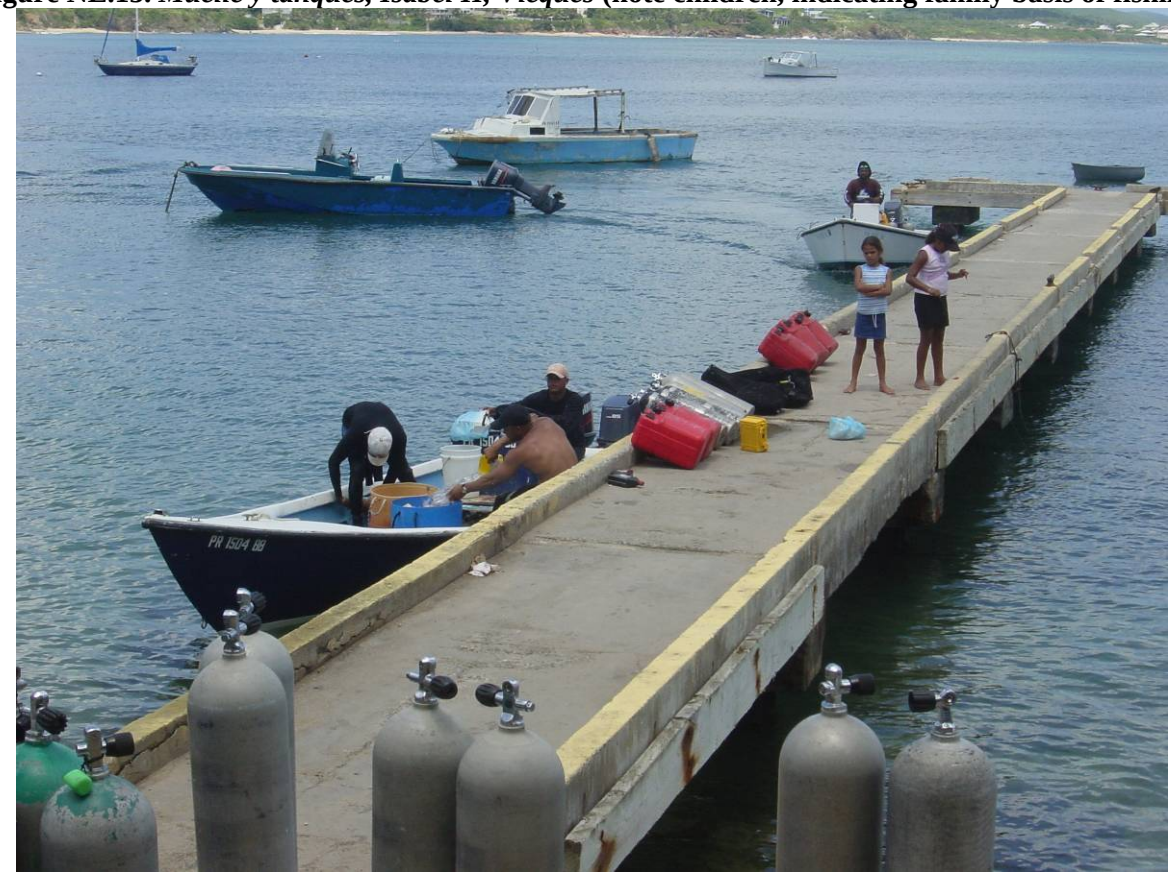
Source: Puerto Rican Census of Fishing, 2002

In general, the fishers of Isabel II tend to be younger and more concentrated on diving than the fishers of Esperanza. Esperanza fishers, more established, are more likely to combine a variety of fishing gear types through the year. Their experience is critical to their identity as fishers, separating them from younger and less experienced fishers and leading them to criticize the fishing behaviors of those with less experience than them. This last point in important in Vieques, where unemployment rates in recent years have led to an increase in part-time fishing. The leader of one of the associations told us that, beyond construction and tourism, job opportunities in Vieques are limited; construction and tourism are cyclical and seasonal in nature, and one avenue that many youth see as an easy way to make money is to fish. The problem is they enter the sea without guidance or apprenticeship. As with fishers elsewhere, experienced commercial fishers view inexperienced commercial fishers as causing problems to themselves, to the resource, and to relations between fishers and regulatory personnel. Part-time fishers expose themselves to hazards, keep lobsters with eggs, damage reefs and other substrates with poor fishing methods, and give regulators the impression that fishers care little about the resource, about reporting income or landings, or about following regulations.

Figure NE. 14. Youth Holding Bottle Containing a Juvenile Octopus for the Aquarium Trade, Vieques

While the July-October seasonal closure for conch creates problems for Vieques fishers in terms of the "derby" noted above, Vieques fishers share with fishers across Puerto Rico several other problems with regulations. As with Ceiba fishers, Vieques fishers expressed dissatisfaction with the current licensing system, which sometimes forces elder, noncompliant fishers into a category of "beginner fisher" for not reporting landings or fishing income. This is particularly humiliating for fishers who have long headed fishing families and who now occupy leadership positions within the fisheries of Vieques. One fisher we interviewed extensively, whom we call Fernando, comes from a family whose members have fished for generations. His father and uncles fish, along with his six brothers and his son. Wives and in-laws, as Griffith and Valdés Pizzini point out (2002: Chapter 4), are rarely excluded from household fishing enterprises. To establish and maintain his fishery, Fernando's wife initially went fishing with him and currently supports his as an occasional crewmember and general assistance with accounts and marketing. Despite being deeply embedded in fishing, Fernando and his son still occasionally have to take other jobs, in construction, when fishing is slow, the income from which enables them to remain fishers. Referring someone like Fernando or his father or uncles beginning fishermen thus becomes an insult not only against an individual fisher but against an entire household and extended family.

Figure NE.15. ***Muelle y tanques, Isabel II, Vieques*** **(note children, indicating family basis of fishing)**



This is doubly disturbing to Vieques fishers when they perceive that some of the people regulating the resource and calling them beginners are, first, without experience on the water and, second, basing regulations on studies conducted outside of Vieques waters, some as far away as U.S. South Atlantic states. When asked what was the principal problem facing Vieques fishers, a fisher in Isabel II said, "NOAA," specifically referring to the regulations outlines in law 278, which was posted on the walls of the fish market. Vieques fishers believe that DRNA officials possess little in-depth knowledge about the sea or its resources, and the lack of visibility of scientists conducing research in their waters has led them to believe that they are being regulated without any basis in science *that applies to their waters*. This *local* interpretation of fishery management is perhaps more important in Vieques than elsewhere; the island's unique history and position in the sea lanes leads many viequenses to believe that their situation is drastically different from even that of fishers on the mainland. This belief extends to the resource: Vieques fishers believe that their waters differ from other Puerto Rican waters, especially those of the west coast, where they believe most of the marine science is conducted.[7]

Additional problems facing Vieques fishers derive from gentrification. In Vieques this takes the form primarily of U.S. mainlanders moving to the island, buying property at prices that have inflated local real estate beyond the reach of most fishing families. Some lots (*cuerdos*) on the island are priced at between

[7] Griffith (1999) found that fishers in North Carolina, too, believed that local fishing resources were so unique that fishery managers could not regulate them based on abstract principals or studies conducted far from their waters. Their detailed understandings of a relatively confined geographical space, however, came at a cost: fishers tended to lack knowledge about others' fisheries even in neighboring waters (perhaps from respecting unwritten territorial rules) kept them from understanding that many fishers faced the same problems they faced, in and out of fishing.

$200,000 and $300,000, and even modest homes sell for well over $100,000. At the same time, municipality officials are promoting development initiatives that are unfriendly to working waterfronts, focusing on tourist development. Again, this emphasis derives, local fishers believe, from the officials' reliance on outside engineers and other supposed experts who do not appreciate the character or history of the Vieques people.

Another problem facing Vieques fishers concerns marketing. The continued presence of part-time and recreational fishers, noted above, has been not only detrimental to full-time commercial fishers from the standpoint of damage to marine resources and relations between fishers and regulatory personnel, fishers also claim that part-time and recreational fishers also dump cheap fish on the market. Fernando said, "A real fisher is someone who makes sacrifices to fish," adding that part-time fishers don't know about putting back lobster with *huevos* (eggs), selling fish that are too small, and damage the market by selling fish below cost. He went on to say that people who fish just when they are down on their luck or just to pay for expenses depress the market and make things bad for other fishermen, not following rules or destroying the environment with their fishing and boating practices, for example anchoring where they shouldn't. The following table shows the percentages using different marketing outlets in Vieques, according to the fisher census.

Table NE.17. Marketing Behaviors Reported by Vieques Fishers (n=52)

Marketing Behaviors	Percent Reporting
Fish dealer/ buyer	86.5
Association	3.8
Street vending	13.5
None	7.7
Restaurant	13.5
Sell fish gutted	1.9
Keep fish on ice	78.8

Source: Puerto Rican Census of Fishers, 2002

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On the weekends, according to Fernando, the boating traffic reaches high levels and their anchors are highly destructive of substrates. Sometimes their anchor bounce along the bottom, tearing up reefs. There are also several sources of contamination, and the resource is sometimes so contaminated (with, for example, lead) that it gets on your clothes and then you pass it along to your children. He knew that lead poisoning was particularly bad for children, saying that once he encountered lead when he had his son with him.

While pollution did show up in the fisher census in Vieques as a cause of problems with fishery resources there, it is surprising that no fishers pointed to crowding as a problem. In any case, most fishers believe that the fisheries are in worse shape today than previously.

Figure NE.16. Trap Vessel at Esperanza Association, Vieques

Table NE.18. Opinions of Fishery Resources in Vieques (n=52)

Opinion	Percent reporting
Status of Fishery Resources	
Better	1.9
The same	26.9
Worse	65.4
Reasons for problems in fisheries	
Pollution	32.7
Habitat Destruction	38.5
Overfishing	11.5
Laws, regulations, and licensing	0
Crowding	0
Seasonal factors	8

Figure NE.17. Ramp at Esperanza, Vieques with Boats in Background

Like the fishers of Culebra, Vieques fishers do face special problems in terms of the costs associated with fishing. Imports of gas, gear, and other fishing inputs are higher in Vieques than on the mainland. According to locals, a fisher's willingness to invest in fishing in Vieques is, therefore, more of a sign that they are a full-time, professional fisher. Because of this the fishers of Vieques find the designation, "bona fide" fisher highly confusing; even the local agricultural extension personnel said that the designation cause more confusion in Vieques than provide a step toward professionalizing the fishery.

Figure NE.18. Equipment Rentals for Tourists, Esperanza, Vieques

Summary

Vieques fishers consider themselves unique in Puerto Rico for their resistance to naval domination, their success at eventually halting the bombing, and their status as an island municipality with close ties to St. Croix, the other Virgin Islands (U.S. and British), and the Lesser Antilles in general. Indeed, one of the fisher leaders we interviewed in Vieques said that he would like to see Vieques achieve independence from the rest of Puerto Rico. This identity of uniqueness extends to fishery regulations and their belief that many of the regulations currently in place, developed based on fishing practices and fisheries research elsewhere, do not apply to them.

How this translates into the impacts of regulations is difficult to tell. We witnessed first hand the problems that attend the *veda* (closure) for conch, underlying the "fishing derby" mentality that results, in some cases, in hazardous behavior among divers. That Vieques fishers question the legitimacy of regulations is some indication that they are unlikely to comply fully with them, particularly when some of their leaders are considered "beginners" in terms of the currently licensing structure. Clearly this undermines local attempts to professionalize the fishery in a way that cuts down on the destructive practices of part-time fishers who jeopardize themselves and the resource with hazardous and damaging fishing practices. Nevertheless, in an island society like Vieques, fishing continues to provide an alternative to sporadic and chronic unemployment and those who know how to fish safely and in an environmentally conscientious way are willing to teach those whose knowledge and environmental sensibilities are less well developed. Through the development of an apprenticeship program, the four associations that currently vie for unaffiliated members may be able to diffuse some of the current conflicts that exist among them, coming together in their shared interest in protecting the resource in the same way they came together, successfully, during the 1999 colonization of naval lands.

Culebra

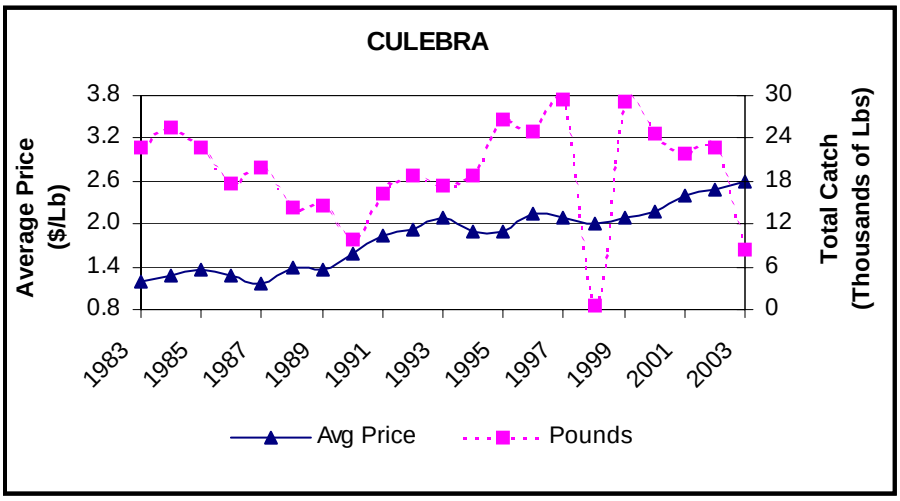
Of the four municipalities in the northeast region, Culebra was the last settled and currently the one most dependent on imported goods from mainland Puerto Rico and elsewhere. Guillermo Iranzo, in his *Etnografía de Culebra* (Ethnography of Culebra), calls Culebra one of the Lesser Antilles, explaining that its relatively dry climate and lack of high mountainous terrain, combined with its small size (3,342 hectares), has resulted in few available natural water supplies, a factor prohibiting settlement on a large scale. Today's permanent population is only around 1,500, around 200 of whom are immigrants from the U.S. mainland, and prehistorically and historically the island was known more as a way station in inter-island shipping and navigation than as a place of permanent residents. This is true even of migrating bird populations, and today Culebra's mangroves and other forests "serve as a refuge for endangered birds" (Iranzo 1995: 1).

Table NE.19. Culebra Census Data

CULEBRA	1950	1960	1970	1980	1990	2000
Population Characteristics						
Population [1]	887	573	732	1,265	1,542	1,868
Civilian Labor Force (CLF) [2]	233	180	322	502	639	701
CLF - Employed	232	172	296	485	596	583
CLF - Unemployed	1	8	26	17	43	118
Percent of unemployed persons	0.43	4.44	8.07	3.39	6.73	16.83
Industry of employed persons [3]						
Agriculture, forestry, fishing and mining [4]		56	53	19	8	0
Construction		8	33	36	104	87
Manufacturing		12	5	177	119	62
Retail trade		16	22	24	75	73
Socioeconomic Characteristics						
Mean travel time to work (minutes) [5]		N/A	N/A	9.0	9.5	12.1
Persons who work in area of residence [6]		160	262	479	554	531
Per capita Income (dollars) [7]			1,237	3,670	4,488	8,901
Median Household Income (dollars) [8]		N/A	3,038	9,375	12,143	17,008
Individuals below poverty level [9]			395	508	677	688
Percent of Individuals below poverty level			53.96	40.16	43.90	36.83

Culebra's economic profile compares well with many other coastal municipalities, with comparably low rates of both poverty and unemployment. Its fishing has been declining in recent years, as indicated not only by the census data and ethnographic information, but also by the landings data, which suggest declining catches from 2000 to 2003 (see Figure NE.19). This was after rising catches through the 1990s (with the exception of the drop from 1998 to 1999, which may be a reporting error).

Figure NE.19. Culebra Landings Data



Culebra Prehistory and History

Perhaps more so than most other Puerto Rican regions, the Taínos who settled Culebra originally depended extensively on fishing and the collection of near shore shellfish and crabs, maintaining the seafaring tradition that carried them there throughout their residence. Taíno encountered Culebra, the scant archaeological evidence suggests, during the 14th century, founding a society that mixed marine-related subsistence patterns with gardening, collecting fruits, and hunting. They had a distinct ceramic tradition yet didn't succumb to the organizational seduction of social classes or ranks, instead organizing themselves into extended nuclear families.

Iranzo speculates that the original settlers may have been fleeing conflicts elsewhere in the Antilles, seeking refuge as much from domination as from war. Even in Taíno communities not involved in territorial disputes or raiding neighbors for women, powerful Taíno caciques were known to have subordinated their subject populations to the point of exacting labor taxes for public works. The sea provided escape, and tiny islands like Culebra sanctuary.

Among Taíno technological achievements were fishing nets, which were evidently used primarily by men. Women hunted small animals and cultivated tubers and grains, and were the vehicles for tracing descent and matrilineage membership, instrumental in forming alliances among families for defensive purposes. Iranzo argues that warfare was common during the years prior to Spanish colonization, and that Culebra most likely fell within the hegemony of Guadelupe, largest of the Lesser Antilles and influential across a broad area. Vieques, Culebra, and the U.S. and British Virgin Islands would have been at the outer margins of Guadelupe's power.

Warfare continued to influence Culebra's development for the next several centuries, at least until the mid-20th century, when the people of Culebra experienced similar pressures from the U.S. Navy to provide it with training grounds for troops. Early Spanish and other European interactions with the caciques of Culebra were similarly distressing. Typically Spaniards enlisted caciques to help them with mining, ranching, and other economic enterprises, particularly in providing labor, and in return the caciques, as much a possible, used Spanish power in their own internal (now externalized) struggles.

Spanish colonization of Culebra was neither swift nor pressing. Very likely disease depopulated the native Taino villages, carried to the island on pirate ships and through fugitive slave and smuggling networks during the chaos of early colonization. Spaniards imposed the encomienda system[8] on the island as early as the 16th century, but fugitive slaves, pirates, and profiteers continued to utilize Culebra as a base of operations, contributing to its reputation as a place of refuge and resistance. Contraband, slaves, and manufactured goods continued to arrive from Europe and Africa, and Culebra's local elites traded agricultural products and livestock for them. Much of this traffic was a kind of spillover trade from Culebra's proximity to St. Thomas, which emerged early as a key place of maritime commerce. Culebra's deep water port, still critical to commerce today, also played a role in this trade. Not until the late 19th century, however, did permanent residents begin to outnumber transients in Culebra. Charcoal making became a principal activity, stressing local forests so much that, by 1869, an official inspection of the forests found them in poor condition (Iranzo 1995: 8).

The inspection of forests was indicative of increasing state interest in Culebra. By 1875, the governor of Puerto Rico, worried that Culebra might serve as a beachhead for a foreign invasion and aware of its reputation for piracy, initiated efforts to colonize the island. In 1877, he sent eleven armed men from Vieques to colonize Culebra officially, but it wasn't until five years later that Puerto Rico commissioned Manuel Garay to assume control of Culebra's ports and shipping between San Juan and Culebra began in earnest. Following this, the state divided up the island into 96 lots, assigning most of them to the current inhabitants and, in the process, founding four barrios within the purview of the Puerto Rican state apparatus. A few areas, primarily those adjoining the coastal areas and lagoons, remained under the direct control of the state. By 1886 there were 86 permanent inhabitants and three small businesses. Six years later there were 519 people in 45 houses with one church, one pier, one school, and a public cistern. Fishing was a key occupation. "Like other littoral zones," Iranzo writes (1995: 10), "in Culebra there developed a culture of fishers who combined fishing with subsistence agriculture." These fisher-farmers were producing their own nets and traps for local use and sale and, by 1894, exporting livestock, tobacco, beans, corn, and plantains.

Like other municipalities in the northeast, Culebra was occupied early in the Spanish-American War. The most brutal period of U.S. occupation occurred later, however, in 1902, when the Navy took control of St. Ildelfonso, one of Culebra's two large towns, and "dismantled" the population. Iranzo argues that: "the presence of the Navy has been the principal factor around which has revolved the sociohistorical development of the island during the present century. Areas such as the economy, demography, culture, politics, including the ecology, have been under its direct influence during the entire period in which they remained on the island (1902-1979)" (1995: 11).

Over the past thirty years, they island has changed in ways that those familiar with Puerto Rico's coast might suspect: increasing development oriented toward tourism and leisure uses of the coast, a decrease in households directly dependent on fisheries or agriculture, an expansion of transfer payments and other state assistance, and some industrial development stimulated by the 936 tax laws. Through all this, hostility toward the Navy and federal government lingers. Ambivalence toward the U.S. government derives from culebrenses' hatred of the Navy on the one hand and their appreciation for various state-funded projects that provide employment. Major employers are three pharmaceutical firms and Abbott Labs (makers of medical supplies), thus linking the fates of culebrenses to the health care industry.

[8] *Encomienda* was a system that granted rights to people and their labor to an *encomendero,* who reported to the Catholic Church and the Spanish Crown. In return for the use of labor, the encomendero was supposed to Chrisianize the people under his rule.

Fishing in Culebra

Our work in Culebra suggests that fishing was formerly more important there than it is at present, with the construction industry primarily responsible for siphoning fishers away from the sea. This seems opposite the situation and Vieques, where unemployment has caused an increase in fishing. Yet what is currently occurring in Culebra could follow the same route as what occurred in Vieques: construction projects and other economic developments could first attract workers to the island, yet subsequent downturns in employment could occur with the completion of projects or the closing of factories, pushing people toward fishing.

Currently, the single association in Culebra has 35 part-time members; according to an official there, not one of these participates in the bona fide program. Formerly, the association had as many as 51 members. Most of these members were born into fishing families and continue to teach their children the skills of fishing; however, others who belonged to the association previously, also from fishing families, have since taken jobs in construction. The part-time nature of fishing in Culebra is reflected in the information on hours spent fishing from the census. Unlike Vieques, nearly a third of Culebra fishers fish fewer than 20 hours per week.

Table NE.20. Selected Fisher Characteristics, Culebra (n=24)

Variable	Response
Association Member	50
Hours spent Fishing	
< 20 hours	29.2
20 – 30 hours	50
31 – 39 hours	4.2
40 hours	16.7
> 40 hours	0
Mean hours	21.71
Standard Deviation	12.723
Minimum hours	0
Maximum hours	40

Source: Puerto Rican Census of Fishers, 2002

This is also reflected in marketing activity. The association officials we interviewed in Culebra reported that only 4 association members sold their catch, the majority to the association. He said that 75% of the catch was sold to the association, 15% to the community at large, and 10% to restaurants. The census information was difficult to decipher, with over 80% mentioning they sold to the association yet two-thirds of those interviewed also saying that they had no marketing strategy.

Table NE.21. Marketing Behaviors in Culebra (n=24)

Marketing Behaviors	Percent Reporting
Fish dealer/ buyer	4.2
Association	83.3
Street vending	4.2
None	66.7
Sell fish gutted	8.3
Keep fish on ice	29.2

Source: Puerto Rican Census of Fishers, 2002

Among the fishery's most important resources is a gas station, originally to service the fishing fleet but eventually providing gas to passing marine traffic, generating the association an income of up to $10,000

per week. Association administrators are worried that ferry schedule changes will affect this source of revenue, because they will have to pay demurrage for the gasoline truck. Nevertheless, their willingness to provide fuel to the community is evidence of their integration. In addition, two fishers at the association also interact with the recreational traffic by providing water taxi services ("six-pack for hire") to tourists. Further, the association sells fish at bargain prices ($3.00/ pound), with only a 25% mark-up from the ex-vessel price of $2.25 per pound. Locals reported that their diet is rich in seafood, and that many of the American and European tourists staying in the Guest Houses desire seafood as well, creating a market that, occasionally, is supplemented with fish from Vieques and Fajardo.

Unique to the fishery profile of Culebra is its mariculture operation, run by the University of Miami, called The Snapper Farm, Inc. This operation grows cobia from larva for six months to weights of between 25 and 25 pounds, and exports between 70% and 75% to New York and Florida, selling the remainder to the community. They hire three divers to work their waters at $9.00 per hour, and the Navy donated them a 90-foot vessel that they are currently repairing. They are trying to grow lobster and dorado in a similar fashion, but their success with snapper has been disappointing. Snapper Farm-raised fish is more expensive than wild species, $4.00 per pound, but they occasionally provide the association with cobias that the association then resells. Annually, they harvest around 40,000 to 45,000 pounds.

Figure NE.20. Culebra Fishing Association

Fishing practices are similar to those in practice in Vieques, with hand and other lines most common but divers and trap fishers also important in the fishery and the use of cast nets important for bait. Our interviewing revealed that, according to the perceptions of locals, part-time diving and trap fishing were the most important gear used. Most of these are made locally, with some locally-purchased materials and others imported from Isla Grande (wire and bouys), Ceiba and Humacao (ropes), and Miami (ropes and bouys).

Figure NE.21. Boat Repair Facilities at Culebra Fishing Association

Table NE.22. Gear Used by Culebra Fishers (n=24)

Gear	Percent Using
Hand Lines	70.8
Snapper reel	4.2
Long line	17.4
Rod & Reel	16.5
Troll line	50
Beach Seine	0
Gill Net	0
Fish trap	33.3
Spear	33.3
SCUBA/ diving	33.3
Trammel Net	0
Lobster trap	25

Source: Puerto Rican Census of Fishers, 2002

With these gear they target several species, as is common across Puerto Rico's fisheries. Traps catch lobster, colirubia, sama, cherna, and mero. With lines they target colirubia, cherna, and pelagic species, principally sierra, and divers target principally lobster, conch, and other bottom fish. The areas they fish, according to the census, are outlined in the following table. Clearly, the reefs and continental shelf are the most commonly fished. Far from being opposed to the marine reserve in Culebra, association personnel reported that Culebra fishers were instrumental in getting it put in place, perceiving the need for the reserve in the wake of Naval activities. They also consider themselves pioneers in protecting species such as *jueyes*, or the land crab and actively support local research on coral reefs, on the reserve, and programs in which students in Culebra schools learn about marine ecosystems and their importance to the health of the island and its keys. This includes working with a local center for the aid of families run by Dominican Sisters, the Ford Foundation, which has given the association a grant of $11,000 to study life

of the coral reefs, the local 4-H club, and with Fish & Wildlife as they educate school children about the importance of mangroves in marine ecosystems.

Table NE.23. Fishing Locations and Styles, Culebra (n=24)

Fishing Location	Percent Reporting
Continental Shelf	100
Oceanic	0
Reef	100
Shore	25
Shelf Edge	37.5

Source: Puerto Rican Census of Fishers, 2002
Totals do not add up to 100% because fishers typically fish multiple locations.

Fishers in Culebra are currently very concerned about the mangroves. As noted earlier, the forests of the island have always been stressed by local populations for wood, charcoal, and other products. Today they are stressed primarily by coastal development, standing in the way of coastal construction. Ironically, the naval presence, so damaging in other ways, protected the mangroves through the 1970s; since they people have been cutting them for a variety of reasons, and fishers view this as a threat to the resource. This information came from our interviews. Interestingly, those surveyed in the census didn't mention habitat destruction as a cause for fish declines, but pollution and overfishing.

Table NE.24. Opinions of Fishery Resources, Culebra (n=24)

Opinion	Percent reporting
Status of Fishery Resources	
Better	0
The same	8.3
Worse	54.2
Reasons for problems in fisheries	
Pollution	4.2
Habitat Destruction	0
Overfishing	50
Laws, regulations, and licensing	0
Crowding	0
Seasonal factors	0

Source: Puerto Rican Census of Fishers, 2002

In addition to the problems with mangroves, Culebra fishers, like those from Ceiba and elsewhere, noted the recent problems with licensing, mentioning that it has been confusing and unfair and, again, that elderly fishers, with deep knowledge, have been issued apprenticeship licenses. Some have left the fisheries because of this, humiliated. This is particularly disheartening at this historical juncture, at a time when older fishers are critical to working with those organizations noted above to improve marine literacy among the youth of Culebra. More directly, the association has proposed a project to teach, formally, the "fishing arts" to Culebra youth; clearly, those elder fishers with extensive knowledge of fishing and marine ecosystems could be important resources in this effort.

Finally, Culebra fishers are, more and more, feeling the pressures of gentrification. Real estate prices are rising rapidly, they say, making it difficult for working people to acquire land and housing. Currently pieces of property for sale, once sold, will likely reshape waterfronts and coastal landscapes. Past experiences suggest that they will likely not benefit from such changes. Before Hurricane Hugo, for example, they possessed a dry dock facility near the gas station, but after Hugo destroyed much of it the

municipality repaired and appropriated it by ordinance. Currently they are working with the mayor to regain control of the facility.

Summary

As an island municipality heavily influenced by the U.S. Navy, Culebra shares many of the same experiences as Vieques, except that in Culebra the result has been a decline of numbers of fishers along with an evident decline in fishing activity among those who remain. Apparently members of the association in Culebra have been increasingly supplementing fishing incomes with other sources, either collectively, as in the gas station or with the grant from the Ford Foundation, or individually, providing rides to tourists. Their interest in promoting knowledge of fishing and of marine ecosystems, directly or through their assistance to other educational programs, also indicates a sense of stewardship that is heartening. Unfortunately, currently licensing requirements may stall these efforts at the very time they are most needed.

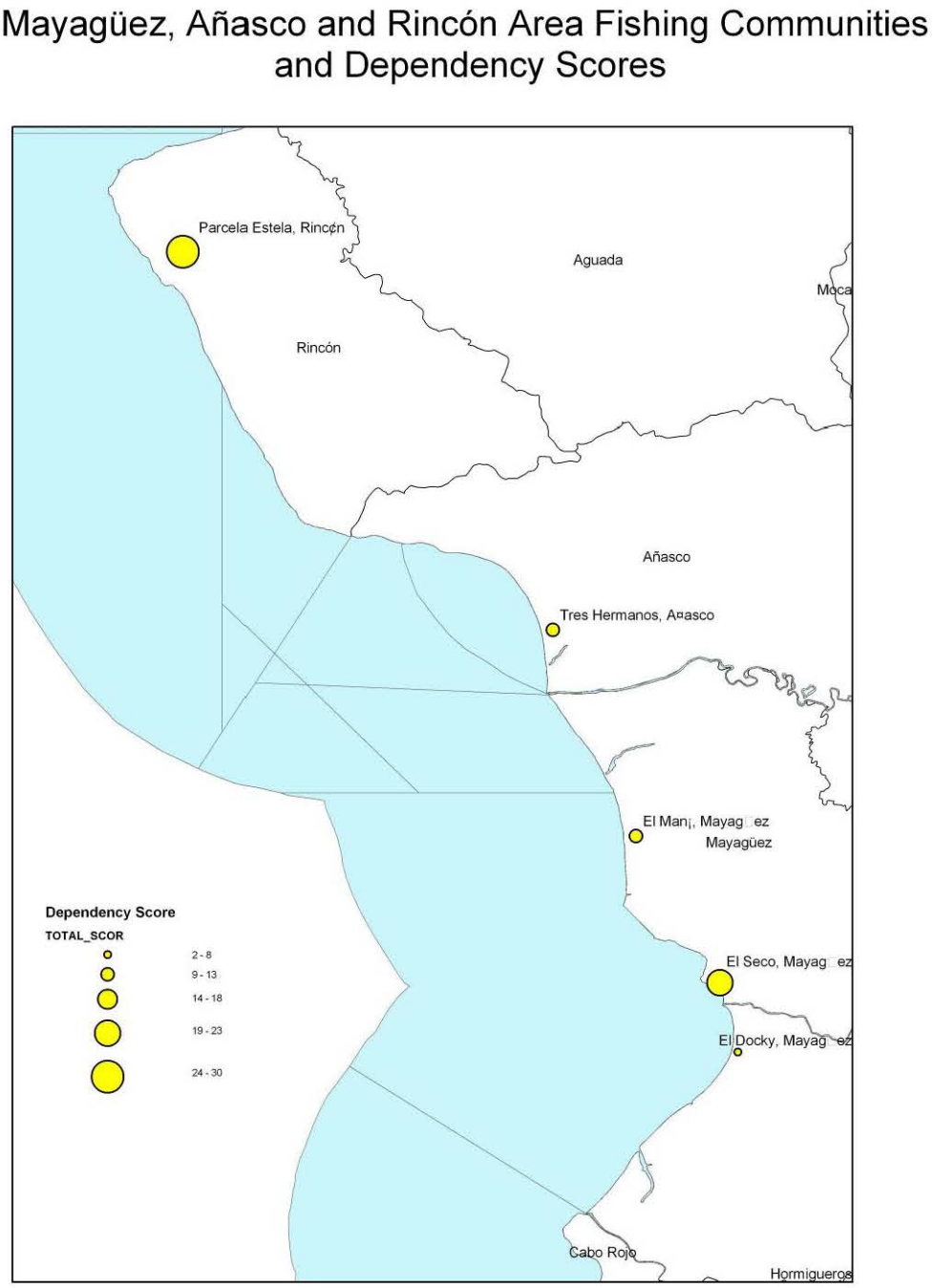
Figure NE.22. Cabanas Across Channel From Fishing Association

Western Metropolitan Municipalities:

Mayagüez, Añasco, Rincón

As the second largest metropolitan area in Puerto Rico and the center of marine science, this region is among the most important for fisheries in Puerto Rico from the perspective of advanced fishery knowledge and the recent development of innovative fishing practices. With the University of Puerto Rico, Recinto Universario Mayagüez (RUM), and the offices of the Departmento Recursos Naturales, Mayagüez is important as the center of fishery science as well as, historically, home to the large tuna canneries near El Maní. Among its most important assets in terms of the islands' fisheries is that the university is home to the UPR Sea Grant College Program, with its marine advisory service and active research agenda, and its links to research stations in Parguera and La Mona. Although the tuna canneries closed, after nearly 40 years, in the late 1990s and early 21st century, Mayagüez still has a ferry terminal to the Dominican Republic, three active fishing associations, and a sport-fishing sector. Another small association, Tres Hermanos, is located just north, in Añasco; many residents here commute to Mayagüez to work. Finally, Rincón is unique in its recent acquisition of crafts from the municipality and the municipality's investment in its fisheries. Fishers here exploit the resources between the Rincón coast and La Mona, attempting to become the most professional deep-water fleet in the west. The innovative and politically engaged fleet of Rincón fit well with the status of this region as a center of fisheries and marine resources research.

Map WM.1. Western Metropolitan Municipalities



Mayagüez

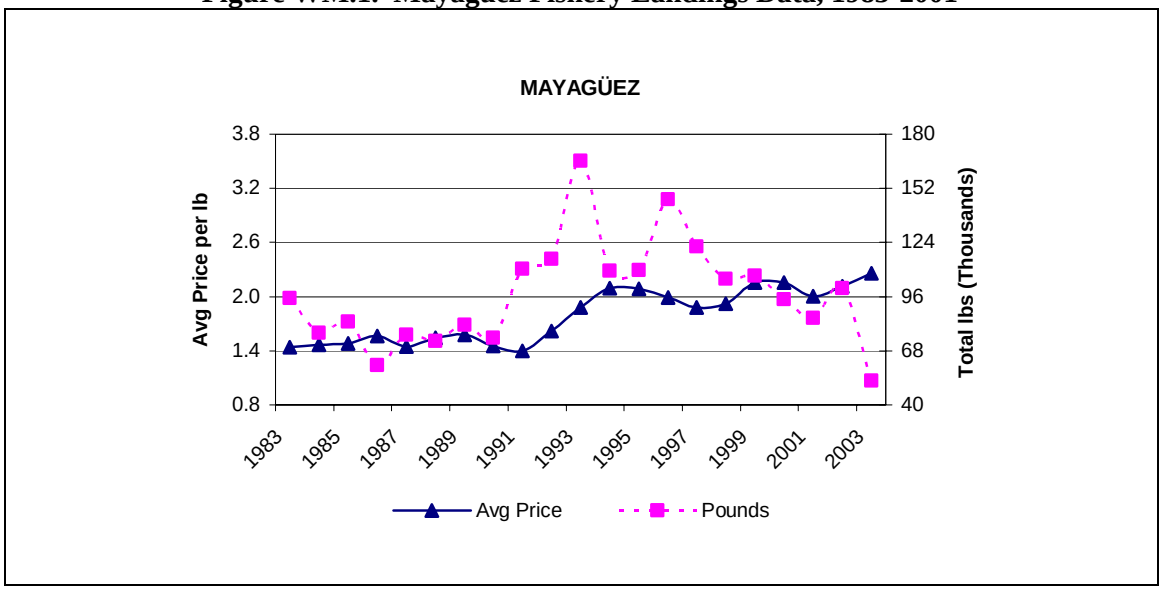
With the large western city by the same name, the municipality of Mayagüez has three significant commercial fishing centers, one active recreational fishing center, and a number of locations where a handful of fishers store their small vessels and land their catch. With the large metropolitan area, Mayagüez is one of the largest western municipalities with a more diverse economic profile than many of the other, predominantly rural municipalities. The retail sector in particular is large, rivaling manufacturing, which has declined over the past decade.

Table WM.1. Mayagüez Demographic Data

MAYAGÜEZ	1950	1960	1970	1980	1990	2000
Population Characteristics						
Population [1]	87,307	83,850	85,857	96,193	100,371	98,434
Civilian Labor Force (CLF) [2]	27,906	22,968	24,289	29,512	34,549	29,691
CLF - Employed	26,631	21,488	23,142	25,101	27,615	22,867
CLF - Unemployed	1275	1480	1,147	4,411	6,934	6,824
Percent of unemployed persons	4.57	6.44	4.72	14.95	20.07	22.98
Industry of employed persons [3]						
Agriculture, forestry, fishing and mining [4]		2,640	1,007	593	451	260
Construction		1,848	2,163	1,483	1,780	1,615
Manufacturing		5,384	6,456	6,659	6,738	3,982
Retail trade		3,212	3,786	3,757	4,361	3,401
Socioeconomic Characteristics						
Mean travel time to work (minutes) [5]		N/A	N/A	N/A	18.8	22.9
Persons who work in area of residence [6]		19,248	19,172	19,048	23,933	18,167
Per capita Income (dollars) [7]			1,007	2,313	4,380	8,003
Median Household Income (dollars) [8]		1,062	2,354	5,533	8,007	11,775
Individuals below poverty level [9]			53,425	54,240	57,902	50,805
Percent of Individuals below poverty level			62.23	56.39	57.69	51.61

Against this background, fishing today plays a minor role in the local economy, although as recently as four years ago tuna canneries employed several hundred workers, having declined from a high of around 3,000 to 4,000. The canneries have since closed, however, and most of the former tuna workers have entered the ranks of the unemployed, migrated to the U.S. mainland, or found work in the informal economy. One displaced tuna worker we interviewed, for example, reported surviving on credit at a local *colmado*, selling *frituras* (fried pastries) from her house, and sewing for people (see Section III for additional discussion of the canneries). Most of the fishers in Mayagüez fish either casually or part-time; over two-thirds of the 48 fishers captured in the fisher census fish for fewer than 40 hours per week. In the catch statistics, Mayagüez ranked 13th, just below San Juan. As in other municipalities, fishers here use nearly the full range of gear, but line rigs predominate, including the multi-hook rigs called *cordel* and *palangre*.

Figure WM.1. Mayagüez Fishery Landings Data, 1983-2001



Based on the landing data, fishing from Mayagüez peaked in the early 1990s and again in 1997 for the last time, after which the decline has been more or less steady (again, this may reflect a trend in reporting, as one of the fishers we interviewed suspects). Prices reflect supplies sporadically (correlation coefficient = .2637). Because Mayagüez is a major urban center, the price of locally landed fish may be less sensitive to supplies because of the availability of imported fish in the large supermarkets and other food stores of the town.

Mayagüez History

Like many coastal municipalities, Mayagüez takes its name from a Taino name, Yagüez, although the name of a river rather than a cacique. Officially founded by the Spanish in 1760, in its first dozen years of existence it managed to grow to 1,800 inhabitants who, together, had built themselves over 50 houses and had begun the construction of a church. Its status as a port facilitated rapid subsequent development, its population expanding ten fold over the next six decades. By 1835 it had received official status as a *Villa*, or recognized town, built a town hall, and erected along its port four armed towers, although some of its most important settlement areas were lost to a fire in 1841.

As a precursor to becoming the educational center it is today, Mayagüez distinguished itself early as a center for the free exchange of information, becoming the second city in Puerto Rico to have a press, *El Imparcial de Mayagüez* (The Impartial of Mayagüez), established in 1848. Architecturally, it was the first city in Puerto Rico to construct, in 1866, a functioning aqueduct. When Puerto Rico fell to the United States in 1898, Mayagüez citizens held protests for and against the change in government, and troops had to be called in to restore order.

During this time the population not only grew, it became more diverse. As a port city, it attracted people from around the world, becoming a major center for the export of agricultural products produced throughout the west. Like peasant farmers and plantations in other coastal municipalities, agricultural producers in Mayagüez produced sugar cane, rice, and fruits and, in its highlands, coffee, which they continue to produce today, hiring Dominican labor. At the turn

of the century Mayagüez had become a municipality of over 35,000, with people from 17 different nations. It had at that time thirty-three schools.

The university was first established in 1909, at the same time a railroad that linked San Juan and Ponce to the city was completed, and the agricultural experiment station shortly thereafter. Parts of the city, as happened across the island, were destroyed in the 1918 tsunami, but the city continued to grow. Towards the middle of the 20th century Mayagüez began receiving immigrants from not only the Dominican Republic, but also from throughout the island, including people from San Juan.

Fishing in Mayagüez

El Seco

This association adjoins a long strip of *carretera* or road that follows the curve of the bay, on the north edge of the metropolitan area of Mayagüez, past a housing project called Concordo. At the north end of the road, nearest the housing project, is a recreational area with ball fields and some other play facilities, along with a few *muelles*, a club for fishermen, a stand where they sell beer, *pinchos*, *empanadillas*, etc., and a large recreational facility that sits on the water and is still under construction. Among the area's attractions is a larger anchor (*ancla)*, which the Corporation for the Development of the West bills as a 300 year old anchor that was placed there with the aid of three fishing families, two of which have the last name of a famous fishing/ maritime family in this area.

Figure WM.2. Three Centuries' Old Anchor on Mayagüez Waterfront

This anchor is significant in a metaphorical sense: the anchor and the festival of the Virgen del Carmen (described in detail below) are reflections of one another. The festival is one way of anchoring the fishing community to the larger community/ coastal barrios of Mayaqüez, with the anchor there to suggest that however much fishing families may be drifting about in a sea of regulations, alternative employment opportunities, trends in seafood markets, and so forth, they

are still bound to this place, this location, and they have this three-hundred year-old artifact of maritime trades and this annual rite of intensification (the festival) to prove it.

Most of the facilities at this end of El Seco, along the road named after the Virgin, Carmen, seem more oriented toward recreational & social activities, and indeed this was where the Virgin ends up after its procession through the water and across the land. As you move south along this road, following the bay, however, you also follow the beach and see people in pavilions having picnics, playing dominoes, and 2 to 3 more vendors selling *pinchos* and other foods and drinks.

At *El Seco* landing center, on the south end of Calle Carmen, there is are the typical lockers and yolas around, along with a fairly nice restaurant/ bar and another stand where they sell cooked seafoods. At the north end of this was a cluster of boats where a man was cleaning and selling fish directly from his boat to consumers, a small scale (balance) there by the cleaning table.

Like Playa Santa in Guánica, this association has close ties to the recreational activities of the municipality, building on its proximity to significant marine recreational infrastructure, a public beach lined with picnic pavilions, and to the urban neighborhoods of Mayagüez. The relations between the commercial fishers who belong to the association and the community at large, its recreational sector as well as the general population, become manifest every July Sunday following the day of the Virgen del Carmen, the patron saint of fishers. The festival, repeated over and over by fishing associations and groups across Puerto Rico, is one way the fishers demonstrate their moral claim over the region's marine resources, at the same time able to illustrate their commitment to their craft to the community at large.

Celebration of the Virgen del Carmen (Virgin of Carmen), Patron Saint of Fishers

The procession is impressive, and similar processions and celebrations take place at all the *Villas Pesqueras*/ landing centers and communities or barrios where fishing is important and even some where full-time commercial fishing is in decline. Early in the day the Virgin, represented as a Madonna-like statue carrying a small child, is surrounded by fresh flowers and placed on a table in the center of the chapel. People begin to gather to pay their respects to the Virgin during this time, taking photos of her through the bars, crossing themselves, genuflecting, and otherwise demonstrating their thanks.

As the festivities begin, people gather to watch from lawn chairs, beach towels, and their cars, and the area begins to hop. Parked cars line the roadway. Families and individuals gather on balconies, at *muelles*, on the water in recreational boats, on jet skies, and along the shore in view of the water parade. Having taken the Virgin on a procession along the highway, showing her off to the town, the fishers then carry the Virgin onto a boat out in the water. Out on the water several crafts participate in the procession, with a few jet skis zooming in and out of the line to give it an animated, lively look. Once they have trailed along the horizon for a few minutes, they turn toward shore to land the Virgin. This is the moment of excitement. People press forward toward the *muelle* where they will land the Virgin, coming up close, crowding together, taking photos, some whistling and clapping. Between six and eight people carry the Virgin down the dock on their shoulders. She is surrounded by flowers, held high, with a child in her arms.

Figure WM.3. Fishers Carrying the Virgin of Carmen, El Seco

Figure WM.4. Fishers Carrying the Virgin of Carmen, El Docky

As the Virgin clears the dock the applause begins in earnest; shortly thereafter, queuing up behind her, several people begin singing a song in praise of her, a hymn, and follow her to the chapel, where she was resting earlier in the day. Others, in front of the procession, begin shouting, *"Arriba Virgen del Carmen" or "Viva Virgen del Carmen."* In one of the processions we witnessed, one of the men preceding the procession, by the way, walked with difficulty, handicapped as though from the bends.

Inside the chapel, at El Seco, they held hands around her, prayed, and then again sang the hymn in praise of her. People crowded the entrance to the chapel, though not all went in; some, though not all, crossed themselves, coming and going or even just standing at the Chapel's entrance. The ceremony inside went on without much attention to the crowd. Others told us that this was part of the *novenas* (nine days of prayer) and really a culmination of three days of active festivities.

Planning for this must involve fishing families' attention for several other days at least, decorating the *lancha*, planning the procession, acquiring the flowers, having commemorative shirts printed, arranging for the time to devote to this and the prayer.

Figure WM.5. The Virgin of Carmen Entering Her Chapel, El Docky

The ring around the Virgin wore commemorative t-shirts about the day, of which there were at least two varieties, and some of them wore sailors' caps, white, with black celluloid bills and yellow stripes, similar to those you see on commodores or yachtsmen. These were the fishermen, however, the members of the association.

This, then, was the ceremony. The other we witnessed went similarly: the procession, the applause, the hymn in praise of the patron saint of fishing… Equally important from a community perspective, however, were the various activities surrounding the central celebration: fireworks, social gatherings on the balconies of the neighborhood facing the beach, groups of all ages gathering to view the festivities, participate, applaud, sing, and buy food and drink from the vendors. Every trashcan overflowed as high as it could with the refuse of these purchases. These were 50-gallon cans and the trash stood at least 2.5 feet above them.

Through events of this nature, the community/ *parcelas/* neighborhood immediately adjacent to fishing centers, along with others from deeper inside the Puerto Rican interior, from Mayagüez and other municipalities, embrace while appropriating the fishing identity just as the fishing families embrace while appropriating the community as part of its being, its identity, and, most importantly, the seat of its soul, where the little chapel that houses the Virgin all year stands. In this way the two become intertwined in a way, for a moment at least, that makes them difficult to extract from one another. How to sustain this over the course of the year is something left up to the markets, but this event is not without its economic significance. In a time when much is being lost, when poverty and unemployment are high, events of this nature may enable some jump-starting of economic processes, with small vendors from lottery-ticket sellers to those who own

the *pinchos* and *empanadilla* stands bringing in cash and buying their supplies, propane, ice, and other products.

El Docky

This is the fishing association about at the end of one of the main streets running east-west through the town of Mayagüez. They too celebrate Carmen, in pretty much the same manner as El Seco, though at a different time of day and with far fewer people. Instead of the hundreds at the El Seco afternoon procession, there were perhaps 80 to 90 individuals here, not all of whom were fishermen but certainly many of whom were tied to fishing families. Fishers used their association lockers to host small gatherings of people, as though tailgating at a football game. (On a comparative note, one of the differences between this festival and the other, in addition to the sheer volume of activity, was that this was set in an area that was exclusively a fishing association, while the other ended up at a major recreational center that serves the community of Mayagüez as well as the social activities of commercial fishers of El Seco.)

Association members of El Dockey, in choosing the location for the festivities and the time of day (11:00 am), may have been consciously keeping the festival as much to themselves as possible, though they clearly didn't exclude the public and didn't mind that people were there to watch. Nevertheless, in addition to ending the procession in an area that was exclusive commercial fishing territory, there were no people there selling any drinks or cooked food, as with the other. The people there seemed no more devout, but they were obviously quite proud of their work for the day. The chapel here is within the fenced grounds of the fishing center.

The association claims to have 27 members, but most of them are part-time fishers. Their official name is the Association of the Virgen del Carmen, Sector El Dockey. They fish primarily with the *cordel*, a hook-and-line rig, catching primarily group and other reef fishes; some of the fishers fish at night for *carite* (another name for kingfish), which they claim are most abundant when there is no moon. The phases of the moon determine much of their fishing activity.

The association has no freezer and so the members aren't obligated to sell to the association. Most of the fishers have their own freezers and sell the fish however they can. Most, too, have their own vessels, but the association president complained that most of the vessels and their motors were small and not very powerful; the longest vessel, he said, was 16 feet. Their vessels, he said, were also in poor condition, which prevented them from venturing too far out to sea.

He classified the sea into three sections: *agua sucia* (near-shore, foul water), *agua verde* (green water, further from shore), and *agua azul* (blue water, very far off shore). He said that primarily the youth of fishers fish *agua sucia* when they aren't in school, catching small and juvenile species, including barracuda, while most of the fishers from the association fish *agua verde* but would like to be able to fish *agua azul*. In *agua verde* they catch grouper and snook, primarily. The few fishers (not necessarily from his association) who fish *agua azul* he described as "living in houses of cement, having large vessels, and no debts." He said that they catch primarily red snapper and large *manchego* (lane snapper).

The fishers of El Docky, by contrast, he described as predominantly illiterate, without facility for expression. Politicians come to them when they want votes, but make promises they never keep. Like many fishers, the fishers here have difficulties with the Department of Natural Resources, saying that they make laws without any explanation. Such comments are often made in the shadow of environmental knowledge: in this case, for example, the association president first spoke of other fish using the shells of the conch for protection; thus, the closure on conch robs

these other species of safe harbor at the same time that garbage and coastal development are ruining the water. He said that his son, a graduate student in marine science, studied conch and found that they played a crucial role in protecting other species, but that the DRNA refused to listen to his findings.

Perhaps because of this, he said, "The people are very frightened of panels and statistics." Currently, they would like to be able to build a ramp, but can't get a permit. They view the DRNA as their enemies, he said. They protect the environment at the cost of those who make their living from the environment.

Villa Pesquera El Maní

El Maní is a small association in the large parcelas by the same name that sits near the old tuna canneries and marine industrial district. It is a busy community with several *colmados* where people gather and a working class population that included the former tuna cannery worker we interviewed. The association sits on the water, near the south end of El Maní. While 14 fishers belong to the association, only around 7 or 8 are fishing now and only two of those sell their catch directly to the administrator. Thus, like other associations, it is a mix of casual, part-time, and full-time fishers, tied to the association by various threads, some only using the facilities for storage while others market their fish here as well. The administrator reported that there was only one bona fide fisher in the association—one of the two who sells all his fish to him.

All of the fishers have their own boats and the administrator reported them to be in "more or less good condition." The place is enclosed by a chain link fence, and they repair vessels here. They fish primarily with *cordel*, for pelagic species such as *sierra*, and with traps for snapper and, at times, lobster. Some of them fish with beach seines, catching second class fish. He said that fishers fish all of the areas that are closed seasonally, including Boya 6, Bajo de Sico, Abrir la Sierra, and Tourmaline, though he didn't say they fished them when they were closed.

They sell most of their fish "al detalle"—retail, but the fish they can't sell they tell to a local supermarket and fish dealers from as far away as Lajas and Aguadilla. Other fishers in the association have their own buyers, independent of him or his.

Mayagüez to Joyuda

Outside of the urban reach of Mayagüez, along the road to Joyuda, there are two small landing centers where fishers keep a few vessels along with small, primitive fish cleaning areas composed of no more than a wooden or metal table and some stools. Generally these places see little activity during most of the week, indicating that these are part-time fishers. Fishers who use these facilities bring their own scales to weigh the fish, selling them to passersby, usually on the weekends.

Also on the outskirts of Mayagüez there is a Club Nautico. On some weekend days it becomes highly active with sports such as volleyball and people parked thickly around its facilities, up and down the *carretera* (highway). Though they are a recreational club, they have a sign that reads *Se Vende Pesca* in large letters on its side. This is an active spot on the weekends, its bar quite popular.

Finally, in Joyuda, in addition to a long line of seafood restaurants, a fisher sells conch shells that are decorated with various images, including that of the Virgen del Carmen. The vendor, who

spent 30 years in the U.S., said that he bought the shells from divers who free dive in 30 to 40 feet of water.

Results from the Fishery Census in Mayagüez

Only 48 fishers responded to the fishers in Mayagüez. As in other municipalities, this is an undercount and likely does not include those fishers who launch their vessels from the small, unaffiliated landing centers south of the urban area. The majority of those interviewed for the census reported being affiliated with an association, and nearly a third are either full-time fishers or fish more than 40 hours per week. In this municipality, fishing part-time, a characteristic of two-thirds of those surveyed, may be related to the variety of alternative occupational opportunities that a bustling urban environment provides.

Table WM.2. Selected Fisher Characteristics, Mayagüez (n=48)

Variable	Response
Association Member	79.2
Hours used for Fishing	
< 20 hours	16.7%
20 – 30 hours	35.4%
31 – 39 hours	16.7%
40 hours	12.5%
> 40 hours	19.7%
Mean hours	32.02
Standard Deviation	15.877
Minimum hours	0
Maximum hours	72

Source: Puerto Rican Census of Fishers, 2002

Table WM.3 shows the most common fishing locations and styles in the municipality. Like many west coast fishers, these take advantage of the productive reefs off the coast as well as the deep water snappers in the Mona Passage. That comparably few fishers fish from shore indicates that most have access to vessels of one sort or another.

Table WM.3. Fishing Locations and Types, Mayagüez (n=48)

Variable	Percent
Shore	6.3
Continental Shelf	56.3
Shelf Edge	58.3
Oceanic	27.1
Reef Fishes	81.3
SCUBA Diving	4.2
Skin Diving	0
Pelagic	22.9
Bait	20.8
Deep Water Snappers	35.4

We discussed marketing in the above narrative, mentioning that many fishers in Mayagüez sell their fish retail, with the associations evidently a less suitable market for many. The census figures support this, with street vending (“walking”) the most popular.

Table WM.4. Marketing Outlets, Mayagüez (n=48)

Variable	Percent
Private	0
Fish Buyer	12.5
Association	35.4
Walking	47.9
Restaurant	2.1
Own Business	8.3
Gutted	64.6
Ice	68.8
None	22.9

Again, similar to the other fisheries of the west-northwest part of the island, lines seem to be the most ubiquitous gear, with nets, traps, and SCUBA equipment somewhat rarer.

Table WM.5. Gear Utilized in Mayagüez (n=48)

Variable	Percent
Beach Seine	10.4
Trammel Net	4.2
Long Line	52.1
Troll Line	6.3
Fish Trap	19.7
Gill Net	6.3
Cast Net	43.7
Hand Line	91.7
Rod and Reel	12.5
Lobster trap	0
Snapper Reel	8.4
Winch	8.3
Skin	0
Spear	14.6
Lace	16.7
SCUBA	12.5
Gaff	33.3
Basket	0

Finally, regarding their opinions about the status of fisheries, the vast majority of those interviewed believe the fishers are worse today than previously, with pollution as the principal problem.

Table WM.6. Opinions of Mayagüez Fishers (n=48)

Variable	Percent
Status of Fishery Resources	
Better	2.1
Same	12.5
Worse	85.4
Source of Problems	
Pollution	39.6
Habitat Destruction	14.6
Overfishing	27.1
Government regulations	12.8
Weather	4.2

Variable	Percent
Crowding	14.7
Other (imports, technology, gear)	6.3

Añasco

North of Mayagüez, Añasco is home to a small fishing association called *Tres Hermanos* (Three Brothers) that adjoins a long public beach—*balneario*—that has been, more or less, closed to the public, although the public still has access through the associaton's entrance. Subsistence, recreational, and commercial fishers use this association's ramp and adjacent wooden pier, taking advantage of the facilities and calm waters off the beach. Tres Hermanos, part of the community of La Playa, is the only landing center in the municipality, and though 34 fishers reported to the fishing census from Añasco (more than from Aguada), its landings ranked 26th out of the municipalities that report landings.

Table WM.7. Añasco Demographic Data

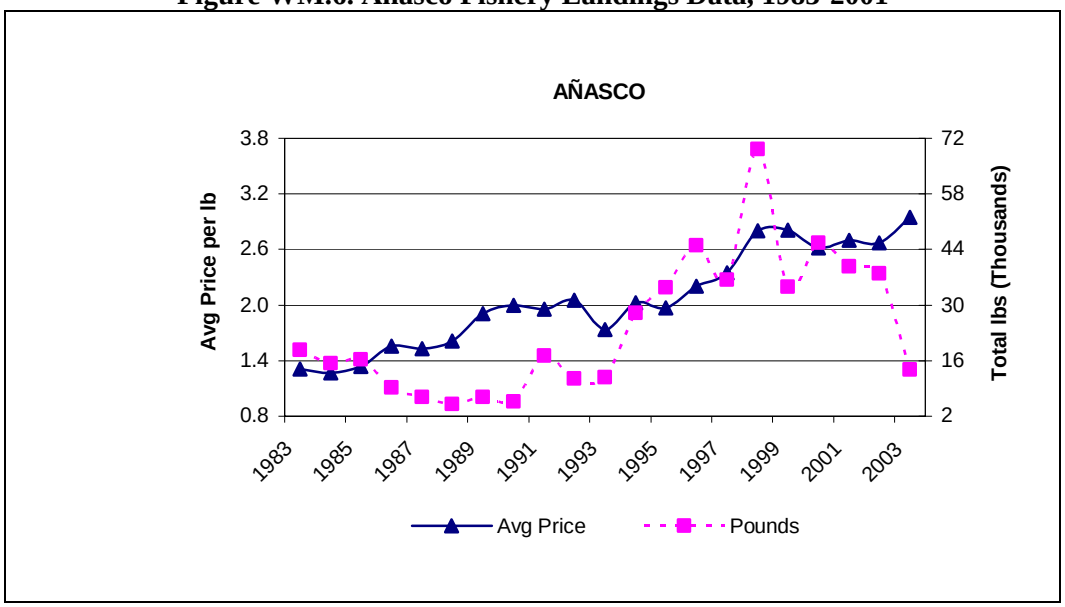
AÑASCO	1950	1960	1970	1980	1990	2000
Population Characteristics						
Population [1]	17,235	17,200	19,416	23,274	25,234	28,348
Civilian Labor Force (CLF) [2]	5,472	4,176	4,758	6,508	9,056	8,922
CLF - Employed	5,363	4,044	4,425	5,696	7,269	6,808
CLF - Unemployed	109	132	333	812	1,787	2,114
Percent of unemployed persons	1.99	3.16	7.00	12.48	19.73	23.69
Industry of employed persons [3]						
Agriculture, forestry, fishing and mining [4]		1,952	747	420	364	142
Construction		248	475	453	474	706
Manufacturing		1,024	1,580	2,283	3,256	2,173
Retail trade		284	416	575	746	541
Socioeconomic Characteristics						
Mean travel time to work (minutes) [5]		N/A	N/A	N/A	18.9	24.7
Persons who work in area of residence [6]		2,948	2,074	2,506	3,978	3,214
Per capita Income (dollars) [7]			641	1,711	3,289	6,613
Median Household Income (dollars) [8]		615	2,050	5,199	8,776	12,620
Individuals below poverty level [9]			14,776	15,260	15,531	14,611
Percent of Individuals below poverty level			76.10	65.57	61.55	51.54

Despite bordering the major western metropolitan area of Mayagüez, Añasco's economic profile has not benefited from this proximity. In terms of population, it is a smaller municipality than either Aguada to the north or Mayagüez to the south, and its unemployment rate is slightly higher (though likely not significantly so) than either of its neighbors. Like the other municipalities thus far profiled, its poverty rate, though high, has declined even as its unemployment rate has increased.

One of the fishers we interviewed at Tres Hermanos was a man who had suffered from depression that he attributed to his work at a local pharmaceutical firm, and he found that fishing offered him therapy for his condition (see Griffith & Valdés Pizzini 2002: Chapter 5 for discussion of fishing as therapy in Puerto Rico). He was an elderly man who fished with his adult daughter, primarily

for recreational and subsistence, and they fished with hand lines from the shore at Tres Hermanos. It is unlikely, of course, that fish from people such as this are included in the landings data, which has declined steadily over the past five years.

Figure WM.6. Añasco Fishery Landings Data, 1983-2001



Average fish prices in Añasco have risen over the past 20 years, particularly during the 1990s, but not always in response to fish supplies. In general, they are less sensitive to fluctuations in supplies than prices in many of the other municipalities (correlation coefficient = .6475). However, average prices reported are higher than in neighboring Aguada, $2.94 compared to $1.64, which may suggest that Añasco fishers are selling a more limited range of fish, targeting only first class species for sale and keeping the remainder for home use. Our interviews in Tres Hermanos did suggest that about half of the 20 fishers that belong to the associations are casual, part-time fishers. One of the part-time fishers we interviewed, for example, only fished for crabs during the month of March, works other jobs (*chiripas*, which are temporary jobs, often in the construction industry) for three months while the season closes and the crabs burrow in the mud, and then takes up crabbing again in October. He sells he catch directly to businesses that also import crabs from Venezuela when they are not available locally.

Añasco History

As the site of Taino settlements prior to the arrival of Europeans, Añasco had scattered populations of Taino and Europeans from as early as the late 18th century. Several of these residents founded the city of Añasco in 1733 with livelihoods based on the common agricultural products throughout the region, raising livestock, and engaging in contraband trade with the English and the French. By the 1770s, Añasco had a population of more than 3,000, including an infantry and calvary, in part because of the ease with which smuggling could be accomplished along its coast.

Añasco's geography stalled its early development. Wetlands, rivers, and lakes surrounded the plain on which the principal city had been built, and rain and flooding were common. During the early 19th century, the population grew slowly, to around 10,000 people, between 5% and 10% of them enslaved. The wet environment, however, may have made the cholera epidemic of the mid-

1850s more devastating here than elsewhere, and Añasco's population was particularly hard hit. By the end of the century its population had grown to only between 13,000 and 14,000 souls. During the 20th century, Añasco's growth was again stifled by the growth of neighboring Mayagüez, which siphoned off its population. Toro Sugrañes suggests that during the first half of the 20th century Añasco increasingly became a dependent satellite of Mayagüez (1995: 40).

The people of Añasco did manage to found at least four sugar mills and export sugar and rum, along with becoming known for the production of livestock. These products dominated the economy until the mid-20th century, after which Añasco became more of a commercial-industrial center, with 17 factories, many dealing in textiles as well as medical supplies, employing over 2,500 people. With the transformations taking place in the textile industry around the world, however, Añasco suffered increasing unemployment and poverty, its residents scrambling for *chiripas* (odd jobs) and migrating to the mainland United States.

Tres Hermanos, Barrio La Playa

Tres Hermanos is part of a larger community called La Playa, whose members operate several small businesses and other organizations nearby the fishing association, including a 7th day Aventis Church, two bakeries (*panaderías*), a small grocery store (*colmado*), rental apartments (some of which are rented to students at UPR in Mayagüez), a gas station, a school, a laboratory, and two beauty shops. Further south along the shore from Tres Hermanos is another small area called El Puente (the bridge), which approaches a river that bears the same name as the municipality. This area is characterized by a few large summer houses, another *colmado*, a Club Náutico founded in 1993 that rents out its facilities, trailers, and a small cluster of wooden buildings that also rent to tourists or others. Together, Tres Hermanos and El Puente collect together the bulk of Añasco's coastal population.

The decline in sugar cane production, local fishers commented, has altered the water quality and species mix in the area, altering the gear fishers use. During an earlier time, they used to fish with *chinchorros* (beach seines) at the mouth of the river and further upstream, but the grasses have grown so thickly that this is no longer possible. Some of these fishers have since switched to traps, though neither traps nor seines are the most common gear in the municipality, according to the census, but various kinds of lines.

Figure WM.7. Lockers at Añasco *Villa Pesquera*

We received conflicting reports on the number of active fishers in the fishing association in Añasco. Fishers we interviewed as they were socializing at the site claimed that there were 10 active fishers and a total of 20 members, but others in the association administration claimed that "actually, only four fishermen sell to this [association] fish market" (*"Actualmente solo cuatro pescadores le venden a esta pesquería"*), out of a total of 14 members. Whether ten or four, the fishers who sell there sell primarily snapper, snook, and lobster; these fishers tend to be younger than the less active ones, in their early twenties, although they do not constitute the only people who fish from this location. Those we interviewed said that people pull boats from as far away as Cabo Rojo and Rincón because the ramp and the large parking area can accommodate several trailered vessels.

Table WM.8. Gear Utilized in Añasco (n=34)

Variable	Percent
Beach Seine	14.7
Trammel Net	20.6
Long Line	11.8
Troll Line	26.5
Fish Trap	14.7
Gill Net	17.6
Cast Net	26.5
Hand Line	67.6
Rod and Reel	14.7
Lobster trap	0
Snapper Reel	61.8
Winch	8.8
Skin	0
Spear	2.9
Lace	0
SCUBA	0
Gaff	64.7
Basket	0

We mentioned earlier that Tres Hermanos, bordering a public beach, was equipped with facilities used by commercial, subsistence, and recreational fishers. In addition to the ramp and pier, the association's facilities include metal lockers and a small boat storage area. The lockers are quite distinct from those of other associations, built with wood and corrugated metal, making the area look less well funded than facilities at associations such as Crash Boat. This could reflect a lack of political prowess on the part of members of the Tres Hermanos association, and those we interviewed there did suggest that the association was in a weakened state. Fisher census data do show that nearly two-thirds (64.6%) of the fishers included in the census devoted fewer than forty hours to fishing. This figure is probably more meaningful in terms of Añasco fishers than the mean figure, in that a few fishers reported fishing over 100 hours per week. These could, we believe, very well be coding errors. If we take out the fishers who reported excessive hours, the mean falls to 33.29 hours per week, confirming local reports of the relative inactivity of many fishers in Añasaco.

Table WM.9. Selected Fisher Characteristics, Añasco (n=34)

Variable	Response
Association Member	52.9%
Hours used for Fishing	
< 20 hours	5.9%
20 – 30 hours	32.3%
31 – 39 hours	26.4%
40 hours	11.8%
> 40 hours	23.5%
Mean hours	40.65
Standard Deviation	26.168
Minimum hours	14
Maximum hours	140

Source: Puerto Rican Census of Fishers, 2002.

Fishers in Añasco fish a variety of locations and utilize a range of marketing techniques, as the following tables show. Fishers in Añasco mentioned fishing in Tourmaline and La Corona.

Table WM.10. Fishing Locations and Types, Añasco (n=34)

Variable	Percent
Shore	20.6
Continental Shelf	17.6
Shelf Edge	55.9
Oceanic	64.7
Reef Fishes	55.9
SCUBA Diving	0
Skin Diving	0
Pelagic	23.5
Bait	41.2
Deep Water Snappers	67.6

Table WM.11. Marketing Outlets, Añasco (n=34)

Variable	Percent
Private	0
Fish Buyer	5.9
Association	73.5
Walking	23.5
Restaurant	2.9
Own Business	0
Gutted	88.2
Ice	79.4
None	14.7

It is interesting that 73.5% (25 individuals) reported selling to the association, when people familiar with the association administration claimed that only 4 fishers sold there. This discrepancy may derive from the fact that some sell to the association regularly while many of those included in the census may sell infrequently to them. The census data suggest that this is the most common method fishers use, yet it would include casual or irregular sales as well as those that sell more frequently, followed by those who sell their catches in the street.

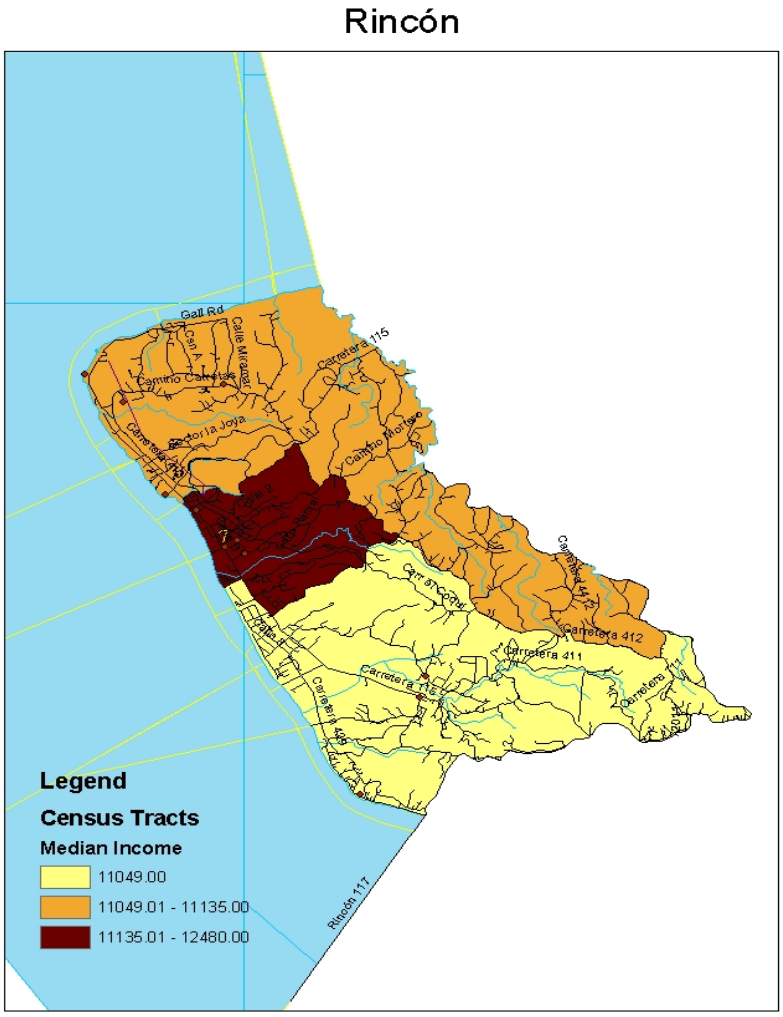
The mixed reports these different sources of information send may be indicative of a declining association or a site that is changing from a commercial fishing site to one that combines commercial, recreational, and subsistence fishing with other kinds of seasonal activities. Others we interviewed in Añasco said that the location was becoming increasingly popular as a recreational site, and that some of the fishers had entered the tourist trade by taking tourists to La Mona. There are a few seafood restaurants in the area which are popular at certain times of the year (mostly during the summer), and the presence of so many rental and summer houses and other facilities, including the public beach, may indicate that Añasco is gradually becoming more of a recreational site. Local officials, clearly, have promoted the area as such, with the "Balneario y área de Remolques Parque Nacional Tres Hermanos" (the official name for the balneario that adjoins the association), a project advertised to have cost over $2,000,000 that will create employment for 30 individuals.

Two features of Añasco fisheries predict that current closures and the MPA at La Mona may have negative effects on those families, between 4 and 25, who rely on commercial fishing and related activities for all or part of their income: the fact that Tourmaline was listed as one of the fishing destinations and that fishers entering the tourist industry are taking tourists to La Mona, recently designated an MPA. While we do not know whether or not fishers are fishing in Tourmaline during the closed season, it is not unlikely that fishers taking tourists to La Mona may be tempted to fish as informal charter or party boats, given the high value placed on Caribbean seafood and fishing among many tourists. Despite future problems developing between Añasco fishers and regulators, comparatively few saw the government as a source of problems:

Table WM.12. Opinions of Añasco fishers (n=34)

Variable	Percent
Status of Fishery Resources	
Same	32.4
Worse	67.6
Source of Problems	
Pollution	50
Habitat Destruction	17.6
Overfishing	20.6
Government regulations	2.9
Weather	2.9

Map WM.2. Rincón



Rincón

Situated far out on the northwest coast, Rincón is probably better known as a surfing location than as a fishing location, despite that it ranked high in landings and in the dependency index. It is also noteworthy that, currently, the fishers of Rincón are among the most innovative on the island. One of its association members brings to the fishers of Rincón his experience as a member of the Caribbean Fishery Management Council, and the current growth trajectory of this fishery promises to place the fishers of Rincón among the most professional and successful in Puerto Rico.

Table WM.13. Rincón Demographic Data

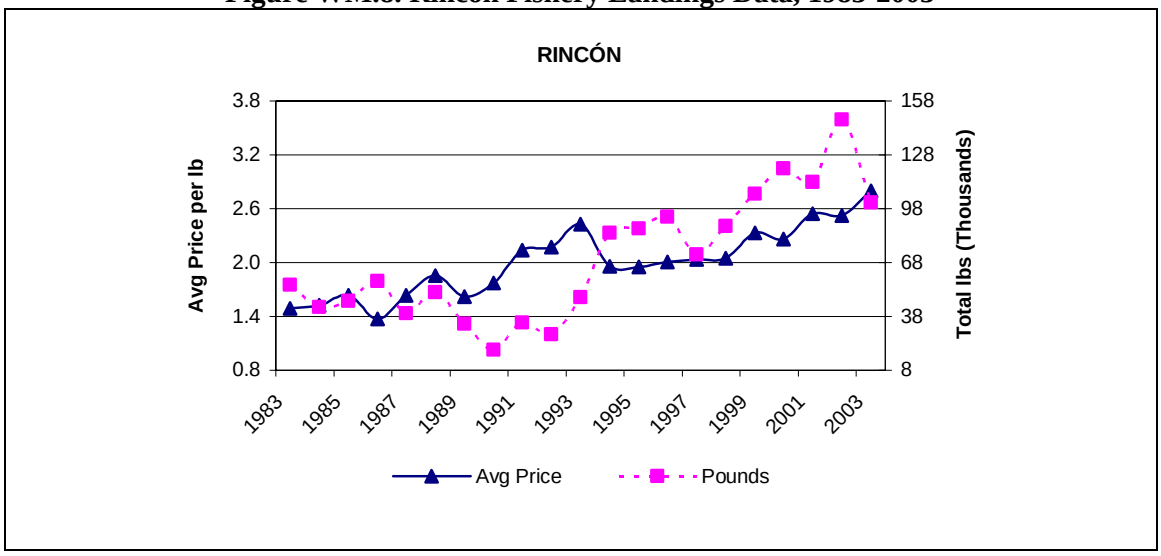
RINCÓN	1950	1960	1970	1980	1990	2000
Population Characteristics						
Population [1]	9,888	8,706	9,094	11,788	12,213	14,767
Civilian Labor Force (CLF) [2]	3,100	1,924	2,222	2,918	4,125	4,321
CLF - Employed	3,073	1,852	2,156	2,251	3,277	3,372
CLF - Unemployed	27	72	66	667	848	949
Percent of unemployed persons	0.87	3.74	2.97	22.86	20.56	21.96
Industry of employed persons [3]						
Agriculture, forestry, fishing and mining [4]		956	405	100	80	58
Construction		96	245	180	363	394
Manufacturing		308	720	758	916	607
Retail trade		168	185	279	381	353
Socioeconomic Characteristics						
Mean travel time to work (minutes) [5]		N/A	N/A	N/A	20.1	25.2
Persons who work in area of residence [6]		1,520	1,461	1,299	1,956	1,627
Per capita Income (dollars) [7]			570	1,323	3,166	6,610
Median Household Income (dollars) [8]		598	1,451	3,277	7,293	11,460
Individuals below poverty level [9]			7,549	9,071	8,483	8,301
Percent of Individuals below poverty level			83.01	76.95	69.46	56.21

In both physical size and population, Rincón is a small municipality, currently highly desired as a place of residence by some of Puerto Rico's wealthiest and most famous citizens. Over the past decade, Rincón has been the site of several coastal real estate development projects, underwriting the gradual increase in construction employment and creating a high demand for sand. The mining of sand from former sugar cane fields is occurring today, yet in the past the mining of sand from marine and littoral locations created problems for what was formerly one of Rincón's most heavily used marinas. Beyond employment associated with construction, all other sectors presented above have been losing jobs, and most of the few still involved in agriculture, forestry, fishing, and mining are likely the fishers of Rincón.

As just noted, Rincón ranked 8th in landings and 6th in revenues, although its 2003 landings were less than half of the leader's, 101, 388 compared to 233,934. Landings reached their high of over 157,000 in 2002 after a gradual rise over the previous two decades. Price has risen since the late 1990s as well, although not in relation to supply (correlation coefficient = .6232). In 2006, however, prices rose to as high as $3.50 per pound. The gradual increase in landings in Rincón is likely due to two factors: the growing recognition among enlightened fishers there that reporting landings is becoming increasingly important in fisheries management decisions; and increasing

fishing effort, in part in response to declines in fishing in its principal competitor, Puerto Real. This history is relevant here.

Figure WM.8. Rincón Fishery Landings Data, 1983-2003



Brief History of Decline of Puerto Real Fishers and its Relevance to Rincón

Up until around 1992, the fishers of Puerto Real would fish all over the Caribbean and were landing their fish in Puerto Rican ports, thus inflating the landings data. They would spend up to three weeks at sea, fishing off of Haiti, the Dominican Republic, and others' waters (Valdés Pizzini 1985). They continued this until the formation of the EEZ, which initiated the process of barring fishers from one nation fishing in the waters of other nations. Once countries like Haiti and the Dominican Republic had their EEZs in place, they began arresting and jailing Cabo Rojo fishers who still fished in their waters, which led them to alter their patterns of fishing and livelihood. Today Cabo Rojo fishers fish near-shore and shallow waters, as well as take hunters to La Mona and then fish around Mona while the hunters camp. Fishers in Rincón have begun to fish the waters off their coast, where Cabo Rojo fishers used to fish more heavily.

Figure WM.9. Floats and Detachable Spools with Hooks used by Rincón Fishers

Rincón History

Certainly every Rincón school child learns that Columbus stepped foot on the shores of this municipality the 19th of November, 1493, just south of Cabo de San Francisco. Its first town was located near this spot, close to the sea, only 30 feet above sea level, where the central town of Rincón remains today. Columbus' early acquaintance with this part of Puerto Rico marked it for early colonization by the Spanish, along with the entire western coast, its importance bolstered by the fact that it faced Spain's most important Caribbean territory: *La Española* (Hispañola, today's Dominican Republic and Haiti). The area had a permanent Spanish settled population as early as 1590, though at the time Rincón was part of the larger administrative unit Aguada (today its northern neighbor). Not until 1770 did Rincón separate from Aguada as its own municipality, and only after Añasco in 1728 and Mayagüez in 1760. Six years after its founding a passing historian described it as populated by 1,130 poor, desperate people living (presumably in huts or other temporary structures) among 11 more permanent dwellings and a small church. By the 1820s, however, it had grown to over 4,200 people, but increased to only around 6,600 by the end of the 19th century.

In addition to sugar, which dominated the economy from the early 19th century until the mid-20th, Rincón's people cultivated tobacco, corn, rice, bananas, and chocolate. Toro Sugrañes reports that growing fruit and fishing were also principal activities in Rincón, suggesting perhaps that fishing was among those activities that subsidized labor for work in agriculture, whether on small farms or larger haciendas and plantations.

As with many other municipalities, Rincón, in poor economic condition, was annexed by Añasco in 1902, but regained control of its territory two years later. In 1918, a devastating tsunami left Rincón one of the hardest hit coastal municipalities, taking its main church and several of its oldest public and private buildings. As Rincón moved away from dependence on agriculture through the latter part of the 20th century, tourism, which fishing and the raising of fruit both fed, became an increasingly powerful force in the local economy. Tourism and the construction of luxury, seaside homes has been central to the economic condition of Rincón in recent years, with former sugar properties now being mined for sand for the construction industry.

Fishing in Rincón

Thirty-five fishers responded to the fisher census in Rincón. Their responses paint a portrait of the fishery that seemed to correspond, roughly, to what respondents interviewed during the ethnographic phase of the project told us. They comprise a serious, dedicated fishery, with two-thirds of its fishers fishing full-time and few fishing fewer than 20 hours per week. The following tables show them to be primarily oceanic fishers, using lines and some traps. The only divergence between the census data and the ethnographic information concerns their marketing behavior. The census data suggests that private buyers are more important than associations in Rincón, but those interviewed there suggest that the association as a marketing facility is becoming more and more important all the time.

Table WM.14. Selected Fisher Characteristics, Rincón (n=35)

Variable	Response
Association Member	60%
Hours used for Fishing	
< 20 hours	8.6%
20 – 30 hours	17.1%
31 – 39 hours	8.6%
40 hours	31.4%
> 40 hours	34.3%
Mean hours	40.31
Standard Deviation	13.385
Minimum hours	15
Maximum hours	72

Source: Puerto Rican Census of Fishers, 2002

Table WM.15. Fishing Locations and Types, Rincón (n=35)

Variable	Percent
Shore	17.1
Continental Shelf	25.7
Shelf Edge	17.1
Oceanic	82.9
Reef Fishes	34.3
SCUBA Diving	14.3
Skin Diving	8.6
Pelagic	22.9
Bait	40
Deep Water Snappers	77.1

Table WM.16. Gear Utilized in Rincón (n=35)

Variable	Percent
Beach Seine	8.6
Trammel Net	8.6
Long Line	17.1
Troll Line	34.3
Fish Trap	28.6
Gill Net	11.4
Cast Net	31.4
Hand Line	68.6
Rod and Reel	20
Lobster trap	0
Snapper Reel	25.7
Winch	28.6
Skin	0
Spear	8.6
Lace	8.6
SCUBA	20
Gaff	45.7
Basket	2.9

Table WM.17. Marketing Behaviors, Rincón (n=35)

Variable	Percent
Private	0
Fish Buyer	77.1
Association	2.9
Walking	14.3
Restaurant	14.3
Own Business	2.9
Gutted	71.4
Ice	77.1
None	17.1

Table WM.18. Opinions of Rincón Fishers (n=35)

Variable	Percent
Status of Fishery Resources	
Better	11.5
Same	34.3
Worse	54.3
Source of Problems	
Pollution	31.4
Habitat Destruction	5.7
Overfishing	22.9
Government regulations	17.4
Weather	5.8
Coastal Development	5.7

According to nautical charts, the waters off Rincón drop off relatively quickly. Rincón fishers fish a corridor from the shore to La Mona, passing Desecheo, which is nearly all deep water. Here they catch mostly highly prized, deep water snapper and grouper species, although during

some times of the year they long-line with spool rigs that a man who lives across from the Club Nautico makes for the association.

Fishers in Rincón are highly cooperative. Each Rincón fisher brings to the fishery different skills, which they pool to help one another. They also help one another if one of them needs money for an immediate family problem. In addition, with other fishers in other municipalities, they will sometimes barter for bait if they have more fish than they can sell, and they routinely give small fish away in the community, enhancing their local reputation and further ingratiating themselves with the municipality's power structure.

There are two fisher "unions" or associations in Rincón, one with 15 captains and another with 10 captains, each of which takes an additional crewmember, for a total of 50 full-time fishers. There are an additional 10 fishers who specialized in lobster. All of the full-time fishers sell their fish through the association, which in turn provides it to the elegant local seafood places across the west coast, including Cabo Rojo's Las Brisas, in Puerto Real. The community, in turn, has been good to them, supporting them by buying modern boats and letting them use them with a number of conditions attached, including keeping them in good shape, using them conscientiously for fishing (as opposed to drug running), and making sure they record all their landings.

Figure WM.10. Municipality-Provided Boat in Rincón
(note MU on license, indicating it belongs to the municipio)

These vessels are evidence of their continuing attempts to "professionalize" the fishery. As further evidence, leaders reported that record-keeping is important to them, in that it enables them

to legitimize the fishery and to use the records as "tools" to access loans and other benefits, including the Bona Fide program. The Villa Pesquera itself is run like a corporation, keeping accurate records and issuing checks (as opposed to cash) to member fishers for their catch. Despite this, some fishers, evidently, fear the records because they believe they will lose some form of public assistance, or pay higher taxes, which is problematic, but some Rincón fishers, nevertheless, believe the advantages to record-keeping outweigh the costs.

Another dimension of the professional attitude of Rincón fishers is their emphasis on supplying high quality seafood to local restaurants—interestingly, a central point in Jarvis's 1930s study of Puerto Rican fisheries. According to them, many of the Rincón hotels buy imported, less succulent fish, caring less about return customers to their restaurants and concentrating on service (and value) from renting rooms. By contrast, local seafood places use only fresh local fish and thrive only if they have consistent quality and return business. It is these restaurants that add to the charm of Puerto Rico's coast, too, and have become a cornerstone of business. Fishers in Rincón estimate that upwards of 90% of fish from the association leaves the municipality.

Not all fishers in Rincón are associated with one of the two active associations. There are fishers who fish for dealers in other municipalities, but this is usually done by part-time fishers, and irregularly. Generally, these individuals are less concerned with supplying quality seafood to their markets.

Most of the association fishers, though not all, live in a single parcela—Parcela Estela—which is adjacent to the waterfront. With a few exceptions most of them have moved away from the actual waterfront, either selling out to wealthy people or renting their beach properties to others. The smart ones are staying, though the wealthy don't particularly like it. "We have a saying," an association leader said: "They like the bird cage, they just don't like the birds." *("Les gusta la jaula, pero no les gusta las aves.")*

There is, indeed, much gentrification in Rincón, along with many big and well-financed construction projects. A Heinz mansion and grounds had just sold for over $3,000,000, purchased by Colombians, and the same people were building two huge high-rise condos and had plans to surround the mansion with small villas. A few famous people stay here (Steve Forbes, for example, as well as several Hollywood stars). Many mainland Americans who bought places on the waterfront have turned them into guesthouses. Of course, the attraction of Rincón to surfers lends the municipality and its residents another dimension—younger, less obviously wealthy, active, with a rich night life of beaches and bars.

One of the interesting aspects of the gentrification is that the construction has created a demand for sand, which the companies that used to own the sugar *centrales* are now mining and selling to the contractors. The demand for sand also caused the marina owner to dredge out sand from near his marina for sale, causing a pile up that clogged the entrance and made the marina unusable.

At the main Rincón association, the time we visited, the freezers contained bait fish, a few pelagics, and some snapper. Fishers here can make up to $1,000 per day in fish sales, which is good for the local economy, but (due to seasonal fluctuations) typically they make an average of around $20,000 per year, contributing as much as $500,000 to the local economy. The association also has a little chapel where they keep the Virgen. They take her out onto the water for the July celebration.

Figure WM.11. Pelagics in Rincón Association Freezer

Figure WM.12. Snapper in Rincón Association Freezer

One of the Rincón fishers' principal gripes is with recreational fishers. According to them, there are, at most, 2,500 commercial fishers on the island (this is probably an overestimate), but 100 times that many (250,000) recreational fishers, who are responsible for half the catch. They've been working to get bag limits on several species, which they have and are already too high.

Currently, there have recreational bag limits on: Mahi (Dorado), Kingfish (sierra), and Wahoo. Recreational fishers are allowed 5 fish apiece, but Rincón fishers believe this is still too high. This is particularly troubling because, with superior boats and seemingly endless amounts of

cash, sport fishers can catch a good amount of fish that they don't need. Instead, they sometimes sell it to local restaurant owners just to cover their trip expenses, essentially dumping it on the market for around a dollar per pound. In the words of one of their more prominent members:

"Market Destruction is just as bad as Habitat Destruction."

Concerning the fishing, they vary through the year depending on the character of the sea. When they can, they bottom fish, but the seas have to be calm. When they are rougher, they deploy the long line spools pictured in WM.6. earlier. The spools are detachable from the winches for this.

They rise earlier in the morning during hurricane season, leaving from the shore around 3:00 in the morning because the seas are calm and they need to fish closer in, to stay closer to shore and (usually) return earlier. The ramp is also a problem, and the municipality is currently trying to open a new marina, in part for the fishers of Rincón. This suggests that the municipality leaders view them as an important component of their community.

They abide by several vedas to allow spawning:

- December to March 1st, Red Hind
- March & April, No grouper
- April-May, no Mutton Snapper
- June, Manchengo (Lane snapper)
- July – September, Queen Conch
- October to September, Deep water snapper: vermillion, silk, black, and black wing. This last one has two peak spawning seasons, one of which they negotiated to choose because this one overlapped more with bad weather and rough seas.

To get access to a boat, a young fisher needs to put in years at sea, maybe 10 or 15. This is considered a rite of passage, or a kind of apprenticeship, allowing new fishers into the fishery. Following this, when a new fisher gets his boat (especially one on contract from the municipio), he can use this as a "tool" to access loans and the bona fide program.

There is an environmental spirit among some of the fishers of Rincón, who believe that reef fishing should be a thing of the past. The reefs need to be protected for tourists to look at and enjoy. One of their spokesman also advocates that fishers move from 2-cycle engines to 4-cycle engines, which burn cleaner and with less damage to the water. Along these same lines, the hotels' needs for clean water is actually bad for some environments, because they flush that water into the estuaries and this changes salinity levels and, hence, the species mix. This is particularly bad in eastern Puerto Rico, where the water is so shallow and the problem is exacerbated by the growth in marinas. Marinas create a major boating traffic problem for fishers, including from jet skis, which Rincón fishers see as damaging fish populations from noise pollution.

Figure WM.13. Rincón Villa Pesquera

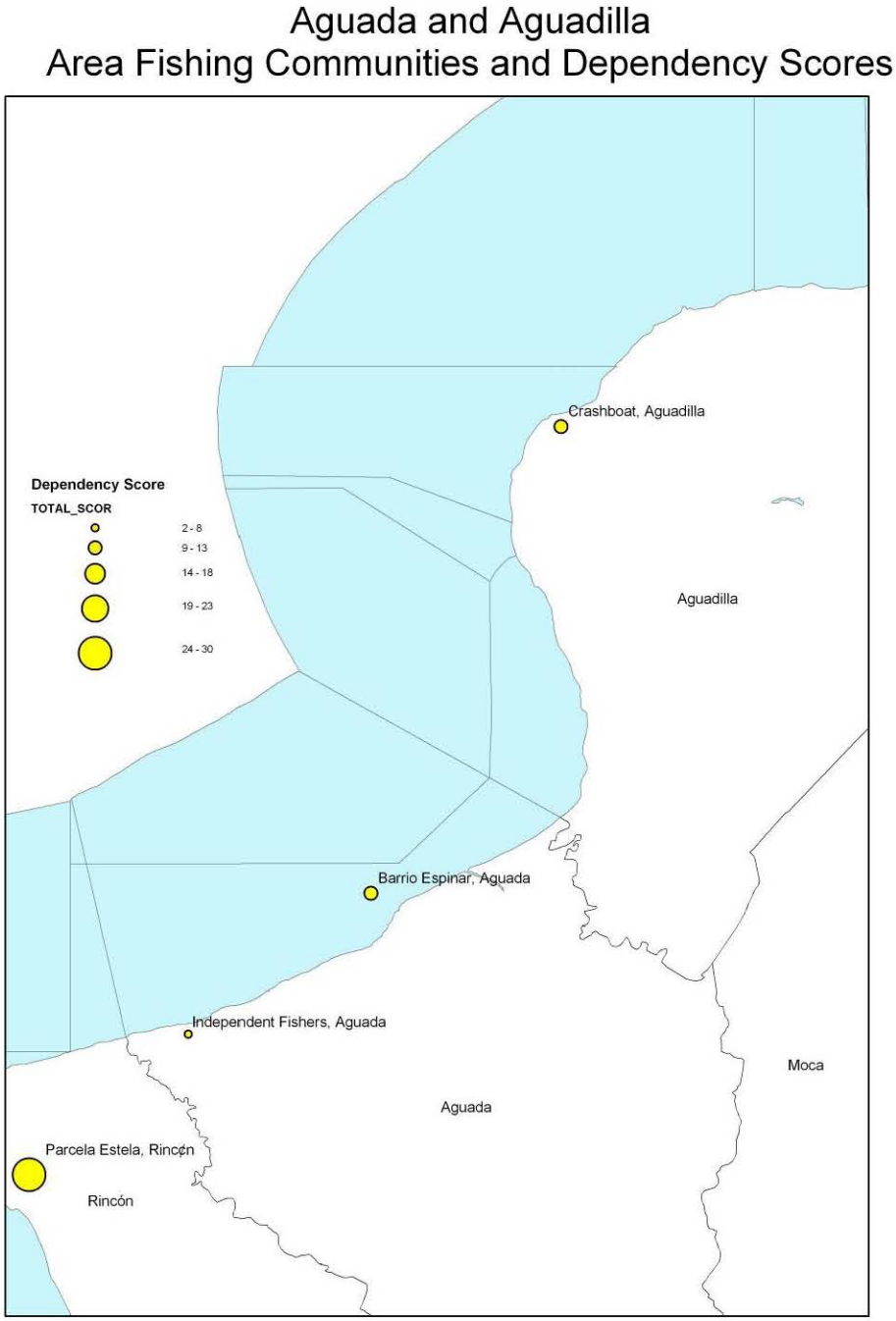
Figure WM.14. Club Naútico of Rincón

Figure WM.15. Ramp at Club Naútico

Northwestern Region:

Aguada and Aguadilla

Map NW.1. Northwest Region



Aguada

Situated between Aguadilla and Rincón, on the northwest coast, Aguada's more than 40,000 residents have experienced changing economic circumstances over the past few decades. Table NW.1 outlines some of these, showing that Aguada's recent economic performance has been mixed.

Table NW.1. Aguada Demographic Data

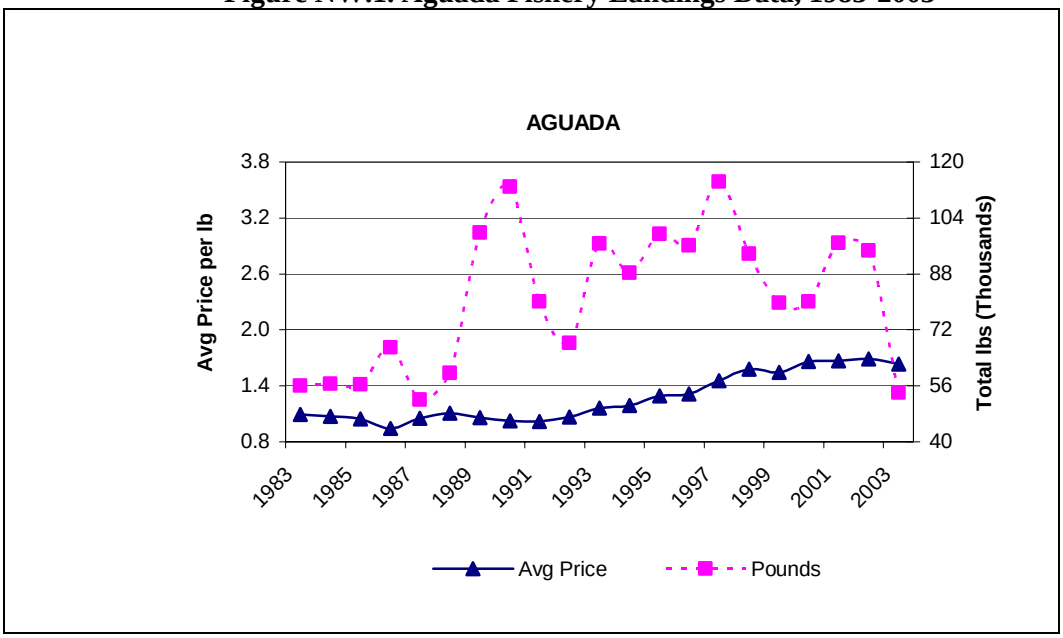
AGUADA	1950	1960	1970	1980	1990	2000
Population Characteristics						
Population [1]	20,743	23,234	25,658	31,567	35,911	42,042
Civilian Labor Force (CLF) [2]	6,633	4,648	4,397	7,702	12,092	12,521
CLF - Employed	6,546	4,464	4,132	6,024	9,359	9,755
CLF - Unemployed	87	184	265	1,678	2,733	2,766
Percent of unemployed persons	1.31	3.96	6.03	21.79	22.60	22.09
Industry of employed persons [3]						
Agriculture, forestry, fishing and mining [4]		2,040	865	343	303	160
Construction		304	493	604	579	1,018
Manufacturing		788	846	1,929	2,914	2,442
Retail trade		380	529	740	1,535	1,183
Socioeconomic Characteristics						
Mean travel time to work (minutes) [5]		N/A	N/A	N/A	17.8	23.6
Persons who work in area of residence [6]		3,636	2,750	3,902	5,323	4,684
Per capita Income (dollars) [7]			524	1,378	2,993	6,100
Median Household Income (dollars) [8]		574	1,535	4,147	7,404	11,384
Individuals below poverty level [9]			21,478	24,175	25,004	24,880
Percent of Individuals below poverty level			83.71	76.58	69.63	59.18

While a smaller proportion of Aguada's population was living below the poverty line in 2000 than in previous decades, the unemployment rate rose from under 2% to over ten times that in the last half of the 20th century. Job losses in agriculture, forestry, and fisheries were especially pronounced. The reduction in poverty with increasing unemployment may be explained, of course, by government transfer payments. The municipality, within commuting distance of Mayagüez, has experienced a doubling of its population since 1950, growing by between 15% and 20% between 1990 and 2000. During the same time, manufacturing jobs declined by 16%, and per capita income rose significantly, by 103%, which may indicate that people are earning incomes from a variety of sources, including informal economic activities, income from working on the mainland (e.g. pensions), or investments. It may also be the case that the increase in construction employment in both absolute and proportional terms contributed to the increase in per capita income. However, this may result from gentrification as well, with more extremely wealthy people moving into the coastal fringe and raising income averages for the whole municipality. In an economic environment sending mixed signals such as these, fishing very likely provides a much needed source of high quality food and sporadic income, and may in fact be among those sources of income for people who are technically unemployed.

Aguada is home to several unlicensed, unaffiliated, and more or less independent fishers who fish part-time, either by themselves or in pairs, as well as one Villa Pesquera whose reach, via marketing and other relations, is extensive. While fishing activity emanating from the municipality is not among the heaviest on the island, data from the census of fishers suggest that

nearly two-thirds of the 24 fishers (62.5%) landing fish at one of Aguada's two fishing centers are full time fishers, and only around 20% fish for 25 hours or fewer per week. Very likely, however, the census count does not include several part-time net fishers we interviewed during our ethnographic work.

Figure NW.1. Aguada Fishery Landings Data, 1983-2003



With its 2003 reported landings of 53,972 pounds, Aguada ranked 15th among 41 municipalities reporting landings that year. Figure NW.1 shows the landings data for the past 20 years in Aguada. These data, coming from two landing centers in the municipality—Espinar, the largest, and Guaniquilla—show that Aguada fishers' commercial landings have fluctuated between a high of nearly 120,000 pounds in 1997 to a low of around half that ten years earlier and in 2003. The most recent data suggest that catches have declined since 1997, yet the decline has not been steady, but fluctuating, with the early years of the 21st century witnessing relatively high catches.

As we will see in all our municipality profiles, price is another story. While price has risen over the 20-year period, from $1.10 to $1.60 per pound, its rise has been more gradual and has not, in all years, mirrored supply. Spikes in price have not matched large contractions in the supply of fish, nor have prices fallen in line with increases in catch (1983-2003 correlation coefficient = .2868). Of course, these conclusions may change over shorter time spans or with larger, island-wide data sets. They may also, however, reflect such factors as seafood imports, which fishers in Puerto Rico, as with fishers everywhere, complain are eating into their ways of life.

Brief History of Aguada and Aguadilla

Although some historians (as well as Aguadilla residents) dispute this, Aguada shares with Rincón and a few other locations around Puerto Rico the supposed honor of being one place that Columbus landed when he "discovered" Puerto Rico. In 1893, when Aguada was celebrating the four-hundredth anniversary of its discovery, they erected a cross in barrio Espinar, which Aguadilla claimed as part of its territory.

In any case, Columbus wasn't the first to see the territory, of course. Aguada was settled by Taino long before Columbus, but it was nevertheless one of the first places in Puerto Rico colonized by Europeans. The first large livestock raising ranch was in Aguada, founded in 1505, and Franciscan priests founded a monastery there only eleven years later, although Taino (or Carib) warriors destroyed it a few years after it was built. The port of Aguada-Aguadilla, according to Toro Sugrañes (1995:21) was the first port the Spanish used to colonize Puerto Rico.

What was originally Aguada was a far larger territory than we see today. At one time Aguada included the neighboring municipalities of Rincón, San Sebastián, Moca, and Aguadilla. It lost these territories between 1752 and 1780, with Aguadilla being the last to break away.

In addition to livestock, Aguada produced flour, coffee, and sugar cane into the 20th century, as well as tropical wood products. Aguadilla produced tobacco and chocolate as well. During the 19th century sugar cane grew to eclipse most other crops, and after Aguada's first mill, La Central Coloso, was opened in 1827, several other, smaller mills started up throughout the region. Coloso was a working sugar mill until 1993. Aguadilla had eight mills. Like other western municipalities, Aguada and Aguadilla suffered great losses of property and life during the 1918 tsunami.

Fishing in Aguada

One of the factors constraining the development of a large and well-developed fishing fleet, similar to that in Aguadilla, seems to be the natural attributes and contours of the coastline. Heavy surf pounds the beaches along the Agauda coast, attracting surfers but making landing fish difficult for fishers. There is a *muelle* or pier near the Espinar association, battered and little used, and there appear to be no highly sheltered bays nearby. According to fisher census data, 45.8% of fishers fish from shore, although this isn't the most common fishing location (see table NW.2):

Table NW.2. Fishing Locations and Styles, Aguada (n=24)

Fishing Location	Percent Reporting
Continental Shelf	87.5
Oceanic	87.5
Reef	87.5
Shore	45.8
Shelf Edge	16.7

Source: Puerto Rican Census of Fishers, 2002
Totals do not add up to 100% because fishers typically fish multiple locations

Figures also show that slightly more than two-thirds of the Aguada fishers included in the census are affiliated with an association, although very likely this is an inflated figure (see table NW.3). A local political official, who supported the fishery in his role as a representative of the people, commented that the fishing association in Aguada existed primarily in name only; fishers were were "well organized," he said, but outside of the association, whose facilities are currently used as a private fish market. In addition, during our ethnographic work, we encountered several independent and unlicensed fishers who were not likely included in the census, which would increase the percentage of unaffiliated fishers, and we never were able to locate fishers affiliated with Aguada's second official landing center, called Guaniquilla. Regarding gear types and species targeted, the census figures coincide, roughly, with reports from our interviews.

Fishers in Aguada tend to fish multiple gears in three categories—lines, nets, and traps (in that order)—and to target both pelagic and deep water species as well as *róbalos* (snook) in the mouth of the Río Corozo. Aguada fishers tend not to dive, however, and though lobster were seen in the local fish markets in Aguada, lobster traps were not listed in the census as a gear used. Well over two-thirds of the Agauda fishers reported to the census that they fish for pelagics (70.8%) and deep water snapper (83.3%), while another 66.7% listed fishing for bait. Lines in general and hand lines in particular are the most common gear used, with 87.5% listing hand lines and others listing long lines (32.3%) and trot lines (25%). We found similar rankings in our ethnographic interviews.

Table NW.3. Selected Fisher Characteristics, Aguada (n=24)

Variable	Response
Association Member	70.8%
Hours used for Fishing	
< 20 hours	16.7%
20 – 30 hours	12.5%
31 – 39 hours	8.4%
40 hours	45.8%
> 40 hours	16.7%
Mean hours	36.76
Standard Deviation	15.294
Minimum hours	10
Maximum hours	80

Source: Puerto Rican Census of Fishers, 2002

Barrio Espinar

Aguada is an interesting case in that it shows that the ties emanating from one association in the municipality, in Espinar, draw on several sources for fish and extend to several areas for markets, creating income and employment for families in a number of neighborhoods spread across at least three municipalities. Accessing supplies from other municipalities may derive from lower and sporadic catches in Aguada compared to other, nearby municipalities such as Aguadilla or Rincon. The association in Espinar sits between the water and a cluster of seafood restaurants on the northwestern edge of the municipality's principal city of Aguada. While the facilities appear similar to other *Villas Pesqueras* (fishing associations) around Puerto Rico, the association is less a cooperative than a private, family-operated fish market. Those considered members consist of those who sell fish regularly to the market.

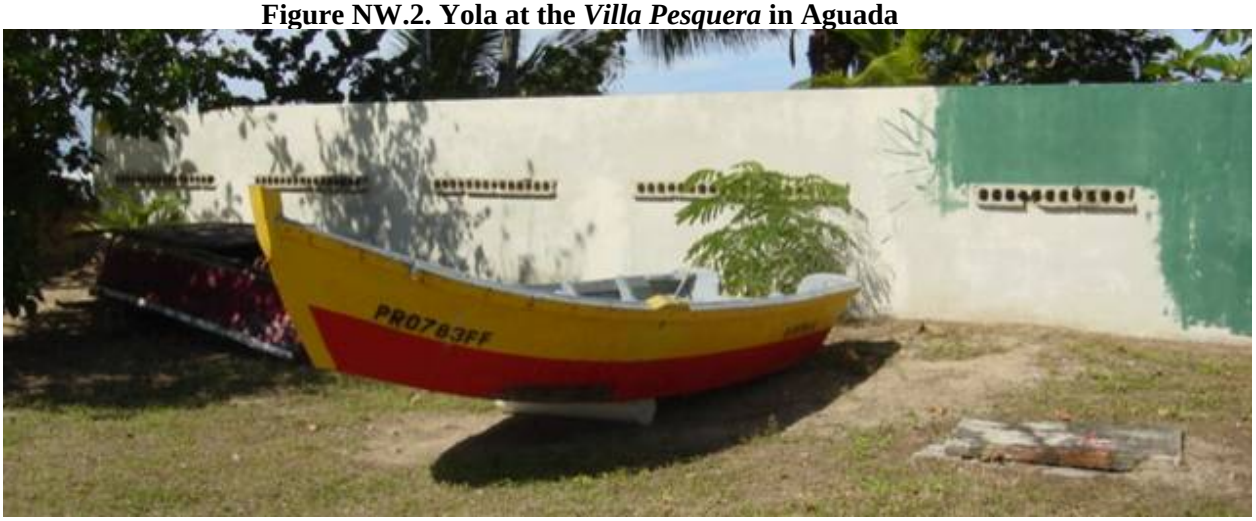
To reach the association, you weave through the main town and cross a bridge until you reach the neighborhood of Espinar, passing at the last through a small cluster of seafood restaurants and markets. The restaurants serve *empanadillas de jueyes* (land crab), *chapin* (trunkfish), and other fish, as well as kingfish and *ensalada del pulpo* (octopus) or *carrucho* (conch). Only two of the four to five restaurants and *pescaderias* (fish markets) there open during the week; the others open on the weekends. In as much as the neighborhood depends heavily on its seafood restaurants, and the restaurants on its fish market and association facilities, Barrio Espinar is Aguada's fishing community. In addition to its fish market and restaurants, it has a school, bakery, service station, three churches, a Head Start center, and several *colmados* (small food stores). Recreational fishers are seeking to deepen its status as a fishing community by establishing a Club Nautico.

The Villa Pesquera is about two blocks from this area of restaurants. Its thirty members fish all kinds of gear, including nasas (traps), trasmallo (trammel net), cordel (lines), and chinchorro (beach seine). The association president, also the fish merchant, staffs the market on daily basis. He reported that members live in Aguadilla, Aguada, and Mayagüez. There are two freezers in the seafood market, one containing the fruits of the *cordel* (lines): dorado, kingfish, tuna, chillo (silk snapper), and so forth, and another containing the fruits of traps, principally *langosta* (lobster). Fisher census data support that lines constitute the most common gear type in use among Aguada fishers, nets second, but traps and diving equipment restricted to only a handful of fishers (see table NW.4.). That Aguada fishers tend not to use traps may be due to the characteristics of the bottom and wave activity of the western coast, which make it difficult to set and check traps; instead, Aguada fishers target pelagics, such as dorado, by trolling, or deep water reef species, such as snapper, with hand and other lines.

Table NW.4. Gear Used by Aguada Fishers (n=24)

Gear	Percent Using
Hand Lines	87.5
Snapper reel	41.7
Long line	33.3
Rod & Reel	29.2
Troll line	25
Beach Seine	25
Gill Net	25
Fish trap	8.3
Spear	4.2
SCUBA/ diving	4.2
Trammel Net	4.2
Lobster trap	0

Figure NW.2. Yola at the *Villa Pesquera* in Aguada



As just noted, the owner of the fish market, whom we call Benacio, links supplies of fish with consumer markets in ways that entangle several others in his operation. Although there are thirty fishers in the association, only six of those 30, or one out of every five, supply him with fish on a

full-time basis.[9] These fishers fish from large vessels out of Rincón, fishing the Mona Passage and traveling as far as Santo Domingo for snapper and lobster.[10] In addition, fishers from Aguada catch the highly desired kingfish, tuna, and other pelagic species. High seas fishers are not, however, his sole suppliers, nor do they constitute the breadth of his operation. The following lists demonstrate the wide reach of Benacio's ties:

Fish Suppliers

- Six steady, full time fishers from Aguada who fish out of Rincón. These are the fishers who use large vessels ("lanchas," which usually refer to vessels longer than the 18' to 20' *yolas* that are ubiquitous across Puerto Rico). They tend to fish far off shore, traveling as far as the Dominican Republic for lobster and routinely fishing in the deep waters of the Mona Passage for grouper and snapper.
- An additional 21 to 24 fishers from Aguada who sell to him part-time.
- Occasional other fishers from Rincón, El Maní (Mayagüez), and Añasco who sell to him irregularly.

Fish Marketing Outlets

- Three seafood restaurants in Cabo Rojo (about 16 miles to the south).
- One dealer in Isabela (about 10 miles east northeast)
- Various consumers in two locations, Tamarindo and Higuey, Aguadilla (adjacent municipality to the north).
- 1 street vendor who sells for him in Rincón & San Sebastian (neighboring municipalities to the south and east).
- 1 street vendor who sells for him in Aguada (home muncipality).
- 1 street vendor who sells for him in Aguadilla.
- 1 street vendor who sells for him in Dorado (north coast, near San Juan, about 50 miles east).

Thus, at the very least, 47 relationships with individuals or businesses *based on fish or fishery resources* emanate from Bonacio's operation. This doesn't even take into account his suppliers for ice, electricity, freezers, plastic bags, etc. Nor does it include the vendor who sells lunches out of the back of his station wagon in the Association's parking lot. Further, each of these individuals or businesses has their own networks and others with whom they conduct commercial or social transactions. For example, the restaurants in Cabo Rojo have owners, employees, suppliers, and customers. The four street vendors support families. The part-time fishers, as is common across Puerto Rico, very likely have alternative occupations that fishing subsidizes to some degree. The seafood dealers have their own families, the restaurants they supply, and those who supply them with ice, freezers and freezer service, and building space. These multi-stranded relationships enhance those that stem from place-based community resources within the barrio: school, churches, *colmados,* and so forth.

In addition to the fishers who supply Bonacio, there is a small group of net fishers who operate out of the area. These individuals, unaffiliated with the association, are street vendors as well. They haul fish in from the beach, primarily, and sell it from their cars and trucks. The fisher

[9] These figures do not correspond with those of the fisher census. First, this is a smaller proportion of full-time fishers than suggested by the figures in the census, and, second, the census only included 24 fishers from Aguada, while Benacio reports 30 fishers at his association alone. The discrepancy might be due to the fact that Benacio is reporting only on the association, and the census derives from licensing data; in any case, the discrepancy points to the need for groundtruthing the census with ethnographic work.

[10] Later in our fieldwork, a fisher from Rincón disputed the claim that all of these fishers fish full time for this fish market.

census found only a handful of marketing strategies in Aguada, suggesting that most of the secondary marketing to private seafood markets, restaurants, hotels, and other outlets is handled though the association by Bonacio (see table NW.5). It is no mere coincidence that the proportion of fishers who sell to the association is identical to the proportion of fishers who belong to the association: Bonacio suggested that selling to the association is a condition of membership, and that he would learn if members were selling their fish elsewhere. As noted in Volume I, association membership often has several advantages, such as access to lockers, freezers, and other facilities. Evidently, independent fishers sell either to fish and seafood buyers/ dealers or on their own, as reported, out of the backs of their trucks on the street. It is interesting, too, that a minority, likely subsistence fishers, do not sell their fish.

Table NW.5. Marketing and Fish Handling Behaviors, Aguada (n=24)

Marketing Behaviors	Percent Reporting
Fish dealer/ buyer	29.2
Association	70.8
Street vending	12.5
None	8.3
Sell fish gutted	75.0
Keep fish on ice	66.7

Source: Puerto Rican Census of Fishers, 2002

Despite the many relationships formed around the association facilities, Bonacio reported that the association does not really function as a cooperative unit or a fishing community. Instead, its facilities have been more or less privatized, it receives little or no help from the government, and the members who founded it and used to form its core are now all old or dead. This suggests that associations have life cycles based on their membership, with a few strong members necessary to keep the association running as a unit capable of accessing state support and advocating on behalf of fishers.

As noted above, the Villa Pesquera at Espinar is part of a larger neighborhood and commercial district adjacent to a private recreational area near the Rio Culebrinas, along which several wealthy individuals "from outside the community" live, including the owner of one of the largest transportation lines in Western Puerto Rico. In Bonacio's words, "*Estos son personas de chavos.*" (These are people of wealth"). There are signs of incipient gentrification: not only has the river attracted the wealthy, but the mayor reported that near the Villa Pesquera they are attempting to locate a Club Nautico. There has been opposition to this project based on the shore's reputation as a manatee haven and as a place where land crabs lay their eggs.

Independent Fishers in Aguada

In addition to Espinar, several independent fishers live and fish out of a *parcela* south of Espinar, just across the street from the beach. The beach has high waves and the fishers here fish from small 18' to 20' foot *yolas*, primarily using beach seines. Four of their boats sit near a small concrete, tiled municipal gazebo while others are in the back yards of fishers. Based on interviews with a small group of these fishers, we determined they are part-timers, unlicensed, and they claimed that Aguada was full of fishers like this. They fish only on the weekends, with beach seines primarily, many men fishing together. They may be some of the same individuals the Bonacio reported, unaffiliated with any association and selling independently. In the back yard of the fisher's house was his fishing equipment (including the *chinchorros*) and boat and a small auto body shop business emitting the common odors of paint and solvents. Four men were standing around, and at least two of them, including the owner of the boat, were working on the

body of a car. They belonged to no association, yet reported they fished together usually on Saturdays. They said that fishing, in general, was bad; one couldn't make a living from it.

Figure NW.3. Vessel in Independent Aguada Fisher's Backyard, with *Chinchorro* (Beach Seine) Drying

Figure NW.4. Independent Aguada Fisher Vessel & *Chinchorro* Near Municipal Gazebo (note rough surf)

In light of these observations, it seems that dependence on fishing in Aguada, for some at least, varies by the days of the week. This is clearly the case with commercial activity in general along the coast. It climbs to bustling, extremely active pitches on weekends but falls to low levels on Mondays and in some cases Tuesday as well, when many of the restaurants close.

Table NW.6. Opinions of Aguada Fishers (n=24)

Opinion	Percent reporting
Status of Fishery Resources	
Better	4.2
The same	29.2
Worse	66.7
Reasons for problems in fisheries	
Pollution	16.4
Habitat Destruction	12.5
Overfishing	8.3
Laws, regulations, and licensing	29.1
Crowding	8.3
Seasonal factors	8.3

Aguadilla

As with Aguada, Aguadilla has experienced a rise in unemployment yet a decrease in persons below the poverty line, suggesting mixed economic performance. The steep (>90%) decline in people employed in agriculture, forestry, and fisheries since 1960 is something the island as a whole has been experiencing; some of the displaced have found work in the growing construction and manufacturing sectors, but manufacturing has suffered losses in recent years after previous tax breaks, the so-called 936 laws, ended. As in Aguada, travel time to work has increased as people either seek more distant jobs or have more difficulty getting from home to work. In one of our open-ended interviews with a worker displaced during a downturn in garment manufacturing, we learned that one of the problems displaced workers face is crossing through dangerous neighborhoods at certain times of the day, which precludes them from taking night jobs or attending night school.

Table NW.7. Aguadilla Census Data

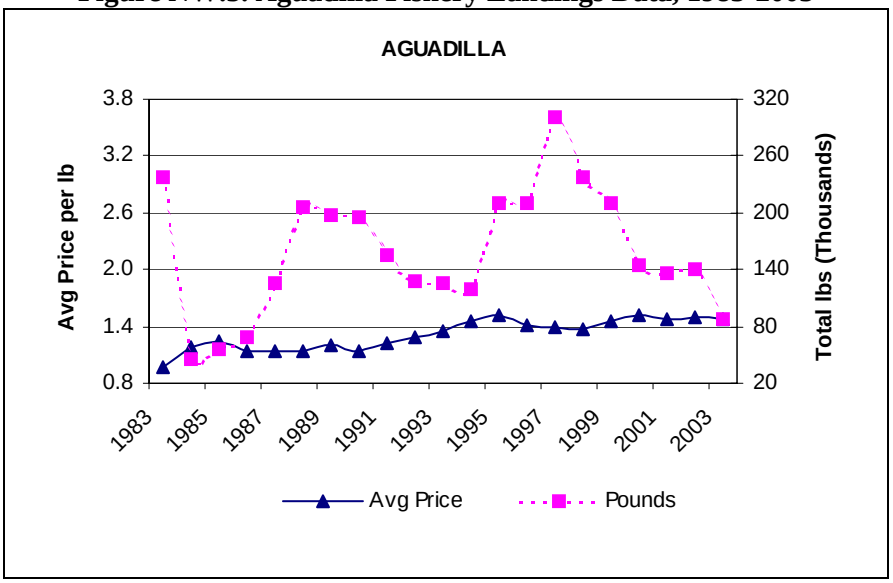
AGUADILLA	1950	1960	1970	1980	1990	2000
Population Characteristics						
Population [1]	44,357	47,864	51,355	54,606	59,335	64,685
Civilian Labor Force (CLF) [2]	11,332	9,564	10,647	14,229	18,576	18,890
CLF - Employed	10,676	8,620	9,876	11,062	13,427	14,108
CLF - Unemployed	656	944	771	3,167	5,149	4,782
Percent of unemployed persons	5.79	9.87	7.24	22.26	27.72	25.31
Industry of employed persons [3]						
Agriculture, forestry, fishing and mining [4]		1,876	978	212	297	177
Construction		704	811	787	689	1,105
Manufacturing		864	1,482	3,063	3,004	2,770
Retail trade		1,496	1,856	1,395	2,271	1,490
Socioeconomic Characteristics						
Mean travel time to work (minutes) [5]		N/A	N/A	N/A	17.7	23.8
Persons who work in area of residence [6]		9,972	10,259	8,286	10,684	11,120
Per capita Income (dollars) [7]			992	1,803	3,722	6,996
Median Household Income (dollars) [8]		1,291	2,360	4,430	7,116	11,476
Individuals below poverty level [9]			32,740	36,033	38,109	35,027
Percent of Individuals below poverty level			63.75	65.99	64.23	54.15

Aguadilla is home to one of the largest and most well organized and politically active Villas Pesqueras, Crash Boat, whose president is a highly skilled boat-builder, providing distinctive vessels to fishers throughout the northwestern part of the island. In the past, Aguadilla fishers have lobbied effectively on behalf of fishers across the island, participating in particular in the outcry against establishing a marine sanctuary in Parguera in the late 1980s (Valdés 1990; Griffith and Valdés 2002).

In Aguadilla, as across much of the island, commercial fishing thus provides income and employment in a beleaguered economic setting. Our survey found that just under half of the Aguadilla fishers we interviewed worked outside of fishing—most of these (45%) in construction. Over half of those interviewed (54.2%), however, still depend on fishing as their primary economic activity, and half believed it would be difficult to find work outside of fishing.

Aguadilla's total landings in 2003, 87,582 pounds generating slightly more than $143,000. In terms of 1999-2003 landings, it ranks fourth in Puerto Rico. As with Aguada's landings data, those in the graph below show little correlation (1983-2003 correlation coefficient = .0258) between fish supplies and price, with the 1997 spike creating only a modest drop in price and the lows of the early 1990s and 2003 met with a similarly languid response.

Figure NW.5. Aguadilla Fishery Landings Data, 1983-2003



As noted earlier, Aguadilla has one of the more powerful and well-organized fishing associations on the island, in part because of the leadership abilities and fishing skills of its president. We profile this association, Crash Boat, below.

Crash Boat

The Crash Boat area includes a long beach where recreational/ tourist infrastructure adjoins the fishing association. There is a large *muelle* (concrete pier) where they used to service oil tankers, but that has since been abandoned to the bathers; the association appears not to use this pier. A small cart/ truck where they sell food, sweets, etc., operates occasionally, on the weekends, and a small bar that operates through the week sits beside the parking lot beside the association. The association itself is surrounded by a chain link fence with at least two gates, taking up an area of around 8,000 to 10,000 square feet.

Figure NW.6. Aguadilla Fishing Association Entrance, Crash Boat, Aguadilla

According to Sea Grant personnel, this is the best-equipped *Villa Pesquera* on the island, led by a fisher who is also an artisanal boat builder. When we interviewed him, he was building an 18' vessel with an upward-sweeping, pointed hull that is perfect for the way they land their vessels here: running them up onto the beach. These designs differ from those farther south, around Parguera, where the front end is less pointed. Beaching a boat, Aguadilla fishers cruise parallel to the shore behind the wave line, then make a quick turn toward shore and run the boat up onto the beach. Several people (usually 3-4) greet the boat, mostly younger men who have been hanging around the association, but old men as well, and they help carry the plastic gas tanks, the gear, and the motor, hoisting their 40 hp Johnson outboards onto their shoulders to carry to the lockers. Landing the day's catch thus becomes a group rather than individual effort—an observation made again and again across the islands of Puerto Rico.

Perhaps reflecting the expertise of the association president, Aguadilla fishers fish from boats with fresh coats and paint, well-maintained, which are 18 feet in length: they are the proto-typical artisanal fishing vessel, wooden with a kind of protective fiberglass paint coating. Each fisher landing fish stores them in black boxes like a large Tupperware tub and carried them on a stick or metal shaft with wire through the mouths. This is a lot of weight to carry, around 200 lbs.

In addition, they store their boats on the beach; the first day we visited, there were 27 and 30 on the beach, but they were coming in during our time there (between 2:00 and 3:00 pm), landing dorado (dolphin), picua (barracuda), and other pelagic species. Their storage facilities are capable of storage for at least 28 fishers. They landed loads of around a dozen or so fish, mostly dorado, caught by hook and line, each of the fish weighing between 5 and 15 pounds. One load weighed 190 lbs.

Figure NW.7. Weighing Dorado in Aguadilla

Along with the lockers and enclosed area, they have elaborate freezer facilities and a nice area to clean fish and to sell fish. The fish market is air conditioned, but the area behind it has a band saw used to cut large fish like yellow fin tuna, counters, a hose, and sinks for cleaning fish. We watched the association president cut a 50 lb. yellowfin tuna into three large pieces for a small Chinese man and clean a dorado with a few deft cuts of the knife, skinning it prior to cutting out the filets.

Figure NW.8. Aguadilla Fishing *Yolas*

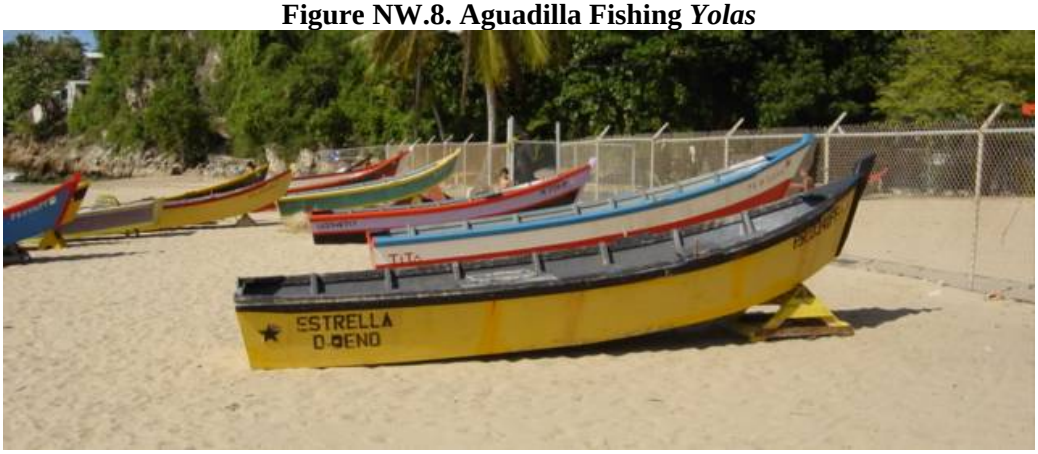


Figure NW.9. Building a *Yola* in Aguadilla

Figure NW.10. Selling a Yellowfin Tuna, Aguadilla

Figure NW.11. Freshly Painted Fishers' Storage Lockers at Aguadilla

Figure NW.12. Band Saw with Tuna in Fish Cleaning Room

According to fisher census data, between one half and one-third of fishers in Aguadilla belong to an association, although the high percentage of fishers who list pelagics as a target fish type, behind reef fishes and deep water snappers, suggest that other fishers in the municipality also target fish such as tuna and dorado off the west and north coasts. The following tables, from the fishery census, profile the fishing styles, marketing behaviors, and other dimensions of Aguadilla fishers.

Table NW.8. Association Membership, Fishing Locations, and Types:Aguadilla (n=59)

Variable	Percent
Affiliated to an Association	57.6
Shore	15.3
Continental Shelf	78
Shelf Edge	37.3
Oceanic	57.8
Reef Fishes	72.9
SCUBA Diving	5.1
Skin Diving	10.2
Pelagic	59.3
Bait	62.7
Deep Water Snappers	61

Again, like Aguada, Aguadilla fishers tend not to be divers, but instead specialize more in fishing with various types of lines. The following table reaffirms this, showing relatively low percentages of nets, traps, and diving equipment, with far higher uses of lines of various sorts and associated gear (e.g. gaff).

Table NW.9. Gear Utilized in Aguadilla (n=59)

Variable	Percent
Beach Seine	11.9
Trammel Net	0
Long Line	45.8
Troll Line	49.2
Fish Trap	6.8
Gill Net	10.2
Cast Net	40.7
Hand Line	79.7
Rod and Reel	11.9
Lobster trap	1.7
Snapper Reel	8.5
Winch	3.4
Skin	0
Spear	5.1
Lace	3.4
SCUBA	1.7
Gaff	67.8
Basket	0

Our survey data elicited similar data from Aguadilla, with hook-and-line rigs, including two types of *palangres*, accounting for 62.5% of primary gear. By contrast, traps accounted for only 8.3% and diving, free diving, for 4.2%. No one mentioned SCUBA diving.

Regarding marketing behaviors, the Aguadilla association is the largest in the municipality, accepting fish from members and non-members alike, as indicated by the higher percentage of fishers who sell to the association than those who reported being affiliated with the association.[11]

[11] Association membership has other advantages besides marketing, including the use of facilities and political support in time of opposition to regulations or other developments.

Unlike Aguada, a higher proportion—over twice as many, 22% vs 8.3%—of fishers in Aguadilla do not market their catch, suggesting that subsistence fishing in Aguadilla may be more prevalent than in its neighboring municipality to the south. When we compared those who do not market their catch (whom we call subsistence fishers) to those who do, we found only two differences in terms of where they fished: subsistence fishers tend not to fish either the shelf edge (Pearson's chi-square tests = 6.246; df = 1; p = .015) or for deep water snappers (Pearson's chi-square = 3.566; df = 1; p = .059).[12] Regarding types of gear they use, subsistence fishers were only slightly less likely to use troll lines than fishers who sell their catch.

Table NW.10. Marketing Behaviors in Aguadilla (n=59)

Variable	Percent
Private	0
Fish Buyer	23.7
Association	64.4
Walking	10.2
Restaurant	0
Own Business	0
Gutted	44.1
Ice	8.5
None	22

As further evidence that there are more subsistence as well as part-time fishers in Aguadilla as in Aguada, we find that the hours devoted to fishing activity are, on average, lower, with a few fishers (nearly 12%) reporting fishing zero hours, indicating they were not actively fishing during the time of year the census data were collected. The table below also shows that, contrary to Aguada, where 16.7% of fishers reported devoting over 40 hours per week to fishing, no fishers in Aguadilla so reported.

Table NW.11. Hours Used for Fishing in Aguadilla (n=59)

Variable	Response
< 20 hours	23.7%
20 – 30 hours	39%
31 – 39 hours	13.6%
40 hours	23.7%
> 40 hours	0%
Mean hours	25.73
Standard deviation	13.136
Minimum hours	0
Maximum	40

Census data also show that Aguadilla fishers have mixed views on the state of the region's fisheries, with around one in five believing that the fisheries are no worse today than they were during earlier years and nearly half believing they are worse. This may vary by the age of fishers, with older fishers assessing resources from a different baseline, although when we compared fishers over 40 years of age to fishers under 40, the majority of both groups still saw fishery resources as worse now than before (65% of older vs. 56% of younger). That overfishing was cited as a reason more often than government regulations is interesting in that Aguadilla fishers were among the more vociferous opponents to the proposed marine sanctuary in Parguera in the late 1980s (Griffith and Valdés Pizzini 2002: 211).

[12] Chi-squares were computed for a two-by-two table; generally, a p of <.05 is considered significant.

Table NW12. Opinions of Aguadilla Fishers (n=59)

Variable	Percent
Status of Fishery Resources	
Better	1.7
The same	22
Worse	47.5
Reasons for problems in fisheries	
Pollution	8.5
Habitat Destruction	3.4
Overfishing	13.6
A lot of vessels/boats	10.2
Currents	6.7
Government	5.1
Laws and restrictions	1.7
Seasonal factors	3.4
Selling fish is getting worse	1.7
Environment	1.7

Our survey elicited slightly different responses than those in the census, with overfishing mentioned in conjunction with the deaths of coral reefs but not with declining fisheries resources. Instead, 62.5% mentioned contamination, including noise pollution, and 12.6% blamed government regulations.

Barrio Higuey & El Tamarindo

Two other fishing associations in Aguadilla, Barrio Higuey and El Tamarindo, are both near the waterfront in downtown Aguadilla. Neither is as vibrant as Crash Boat. According the Wilson (1998: 164-66), Higuey had 19 members in 1998 and an additional five fishers fished independently out of the neighborhood; Wilson failed to report that number of fishers at El Tamarindo, although his narrative implies that both associations had seen better days: "According to our key informants, in the past ten years the area has changed very much. In the past there were a lot of *kioskos* and the fishers had access to almost all the coast near the town. However, now the *kioskos* are abandoned and in ruins. All that is left is a part of a boat ramp and around ten to fifteen *yolas* situated in the rocks."

During our fieldwork, we were unable to intercept any fishers at either of these associations, which may indicate their memberships may have declined even further over the past six years. Wilson reported that Aguadilla officials didn't consider fishing a key part of the local economy and that fishers in the downtown area complained that the local government sought to displace them by developing a marina near their facilities. This effort served to redirect the flow of sand, eroding Higuey's beach while building up El Tamarindo's, and failed to achieve its objective of creating a port. Large ships cannot enter its shallow, sand-choked waters.

Like fishers in Crash Boat, the downtown Aguadilla fishers used lines primarily, reporting specifically the multi-line rig called a *palangre:* this consists of several hooks and lines attached to a main line that is anchored on one end to the bottom and buoyed at the other; other variations on *palangres* exist, but they share with long lines the characteristic of multiple hooks from multiple lines hanging in the water column from a single main line. Matta (1989) shows two variations on *palangres* in his sketches of gear types.

Wilson also reported a great deal of mistrust of fishery regulations especially in Higuey, where fishers complained that regulators favored recreational fishers, most of whom fish for big game fish (like marlin) from Club Naúticos on the island's north and west coasts. Tournament fishing, they claim, takes up to 200 marlins per tournament, and many of these end up in the black market. They also sited problems with the ornamental or aquarium fish industry, suggesting young divers are picking reefs clean of small, pretty fish, using solutions that stun the fish.

Finally, Wilson reports that during the 1990s, Aguadilla fishers had problems with longline fishers from US mainland ports fishing for tuna and other highly desired pelagics in their waters. Complaints to the DNR about what they viewed as an incursion into their territory fell on deaf ears. When government officials took no action, fishers reported cutting the mainland fishers' lines at night.

Southern Metropolitan Region:

Ponce & Juana Díaz

Regional History

Historically a region of contraband and piracy, with a rich Taino prehistory, Ponce has become a major port and is rapidly rivaling the San Juan metropolitan area in economic importance. Juana Díaz has benefited from this growth, although it has not received the heavy commercial traffic—by both land and water—that Ponce has. As important as Ponce has been economically as Puerto Rico's second largest city and rival of San Juan, Vidal Armstrong (1986), in his history of the municipality, suggests that the true value of the municipality lies in its cultural past. Contrasting Ponce with San Juan, which he characterizes as the "bureaucratic capitol," he suggests that early on this part of the southern coast was home to an eclectic mix of international folk. During the Colonial period, Ponce achieved a "cosmopolitan" reputation for having attracted immigrants from Venezuela and the Lesser Antilles—Spanish, French, and English-speaking people, who founded schools and cultural centers that highlighted their heritage.

As with much of the south central and southwest coast of Puerto Rico, Ponce's first enduring Europeans settlement was established by people from San German, the early regional capitol, but only after Ponce de Leon met with the cacique Agüeybana and acquired lands to found a town on Ponce Bay. This town, called Bucaná, existed as early as 1597, and its population consisted of primarily subsistence farmers and fishers who lived in a nucleated, bayside settlement primarily for protection; their selection of this location was clearly oriented toward taking advantage of maritime traffic, despite that they continued to be threatened by piracy. Its early founding, along with settlement in Juana Díaz, led Toro Sugrañes to open his history of Juana Díaz with the comment:

"Esta region costera del País es conocida desde los albores de la colonizaciòn." (This region of the country's coast has been known since the dawn of colonization"—1995: 215)

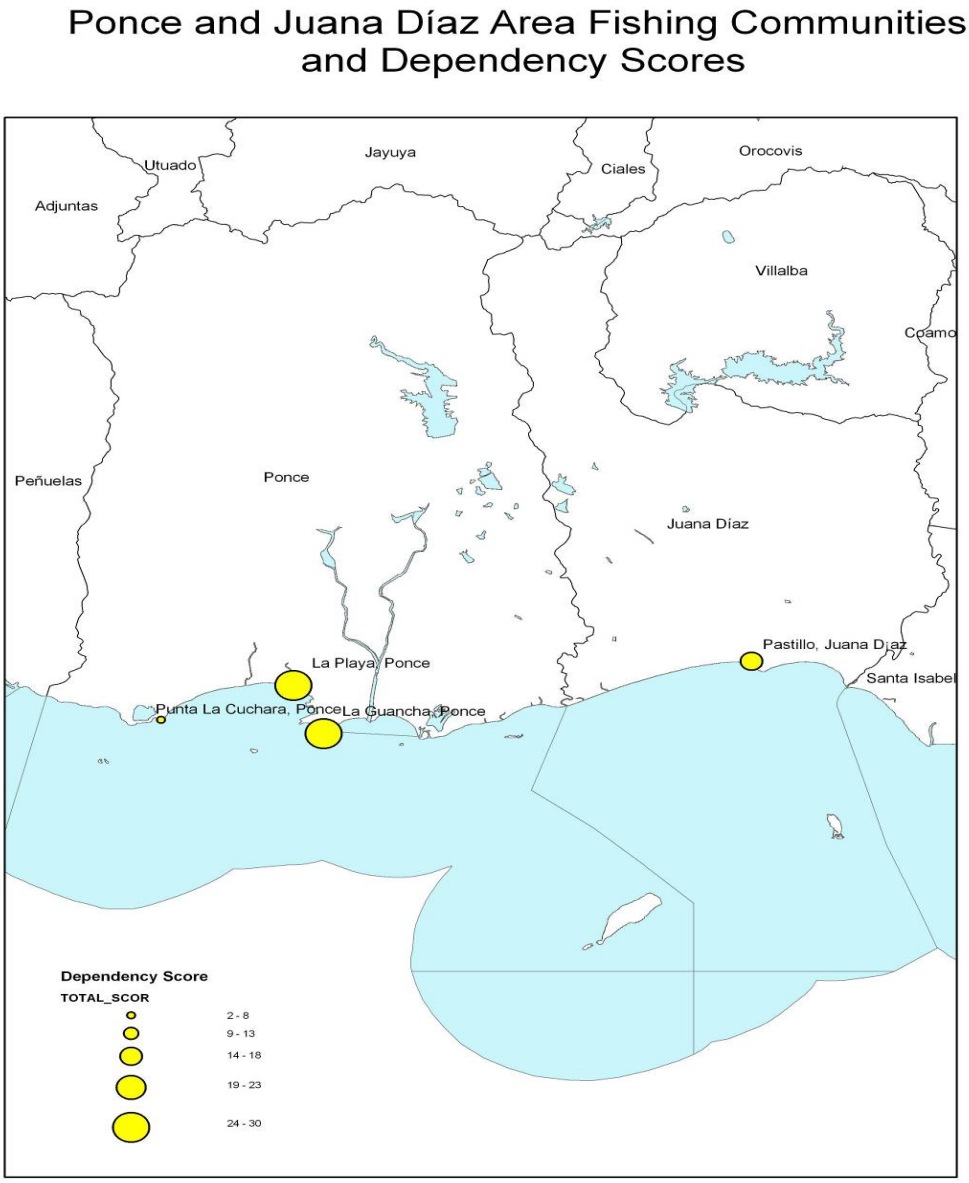
For most of the 17th century, territory in this region of the coast was contested by Caribs and by the French, although late in the 17th century and early in the 18th San German worked to consolidate its hold over Ponce. Early in the 18th century, a San German resident established a sugar mill in Ponce, operating it as an absentee landlord with principally slave labor, and in 1760 the residents of Ponce built a fort and battery to repel continued pirate attacks. Juana Díaz was similarly controlled, bureaucratically, from afar, originally part of and under the jurisdiction of Coamo—the third oldest municipality in Puerto Rico, whose authority ranged over much of the southeast coast of Puerto Rico.

These early internal and external relationships made this region of the coast prone to self-defense, regional autonomy, and resistance. Juana Díaz broke from Coamo in 1798. Like Mayagüez, Ponce established a press early, first *El Crepúsculo* (The Twilight) in 1866 and later *El Annunciador* (The Announcer) in 1867. The entire region was known for both large-scale agriculture and smaller-scale production oriented toward livestock and subsistence farming. Livestock in Juana Díaz were used for milk production as well as meat and for draft animals, and they became a major center for raising horses. As with most of coastal Puerto Rico, sugar grew to dominate the economy of Juana Díaz and rival all other economic sectors in Ponce through the 19th and into the 20th century.

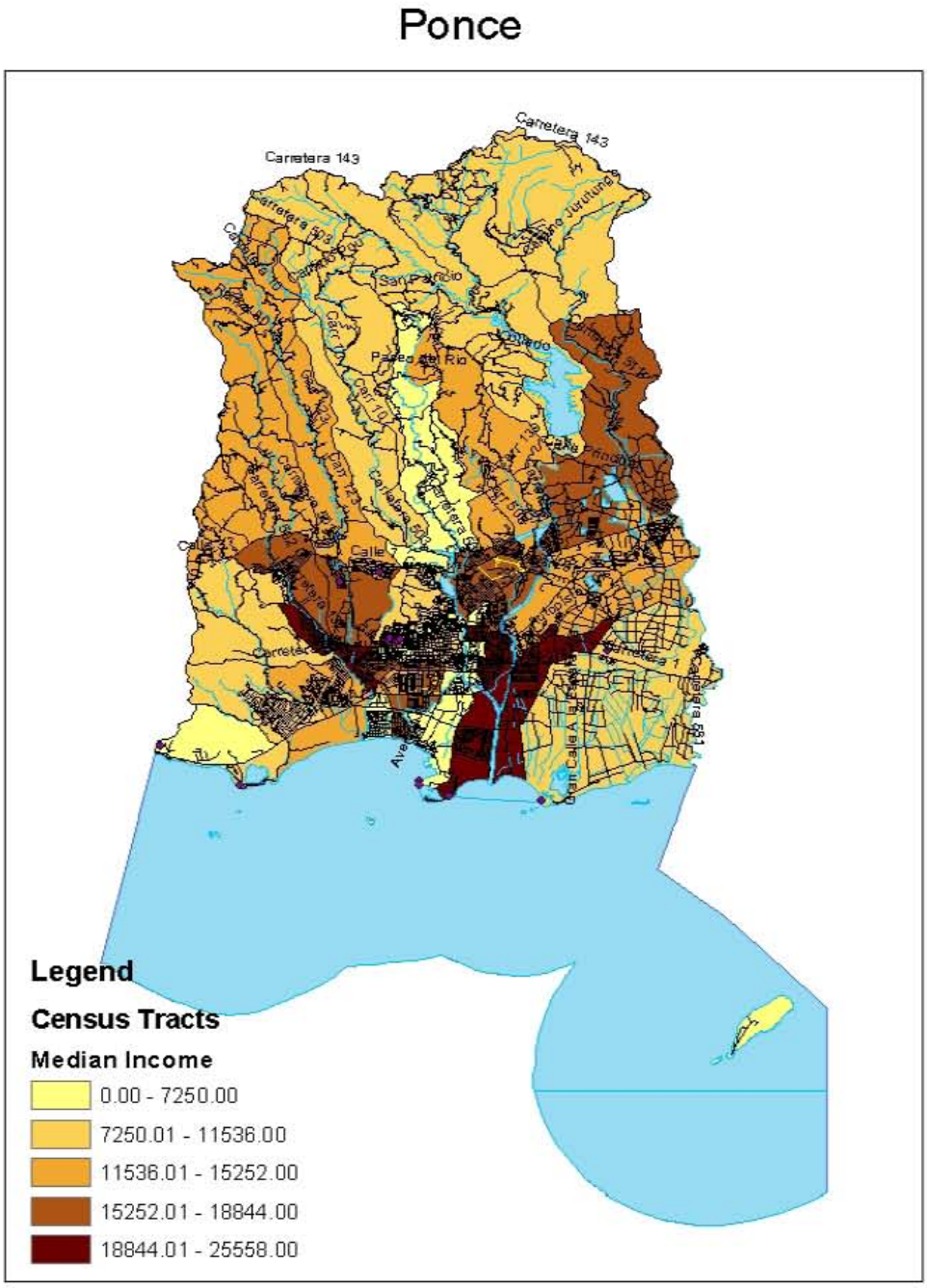
Throughout its history, the region's links to the sea have been substantial. It was among the first regions that U.S. troops invaded during the Spanish American war, and in 1918 also suffered the devastation of

the tsunami. Shipping and maritime trade has been central to Ponce's economy since its earliest days, and Juana Díaz has grown in part because of its proximity to these important port facilities. In keeping with its character as a cultural city, in 1911 it founded the influential newspaper *El Dia* and in the same year the *Teatro La Perla* (Pearl Theater). Through the latter part of the 20th century, the region has attracted more and more internal migrants fleeing the San Juan metropolitan area.

Map SM.1. Southern Metropolitan Region



Map SM.2. Ponce, Showing Caja de Muertos



Ponce

As Puerto Rico's second largest city, Ponce, and the municipality by the same name, can hardly be said to be dependent on fishing to any great degree. As the table below shows, those involved in the extractive enterprises of fishing, farming, agriculture, and forestry have never made up a large portion of the municipality's population, with only around two-tenths of one percent involved in those activities. Nevertheless, Ponce's three fishing centers represent important variations on the ways that fishers across Puerto Rico utilize the region's fishery resources, and the urban economy of Ponce offers fishers a wide range of possibilities to supplement fishing income and take advantage of high levels of weekend traffic to the ocean.

Table SM.1. Ponce Demographic Data

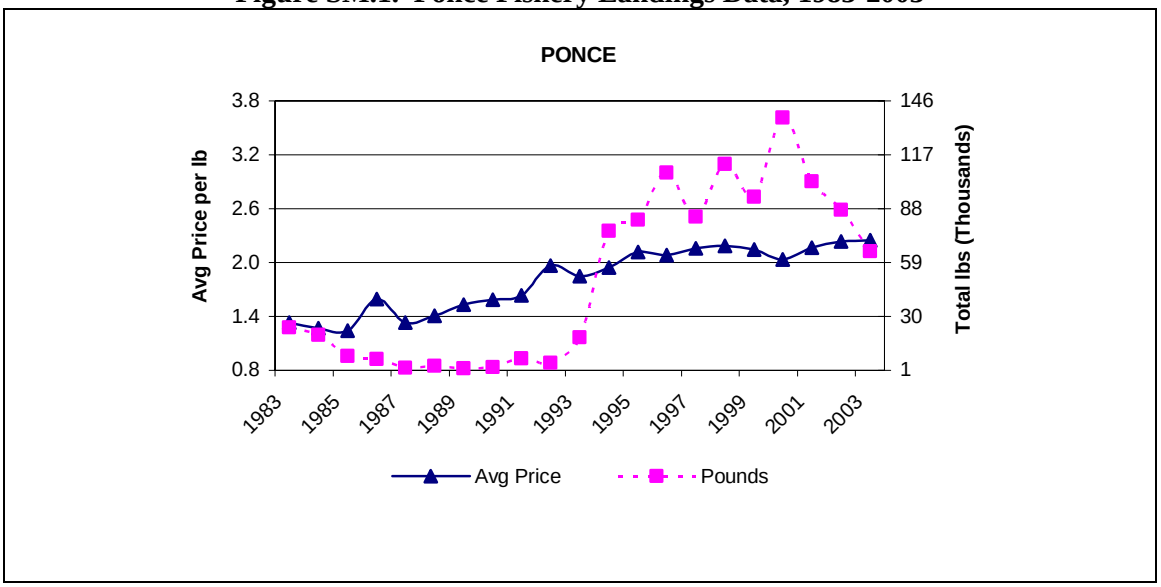
PONCE	1950	1960	1970	1980	1990	2000
Population Characteristics						
Population [1]	126,810	145,586	158,981	189,046	187,749	186,475
Civilian Labor Force (CLF) [2]	32,533	36,224	38,826	49,091	59,141	55,714
CLF - Employed	29,496	33,720	36,838	40,619	43,582	41,715
CLF - Unemployed	3037	2504	1,988	8,472	15,559	13,999
Percent of unemployed persons	9.34	6.91	5.12	17.26	26.31	25.13
Industry of employed persons [3]						
Agriculture, forestry, fishing and mining [4]		3,676	1,309	730	750	359
Construction		2,760	4,928	2,798	3,182	3,143
Manufacturing		7,916	9,323	8,783	6,546	5,367
Retail trade		4,852	5,878	6,166	7,510	5,811
Socioeconomic Characteristics						
Mean travel time to work (minutes) [5]		N/A	N/A	N/A	21.5	24.0
Persons who work in area of residence [6]		29,784	28,332	33,022	39,097	35,130
Per capita Income (dollars) [7]			1,011	2,082	3,735	7,276
Median Household Income (dollars) [8]		1,173	2,585	5,307	7,905	12,998
Individuals below poverty level [9]			100,576	117,162	115,720	95,016
Percent of Individuals below poverty level			63.26	61.98	61.64	50.95

Fishing from Ponce

Ponce ranks 10th in landings, just below its neighbor Juana Díaz, and although only 46 fishers responded to the fisher census from Ponce, the region's two associations alone include over 100 fishers. A third area, Punta Las Cucharas (Spoons Point), has another dozen fishers, although they fish on more of a part-time basis. Ponce also has one of the largest yacht clubs on the main island of Puerto Rico, a large Club Nautico which shares grounds with one of the principal fishing associations, and relatively rich fishing grounds only a few miles off shore, around an island called *Caja de Muertos*, which is shaped like a "box of the dead:" a coffin.

Like other municipalities, Ponce's landings have been sporadic over time, yet show a general upward trend from 1983 to the end of the 20th century; since that time landings have been declining. Price has been stable over time, with if anything a negative relationship to supply (correlation coefficient = .7999).

Figure SM.1. Ponce Fishery Landings Data, 1983-2003



Situated on the south central coast, people fishing from either Ponce or Juana Díaz, whether recreationally or commercially, have access to waters that include the favorite island called Caja de Muertos (Coffin Island) and extend east and west along the continental shelf. This region is unique for its interesting ties to tourism at La Guancha and its lobster-based trap fishery in Juana Díaz, which specializes to a degree uncommon in Puerto Rican fisheries. While parts of these waters can be productive, people living in close proximity to the water of Puerto Rico's south coast, unfortunately, have also witnessed some of the most expansive industrial development, thermal pollution, and, here, metropolitan growth that has altered marine and littoral habitats in ways that fishers have worked hard to circumvent and adapt to. Shipping traffic presents another obstacle to fishing. People interviewed here, when questioned about the health of coral reefs or the marine environment generally, routinely report their demise as due to "anchors from ships," or "contamination from the discharge of factories."

The significant fishing sites in Ponce include La Guancha, a large association in the municipal area that neighbors the Club Nautico de Ponce and the Ponce Yacht Club; La Playa, an association in downtown Ponce, on the water, that also serves as a marina for police and recreational vessels; and Punta Las Cucharas, an area of wooden houses in stilts, near a lagoon, where a dozen families rely on fishing much as the retired fishers in El Faro, Guayanilla, fishing primarily for subsistence, barter, and some market, managing to achieve a certain degree of solitude and isolation only a few miles from Ponce's bustling center. The different fishing areas of Ponce are all within 15-20 minutes by car from each other, but from La Guancha to Punta Las Cucharas is difficult not to feel that one has traveled between two countries instead of between two coastal locations of the same municipality that share fishing as an important economic activity.

La Guancha

On July 25th, 2004, Puerto Rico's Constitution Day, lines of cars and school buses full of visitors clogged the exit off the main interstate (*autopista*) to La Guancha. A large lighted highway department sign read, "La Guancha," in large letters, directing travelers to the waterfront area with a huge orange arrow. The traffic from San Juan, from the north, was backed up for miles; it had come to a complete halt. The 1,200

parking spaces at La Guancha were insufficient to contain this many people; shuttles that ran daily from alternative parking spaces and downtown Ponce would run throughout the day.

This was the scene at La Guancha on Constitution Day, a major Puerto Rican holiday, yet it is not uncommon for well over 5,000 people to visit La Guancha on a weekend. The shuttle service that ferried people from downtown to La Guancha is not restricted to Constitution Day but runs every weekend. Here leisure and commercial interests are so thoroughly intertwined that they form one massive tourist attraction. People come here to eat fish, feed tarpons that school around the docks, and enjoy music. Inside the association facilities, which are large and surrounded by a fence, are several docks, tables, a counter that sells food, a fish cleaning facility, a tower, and boat repair shop. Hundreds of people gather here, buying *helados* (ice cream), seafood, sardines, walking among the facilities, spending their afternoons. Over a weekend, several thousand people visit. In and around the *Villa Pesquera,* old men and women sit in the shade near the restaurant or bring their families to the exclusive part of the association where only the association's members are allowed. In this way fishers reaffirm their membership in a community of fishers—essential for the development of social capital—while engaging the wider community of Ponce and southern Puerto Rico.

La Guancha is a family entertainment place, with many couples with their children eating seafood and buying sardines to feed tarpon. Tarpon school in three or four locations near the docks, waiting for handouts, and the association does a thriving business selling sardines to kids to feed them and the pelicans. The association also operates their own restaurant and hosts fishing tournaments, elaborating their linkages to tourism and recreational fishing after the fashion of the most successful of Puerto Rico's fishing associations.

Figure SM.2. Fishers and Tourists at La Guancha on the Weekend

Figure SM.3. Fishing Vessel (the Santa Clara) in the Harbor at La Guancha

In these and other ways, La Guancha fishing association has taken advantage of the growth of this as a major port, partnering with the municipality of to become a central part of this development. There is a public beach nearby and a large new park with playground equipment; the Club Nautico de Ponce and Yacht Club also share this space. A large snapper vessel ties up here; fishers reported they use it three or four days per week fishing for the association's restaurant. All around the area are warehouses and other port facilities, but the area immediately adjacent to the association has no industrial feel.

Figure SM.4. Tourists Feeding Tarpon at La Guancha

As noted earlier, parts of the facility are private, for association members only, where they can play pool and get away from the crowds. Another part, where they repair the boats, was also off limits to the general public, surrounded by a chain link fence. These repair and associated services aren't restricted to the association grounds. At La Guancha it is clear that economic activity in the sector is eminently maritime or maritime-associated. Boat repair and supplies shops are prominently advertised and several large warehouses filled with shipping containers can be seen. The Ponce Harbor spans across both the La Guancha and La Playa fishing areas; currently the second largest and second most active commercial port in Puerto Rico, it might soon be the first: The huge Mega-Port (El Megapuerto) of the Americas is proposed for Ponce and construction work could begin as soon as 2005, according to government advertisement billboards posted along the road leading to the area.

La Guancha focuses coastal tourism and recreation in Ponce. A large and very well-maintained boardwalk (Paseo Tablado de La Guancha) with a bar/disco/restaurant and several kiosks was built in the area. External and internal tourists visit the boardwalk area on the weekends on numbers that can only be described as several hundred at any given time during the day. Our observations determined that there were >1,200 parking spaces in the area. With an average of only two persons per car, a conservative estimate would place the daily traffic on the weekend at 2,400, though this doesn't account for people

coming and going. On Puerto Rico's dry southern coast, La Guancha benefits from more consistently sunny weather as well. There is also a semi-artificial sandy beach that was evidently stolen from the mangroves that originally filled the area. Dead stumps of mangroves peppering the beach attest to this.

La Guancha is also home of the very high-class Club Náutico de Ponce marina. Several hundred luxury powerboats and sailboats hail from the Club Nautico. 40-50 foot Hatteras, Bertrams, of Chris-Craft powerboats are not rare in the Club Nautico, which also hosts some of the most famous yearly parties and social events attended by Ponce's socialites. In the parking lot, typically, late-model Mercedes Benz, BMW's and Cadillacs predominate. Right between the Club Nautico and the Paseo Tablado there is fisher association.

The Asociación de Pescadores y Dueños de Botes de Motor de La Guancha Inc. is where fishermen of La Guancha hail from and land their catches, and also where they fix their boats and socialize with other fishermen, though this is a network-based community, with fishers living in parcelas around the southern coast, including in Ponce and Juana Díaz. The 20-30 slips right next to the Association are filled with working boats, such as 15-18 foot yolas and Crabber-style SeaHawk 20's, as opposed to the six hundred thousand dollar, 50-foot Bertrams next door in the Club Nautico. There is also a ramp for the fishermen, although much smaller than the one used by the private boats on the other side of the Bay.

One of the fishermen reported that fishers from La Guancha fish mostly using nasas or *malacates* (diesel-powered rigs for pulling up deep water fishing lines; the word often refers to the entire rig, including the engine, pulley, lines, hooks, etc.). Also that the most frequented fishing grounds are Caja de Muertos, Las Coronas, El Derrumbadero and Cabo (the last two are names of fishing grounds on the seaward (south) side of Caja De Muertos. Red snapper (*Lutjanus vivanus*) and king mackerel (*Scomberomorus regalis*) are the most important fish species. He mentioned that fishermen of La Guancha Association come from "all over the place," which is another ways of saying this is a network-based community. Again, those we interviewed, combined with census data, do suggest that they come from Ponce as well as neighboring municipalities. Based on the number of working vessels, between 20 and 40 fishers fish out of La Guancha, although the number could be higher, given the presence of the large trap vessel the Santa Clara.

While the recreational traffic generates a fairly large local market for fish, freezer trucks in the parking lot during the weekdays suggest there must be middlemen-type marketing activity going on. On the weekends the La Guancha grounds serve as a landing site, a boat maintenance and repair site, an area of cleaning and preparing fish, a tourism point of interest, a restaurant, a social gathering and information exchange center for the fishermen (the death of a member's son and the place of vigil were announced in a blackboard near the fish cleaning area), and even a wildlife viewing area.

This lengthy description of economic activity is due to the fact that it represents one of the ways that fishermen associations in Puerto Rico take advantage of nearby tourism and recreational infrastructure, even becoming a tourism point of interest themselves. By doing this they attract large groups of people. Essentially, association members have integrated themselves into the recreational and tourism sector (who are different stakeholders and in some cases oppose commercial fishers).

During the 1990's the city of Ponce, received a very large, economic revitalization boost from a project called *Ponce en Marcha* (Ponce Marches On). Tourism and recreation infrastructure absorbed a massive infusion of public funds, and La Guancha was one place that received funds for recreational development. This was probably to the detriment of other coastal areas, such the commercial harbor of the La Playa area, discussed below. While we cannot know for certain that fishers are making a profit here, attracting such large amounts of people to the grounds and restaurant can't be all bad, since cash is flowing. As a Puerto Rican proverb says, *El que se pega al chorro se moja* ("If you get near the water fountain, you're

bound to get wet"). In any case, La Guancha is an exemplary case of how fishing and coastal development, particularly tourist development, have become vertically integrated, with fishers supplying seafood markets, processing seafood, and entering retail markets while also embracing other dimensions of tourism, up to and including becoming a tourist attraction themselves. They have accomplished this, moreover, as a network-based community, in part because they have managed to hang on to an elaborate space in the midst of other kinds of port development—a space that evokes the culture of fishing, that continues to constitute a working waterfront, reaffirming fishing's moral dimension, and that maintains exclusive space for fishers and their families, helping them continue they are part of a fishing community—a part of, yet apart from, other residents of and visitors to Ponce.

Club Nautico de Ponce

Similar to commercial fishers from La Guancha, a recreational fisherman we interviewed in Ponce reported that he fishes in the waters around La Caja de Muerta, but added that this is an unknown destination among most recreational fishers, very productive. He also reported disliking, intensely, the DRNA, saying that they have a heavy-handed approach to managing natural resources, that they don't care about input from the public, and that they seem composed of under-educated men and women who have few if any public relations skills.

Ponce Marine Supplier

La Guancha is also home to one of the most well-stocked marine suppliers on the island, whom we call Marcus. Marcus has been in this business for 30 years and in this La Guancha location for 15. He was well informed about the recreational boating/ fishing crowd of Ponce and has business ties with Club Nauticos all over the island as well as with people from several foreign countries: he mentioned China, Germany, Brazil, etc. He said that he knows of at least 6 fishing tournaments sponsored per year, one by each Club Nautico, and he supplies various products to each of these.

His shop resembles an auto parts store, only for boats, with not only parts for boats but also hooks, gaffs, and other sportfishing equipment. Three people were there the day we interviewed him, the other two young (perhaps his sons), and his wife's name is with his on his card. He told us about a few charters operating out of the south coast and mentioned that information about each of them would be available at the Ponce Hilton. Evidently most of the charters' traffic comes from tourists, gringos, and foreigners who are staying at the hotels.

In addition to fishing supplies, he sells a kind of specialty bait from a freezer: it's ballyhoo, packaged in small packs of around a dozen fish exactly the way that most sport fishers like it. He says there's a man in Cabo Rojo who fishes the canals inside the mangroves with a cast net and is known for packaging it this way. He had a freezer full of these packages. His business can't be said to be local, with all the international traffic and the ties among Club Nauticos and him around the island.

From the Ponce Hilton, which is near La Guancha, we found information on several charters who operate on the southern and western coasts. These include:

Charters:

Capt. Mickey Amador
Parguera Fishing Charters
(787) 899-4698
(787) 382-4698
hometown.alo.com/mareja
mareja@aol.com
PO Box 36
La Parguera
Lajas, PR 00667

Island Ventures
(787) 842-8546
Rafael Vega
(787) 616-8468

Tour Marine
(787) 851-9259
Joyuda, Cabo Rojo, Mona & Desecheo islands

Of a list of 12 charters at the Ponce Hilton, 5 were on the north coast (Dorado, San Juan, Carolina), four were on the east coast (Farjardo and Humacao/ Palmas del Mar), and only 2 were on the south/ west coasts, one in Parguera and the other in Joyda or Cabo Rojo. Hence, the south and west seem to be more or less afterthoughts with the charter boat community.

La Playa, Ponce

La Playa is a barrio within the coastal section of the larger metropolitan area of Ponce, linked to the larger city yet without the thick traffic and noise, that distinguishes itself through its long history of attachment to the sea. This is most evident in a park/plaza along its waterfront, a few blocks from the modern facilities of the community's *Villa Pesquera*. One section of the park is dedicated, quite elaborately, to the community's fishing past. With ornamental colored tiles, a set of five steps leading to the sea tell of the community's origins during "la epoca de la marina." Off to the side of the steps is a concrete bench in the shape of the hull of a ship, and the rolled-fin, hooked sculpture at the top of the steps depicts the names and images of fishers who have lived in La Playa, as do the walls at either end of the steps. Most importantly, behind the sculpture is a monolith with the image of the Virgen del Carmen.

Figure SM.5. Steps Outlining La Playa History, Ponce

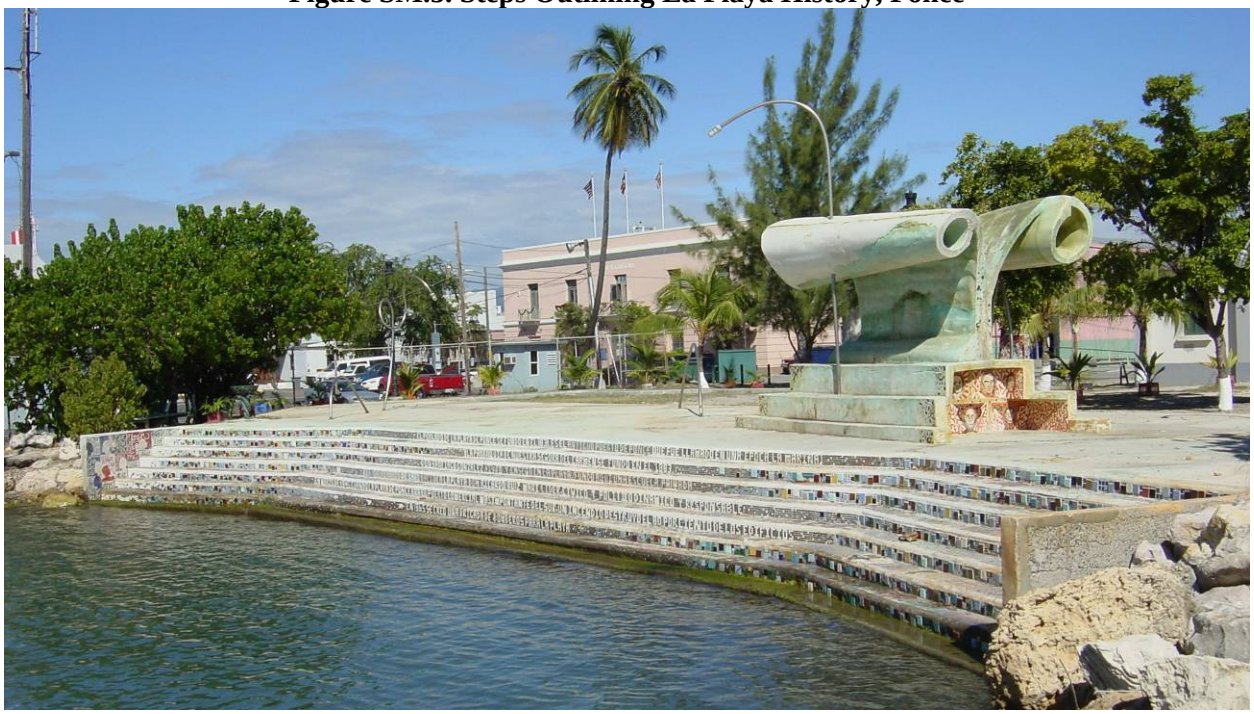


Figure SM.6. Steps Outlining La Playa History, Ponce

Figure SM.7. Virgen Del Carmen Monolith, La Playa, Ponce

La Playa Villa Pesquera

In a western coastal section of the city of Ponce, within view of the port facilities and warehouses around La Guancha, *La Playa Villa Pesquera* serves fifty-three members. It is the largest fishing association in Ponce and they have some of the nicest association facilities in western Puerto Rico, newer looking than Aguadilla's, with sheltered docking facilities with numerous slips and a small stretch of beach where a few old vessels rest. There are many lockers for gear, a small seafood restaurant, and a small fish market.

Figure SM.8. Marina and Association Facilities at La Playa, Ponce

They sell many varieties of seafood for the following (March, 2004) prices:

Arrayo	$2.90/ por libra	Colirubia	$2.75
Sierra	2.50	Chillo	4.50
Chapin	3.00	Pargo	2.75
Dorado	3.00	Peje Puerco	2.50
Atun	2.50	Boqucolorado	2.00
Sama	3.00	Mero	3.00
Capitán	4.00	Burro	2.50
Tiburón	2.50	Loros	2.50
Langosta	7.00	Pulpo	3.50

Extensive construction and remodeling went on inside the association grounds during the spring of 2004. The restaurant, which markets catch from members, was finished and operating, and according to the secretary, the concept of the restaurant is a small place where (mostly locals) people know they can go and get high quality, fresh fish straight form the source (this differs from the La Guancha association's restaurant, which caters to large crowds of mixed locals and tourists. Also a host of new lockers are being constructed and the fish cleaning/processing and fish vending areas are being remodeled as well. These remodeling jobs are undertaken communally, pooling resources to hire specialists (e.g. electricians) as needed.

According to another administrator of La Playa, association members use Palangre (longlines, with 150 hooks or less); single lines or *silgas,* for trolling for pelagics, including (most importantly) mackerels; *luz* (light) for night fishing, suspended either at the surface or midwater, from an anchor or drifting boat; diving equipment, both for free diving and with SCUBA tanks, for octopus, lobster, and reef fish; *nasas* (traps); *chinchorros* (beach seines); *trasmallo* (drift or trammel nets); *La cala/ malacates* (deep water lines, some by hand, but most with *malacates* (engine-powered winches), which are used for red snapper by season and at night, during the new moon; other lines called *lineas de puntas.*

Of these, the predominant gear are longlines and the different forms or line fishing (including trolling for mackerel and deep water lines). When fishing for *sierra* (king mackerel), they follow one of two strategies: 1)The "silguero" (troller) trolls around shelves and bays around dawn or 2) The "*luz*" fisher fishes at night, when the light attracts the mackerel.

All the association members are bound to market their catch through the association. "There is a "compromiso" (an agreement bound by word of honor) between the fishermen and the association, that they will always market their catch (of certain high value species) through the association; in return, the association always buys all their catch from them (an exception to this is during Lent when at times the association administration will order the fishermen not to bring any more mackerels if the freezers are too full with them, until they alleviate some of the surplus. When that happens, the fishers know in advance that if they go for mackerel, they will have to sell it on their own for a while). Everybody keeps to their agreement, with very few exceptions. The association assumes the greatest risk (which in fact means the risk is distributed more or less equally between the members of the association), for example when a year ago the ice-making machine broke and pounds and pounds of mackerel were ruined.

The association has about 50 boat slips, 60 lockers (some of them furnished with small freezers for species that are not usually marketed through the association, or the catch they wish to keep for self consumption). The most important species the association sells are mackerels and yellowtail snappers. The association's restaurant has been operating for two months, managed by a committee composed of some fishermen and fishermen' wives and family members. Some fishermen family members are employed by the restaurant and fish vending area as well, so the association serves as a source of employment for members of fishers' households).

Association has its own ice making plant "*la planta de hielo*". According to one of the administrators, "the ice plant is an essential component of the cooperative agreement between the fishermen members and the association": Fishermen need (and are required to) take at least two large bags of ice on each trip (more for long trips), so that the catch makes it back to land on good condition and the association's fish vending unit is able to keep to its quality standards and thus keep the clientele happy.

The association is highly active in the politics of fishing. According to one of the association's administrators, the plight of fishermen in the decade began when the management and development of fisheries was put in the hands of the State Department of Agriculture. "They went ahead and mixed us together with farmers!" the administrator said. "Farmers, there are more of them, their product has a greater economic values for the government, so we (fishermen) are always losers if we have a disagreement. If there is a hurricane, for example, the plan for insurance and reimbursements will follow a plan designed for farmers, not for fishermen." For example, a plantain grower, in the case of a hurricane, is reimbursed by the Puerto Rican Department of Agriculture for the entire value (or close to it) of the equipment and the crops he lost, while a fisherman is compensated only for the equipment he lost, not for the catch he could not catch while having no equipment. The informant also mentioned that if fishers complain about the effects of agricultural practices on mangroves and reefs downstream, they will also be at a disadvantage, and that, in general, they are stuck in a system designed for dealing with (mid to large scale) farmers, not with small-scale fishermen.

A phrase uttered by this informant put the current situation between fishermen and the government in Puerto Rico very tersely: "In this Association, we are 50 fishermen, and that makes 50 fishermen who are against the government." Another association administrator placed the number of members at 56, and said that they were all predominantly full-time fishers.

Association members commented that the multi-species, multi-licenses regulations will affect their members in particular. La Playa de Ponce is most heavily dependent on the two kinds of fisheries noted above: 1) Mackerels (s. regalis and s. maculates) and 2) Deep sea snapper fisheries (red snapper, silk snapper, blackfin snapper, and others) (Spanish names: *chillo, chillo ojoamarillo, chillo alanegra (a.k.a. negrita), and cartucho. Arrayao (lutjanus synagris)* and *sama (lutjanus analis)* fisheries are also important, but a little less so, according to this informant (contrast this with the nearby Punta Las Cucharas, where informants report that Arrayaos and octopus are the staple species pursued). According to the informant, the new regulations restrict size limits for deep water snappers, plus the requirement for separate licenses for various deep water species put fishermen in a very difficult position, because "you cannot tell the fish: 'small ones are not allowed to bite' or 'only *chillos* (meaning only x or y species) are allowed to bite today", and whatever you pull up from 200 brazas (very close to a fathom) is going to be bloated (much like a divers lungs when she ascends to fast to the surface) and dead long before reaching the surface." This argument is that the fisherman of deep water snappers has two options: either buying all the licenses for all the species that are caught together (perceived as too expensive), or risk breaking the law and getting tremendous fines.

As vice-president of the association, the informant is also very up to date on fines and administrative procedures that have been initiated against association members. He contends that not only tickets are very often levied on la Playa fishermen, but that he in fact even knows the places in which DRNA law enforcement people 'hide behind an islet' to ambush association members going out to or coming back form the sea. "Many people here have tickets and fines pending at this moment!" He says most tickets are not even related to fishing per se, but to mandatory safety equipment (for example, forgetting to bring a flare or a class IV lifejacket, etc.). The relationship between DRNA law enforcement and fishermen is not what it should be, one of "helpfulness and cooperation, instead of one of regulation", and that one of the culprits of these is that the 'Cuerpo de Vigilantes" of the DRNA are dispatched with orders of ticketing people for minor safety equipment infractions, while environmental destruction by other people (large companies, marinas) goes on in plain sight, with no visible punishment or control: "While they are out there ambushing and fining the small fisherman that goes out to catch a few pounds," he said, "the Ponce Hilton destroyed acres and acres of mangroves and built an artificial beach for its guests. And all the mangrove area that was cut down and re-filled for this artificial beach used to be premium Jueyes (land crab) habitat."

He also claimed that the small road leading to the Club Nautico de Ponce was "robbed from the sea," meaning that where the road passes now used to be a shallow underwater area; in fact, the informant recalls that that area where the road was built used to be a beautiful, very shallow reef, with many juvenile fish and a prime grounds for collecting/browsing for *burgao* (West Indian Top Shell, *Cittarium pica*) and octopus. The informant recalls when this reef was drained and filled with sediment, then cement, and finally asphalt for the cars of Club Nautico Members to pass through: "Nothing happens when all that (destruction) happens, but when it comes to the fishermen, the DRNA has been since the regulations were put in place , '*con el látigo en la mano*' ('with the whip in hand')."

Puntas Las Cucharas (Spoons Point)

The final place we discuss in Ponce is quite different from either La Guancha or La Playa. First, it is not a fishing association at all but a small cluster of homes where some 20 to 30 fishers either depend on fishing or supplement other incomes with fruits of the sea. To get to Punta Las Cucharas, which sits on a peninsula near the El Tuque recreational complex (a water park and race track), you have to wind down a long, rutted, sand and gravel road that ends up at a point of dirty sand, downwind from much of the litter of Ponce. You pass a lagoon and course through mangroves and other landed aquatic plants and end up at a string of around 30 houses built from wood on stilts. Across the road from these houses are mangroves, and interspersed among the mangroves and the houses are a number of small *yolas* that can be launched either from the beach facing Ponce or from the shore facing the sea to the south.

The community is separated from the rest of Ponce by the Las Cucharas Lagoon, on the seaward side of the tidal flats near the mouth of the estuary. There is a small communal dock in a small embayment near the eastern part of the settlement. Most of the houses have fishing equipment, boats, and trailers around them. The presence of the dock suggests some cooperation, though there is no association here. The houses appear to be the homes of the poor, perhaps even lacking basic services. One feature they have in common is that the yards contain several scavenged or used pieces of equipment, construction materials, etc. Much as in the U.S. South, where you see homesteads with all kinds of metal, wood, and other material that may, someday, come in handy, families in Puntas Las Cucharas also seem to collect junk for possible future use. Families recreate in the water off the point, swimming or simply sitting in the water, and a number of scrawny dogs roam freely around the area.

Figure SM. 9. *Yolas* and Communal Pier at Punta Las Cucharas

Figure SM.10. Fisher's House and Yard in Punta Las Cucharas

One of the fishers we spoke with, Hector, was in his late 60s or early 70s. He said he had lived there for a long time and that his only occupation was fishing. Also, he said that there were 12 fishermen in the community, which seemed to agree with the 12 boats moored on or near the water. However, later, we spoke with two other fishers who said that there were actually 20+ fishers fishing from there. Some come from outside the community and launch their boats from there. We were able to see the catch of those two fishers, which included 5-6 octopi, several *arrayaos* (Lutjanus synagris), several *colirrubias*, yellowtail snappers (Ocyurus chrysurus), and an array of small grunts and snappers. They told us that that particular catch was for consumption in a birthday party later on that afternoon. We asked about marketing of fish, and they told us it was done mostly informally, based on word-of-mouth about who was going out and catching fish on particular days, instead of in a highly centralized fashion like it seems to be the case in La Guancha and other larger landing centers. However one of the fishermen pointed out that this way of marketing was highly effective, because they usually had few problems selling their catch.

Hector also reported that fishers from Las Cucharas tend to practice inshore or nearshore fishing, and that practically all of the activity happened in the extensive shallow grounds between Ponce and the landward side of Caja de Muertos island, and practically none of it beyond that towards open sea. The extensive seagrass and sand flats with patch reefs that have a reputation for being highly productive. The shelf and reef drop-offs are pretty far away for these communities (10-12 miles). He mentioned the usual array of handlines, chinchorros, trasmallos, spearfishing and collecting conch as the types of fishing activity in the area.

Results of the Fishery Census in Ponce

Again, fewer fishers participated in the census than we learned fish out of Ponce in our ethnographic work, only 34 compared to over 100 in our study. They are, in addition, serious about their fishing, with high average weekly hours and high ratios of full-time to part-time fishers.

Table SM.2. Selected Fisher Characteristics, Ponce (n=34)

Variable	Response
Association Member	91.3%
Hours used for Fishing	
< 20 hours	4.3%
20 – 30 hours	28.3%
31 – 39 hours	4.4%
40 hours	52.2%
> 40 hours	10.9%
Mean hours	35.93
Standard Deviation	9.794
Minimum hours	12
Maximum hours	60

Source: Puerto Rican Census of Fishers, 2002

Table SM.3. Fishing Territories and Styles, Ponce (n=34)

Variable	Percent
Shore	4.3
Continental Shelf	95.7
Shelf Edge	23.9
Oceanic	58.7
Reef Fishes	93.5
SCUBA Diving	17.4
Skin Diving	26.1
Pelagic	19.6
Bait	37.0
Deep Water Snappers	56.5

Table SM.4. Gear Utilized by Ponce Fishers (n=34)

Variable	Percent
Beach Seine	8.6
Trammel Net	0.0
Long Line	56.5
Troll Line	52.2
Fish Trap	17.4
Gill Net	37.0
Cast Net	80.4
Hand Line	87.0
Rod and Reel	71.7
Lobster trap	6.5
Snapper Reel	15.6
Winch	2.2
Skin	0.0
Spear	17.4
Lace	6.5
SCUBA	8.7
Gaff	97.8
Basket	0.0

Table SM.5. Marketing Behaviors in Ponce (n=34)

Variable	Percent
Private	2.2
Fish Buyer	2.2
Association	91.3
Walking	8.7
Restaurant	0.0
Own Business	0.0
Gutted	54.3
Ice	71.7
None	17.4

Tables SM.5 and SM.6 also indicate fishers who are highly dedicated to fishing, with under 20% reporting that they do not market their fish and fully 91.3% saying that they sell to the association (the discrepancy between these figures may be from reporting past instead of current behavior, or could be a census coding error). Ponce fishers also report using a wide range of gear and fishing in a variety of waters.

Finally, no Ponce fishers captured in the census reported that fishery resources had improved, with the vast majority, nearly 90%, believing that they were worse. Pollution was cited as the most likely culprit for the declines, as perhaps we should expect from a heavily industrialized coast with a busy port and a high urban population that seems to be sprawling up and down the southern coast. We were a little surprised that habitat destruction was not cited with more frequency, given complaints of fishers about the destruction of mangroves from the Hilton and other coastal development.

Table SM.6. Ponce Fishers' Opinions of Fisher Resources (n=34)

Variable	Percent
Status of the Fishery Resources: same	10.9
Status of the Fishery Resources: worse	89.1
Pollution	78.3
Habitat Destruction	6.5
Overfishing	10.9
Beach Seine	2.2
Boats breaking the reefs	6.5
Currents	2.2
Dynamite	4.3
SCUBA Divers	2.2

Juana Díaz

Like other municipalities within driving distance of densely populated metropolitan areas, construction in Juana Díaz remained relatively stable over the most recent decade for which we have data. Similarly, employment in retail trade changed little from 1990 to 2000. This employment picture creates a setting in which the typical movement between fishing and other work may be relatively more easily accomplished than in other areas.

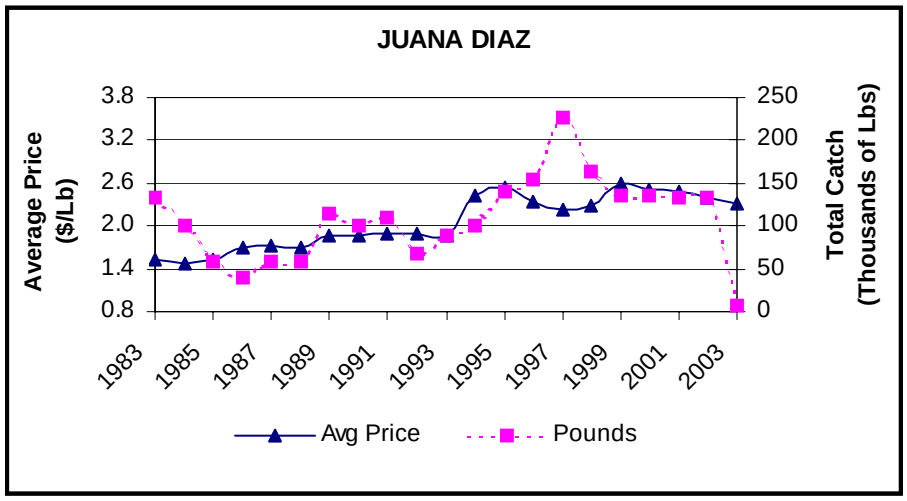
Table SM.7. Juana Diaz Census Data

JUANA DIAZ	1950	1960	1970	1980	1990	2000
Population Characteristics						
Population [1]	27,697	30,043	36,270	43,505	45,198	50,531
Civilian Labor Force (CLF) [2]	6,918	6,720	7,201	10,141	12,752	14,135
CLF - Employed	6,503	6,304	6,877	8,247	8,930	10,255
CLF - Unemployed	415	416	324	1,894	3,822	3,880
Percent of unemployed persons	6.00	6.19	4.50	18.68	29.97	27.45
Industry of employed persons [3]						
Agriculture, forestry, fishing and mining [4]		2,536	1,011	951	472	586
Construction		612	1,225	795	991	972
Manufacturing		968	1,628	1,639	1,560	1,540
Retail trade		612	762	950	1,157	1,186
Socioeconomic Characteristics						
Mean travel time to work (minutes) [5]		N/A	N/A	25.2	23.9	28.3
Persons who work in area of residence [6]		4,232	2,794	3,507	3,397	3,905
Per capita Income (dollars) [7]			648	1,461	2,582	5,632
Median Household Income (dollars) [8]		841	2,129	4,535	6,893	12,892
Individuals below poverty level [9]			27,705	32,343	32,900	28,500
Percent of Individuals below poverty level			76.39	74.34	72.79	56.40

Fishing from Juana Díaz

Just east of Ponce, Juana Díaz is less metropolitan in character yet, according to ethnographic reports, fishers here are tied to Ponce fishers through family ties and some Juana Díaz fishers belong to the La Guancha association. In addition, certainly many Juana Díaz residents work in the Ponce metropolitan area, whose unemployment rate is slightly lower. Landings from this area are slightly higher than those from Ponce, and the two municipalities rank 9th and 10th in the landings data. Several other attributes of the Juana Díaz fishery suggest a robust fishing economy. This is true even in light of the apparent declines in landings from 2002 to 2003, when landings dropped to record low levels. During this time, prices fluctuated within a far narrower range, with the average ex-vessel price around $2.25 per pound. This is somewhat strange, given that the most commonly captured species in Juana Díaz is lobster, accounting for over 60% of the catch. Ethnographic work confirmed its continued importance beyond 2003.

Figure SM.11. Juana Díaz Landings Data, 1983-2003



Villa Pesquera de Pastillo

Perhaps the most notable attribute of this municipality's fishery is its specialization. While the most widely caught species in most municipalities rarely accounts for more than 10% to 15% of the landings, in Juana Díaz lobster landings accounted for 32.2% of the landings from 1999 to 2003. Our ethnographic work in Pastillo, the fishing center, supported this finding as well; members not only target lobster extensively, they build their own lobster and fish pots.

The association is fairly large, with 39 members, 21 of whom are full-time and 18 of whom are part-time. This too differs from other communities where part-time fishers usually outnumber full-time fishers. According to the fisher census, however, association members account for only about half the fishers in Juana Díaz, and 60 percent of the fishers in the census fished for less than 40 hours per week.

Figure SM.12. "Pescador Juanadino" Statue, Patillas, Juana Diaz

Visits to Pastillo nevertheless revealed a community with a heavy dedication to commercial fishing and to supplying the community with fresh fish. In line with their targeting lobster, they are primarily an in-shore fishery, working the continental shelf and nearshore reefs as well as the waters off the coast of Ponce. Their close proximity to these productive lobster grounds may account for their high degree of specializing in lobster, combined, of course, with the species' high ex-vessel and retail value. These grounds include the famous island of Caja de Muertos.

Table SM.8. Fishing Locations and Styles, Juana Diaz (n= 15)

Variable	Percent
Shore	0
Continental Shelf	100
Shelf Edge	0
Oceanic	6.7
Reef Fishes	93.3
SCUBA Diving	13.3
Skin Diving	13.3
Pelagic	13.3
Bait	0
Deep Water Snappers	0

Source: Puerto Rican Census of Fishers, 2002
Totals do not add up to 100% because fishers typically fish multiple locations.

Table SM.9. Selected Juana Díaz Fisher Characteristics

Variable	Response
Association Member	46.7
Hours used for Fishing	
< 20 hours	20
20 – 30 hours	20
31 – 39 hours	20
40 hours	33.3
> 40 hours	6.7
Mean hours	31.8
Standard Deviation	10.692
Minimum hours	10
Maximum hours	48

Source: Puerto Rican Census of Fishers, 2002.

The specialization on lobster is reflected in gear use, with the highest reported gear types being traps—in this case both lobster and fish pots. As noted earlier, they make the traps themselves, of both wire and wood. While the fish pots are almost exclusively made of wire, their lobster pots are either of wire or wood. The latter are an interesting design, pyramid in shape (as opposed to rectangular), which they claim work better than other designs. The wood is recycled from palates that local manufacturing plants give them. They deploy gear from 25 to 30 vessels that tend to be in the 18' to 20' range, made of wood covered with fiberglass; some possessing advanced equipment, such as depth finders and GPS positioning equipment, and many of the younger fishers go to sea with cell phones in case of emergency.

Table SM.10. Gear Used by Juana Díaz Fishers

Variable	Percent
Beach Seine	6.7
Trammel Net	6.7
Long Line	6.7
Troll Line	6.7
Fish Trap	66.7
Gill Net	13.3
Cast Net	13.3
Hand Line	40
Rod and Reel	6.7
Lobster trap	60
Snapper Reel	0
Winch	0
Skin	0
Spear	20
Lace	0
SCUBA	6.7
Gaff	60
Basket	0

That the association does not control the market is something that both our ethnographic work and the census revealed. According to local informants, each fisher in the association has his own freezer and they sell to restaurants primarily (at least half their catch) and afterwards to the local community (about 25%) and to communities elsewhere in the municipality (about 25%). The restaurants that buy their fish are located in Ponce, Salinas, Santa Isabel, Coamo, and Aibonito; the last two are interior municipalities, but the others are coastal municipalities, with their own fisheries. Census data indicate that market

intermediaries—private buyers—are most common, representing 86.7% of fishers; this contradicts the 80% who said they had no marketing strategy.[13]

Our ethnographic work falls on the side of those with marketing strategies. Fishers we interviewed reported that Juana Díaz fishers sell most of their catch; the targeting of lobster would further confirm that they are fishing with an eye toward the market. Fishers reported that fish sales during Lent were particularly brisk; community members, who consume fresh fish routinely, are even more grateful for this supply during the spring holiday.

Marketing is particularly important to divers, who make up between one-third and one-half of the association fishers. They fill their tanks in Ponce, at El Tuque, at $3.00 per tank, using between 5 and 9 tanks per trip. Divers were particularly hard hit by the seasonal closure for conch, which they target behind lobster. They don't disagree with the closure exactly, but some local divers did admit to fishing for conch after the season closed. Some believe that closing conch season indirectly affects the octopus catch. This is because the conch shells provide shelter for small octopus, so fishers leave them in areas where octopus are likely to gather and then return to check the shells. Like fishers elsewhere, they have conflicting theories and practices regarding the disposal of conch shells, with some believing that empty shells repel conch yet others using the shells, as just noted, to lure octopus. However, when they deposit shells to lure octopus, they put them in a different area than where they catch conch. They complained that fishers from outside of the community often leave the conch shells where they find the conch, which Juana Díaz fishers believe spoils the bottom.

Table SM.11. Marketing Behaviors of Juana Díaz Fishers

Marketing Behaviors	Percent Reporting
Fish dealer/ buyer	86.7
Private	6.7
Association	0
Street vending	6.7
Restaurant	6.7
None	80
Sell fish gutted	6.7
Keep fish on ice	13.3

Source: Puerto Rican Census of Fishers, 2002.

In addition to the costs divers incur filling tanks, other costs that Juana Díaz fishers incur include approximately $50.00 per trip for gas, $20.00 per person for breakfast and lunch, and another $4.00 for ice. The association doesn't produce its own ice, but members purchase it locally, as with most other equipment. Materials for the lines cost between $50.00 and $60.00, and other equipment (trap wire, nails, etc.) costs are also rising. They claim that the increasing cost of fuel is responsible for recent declines in landings, causing fishers to make fewer trips or stay closer to shore.

Local fishers also site contamination as a cause, in line with census data. Specifically, they complained that the Salinas water treatment plant discharged their waste water 5 to 6 miles off shore, and that they can't fish in this area due to the odor. Census data indicate that fishers view pollution and habitat destruction as the principal causes of declining resources, but during our ethnographic work fishers reported that the mangroves were in fairly good shape. However, one claimed that the destruction of the mangroves was underway, from "construction and the selling land for hotels."

[13] Of course, this may indicate problems with the census data or the interpretation of the question by fishers.

Table SM.12. Opinions of Juana Díaz Fishers

Opinion	Percent reporting
Status of Fishery Resources	
Better	0
The same	60
Worse	40
Reasons for problems in fisheries	
Pollution	40
Habitat Destruction	20
Overfishing	0
Laws, regulations, and licensing	0
Crowding	0
Seasonal factors	0

More than habitat destruction and pollution, among their principal problems has been barge traffic through the area. Propellers from barges often entangle the lines of their traps, dragging them. They also object to the new licensing regime, although they praised the DRNA for its protection of turtles around Caja del Muertos. They were dismayed, however, with most of the regulations, believing that they did not benefit them. They specifically cited the size limitations, although claiming not that the smaller were dying from rising from great depths, but that they often die on the line and, again, throwing them back is wasteful.

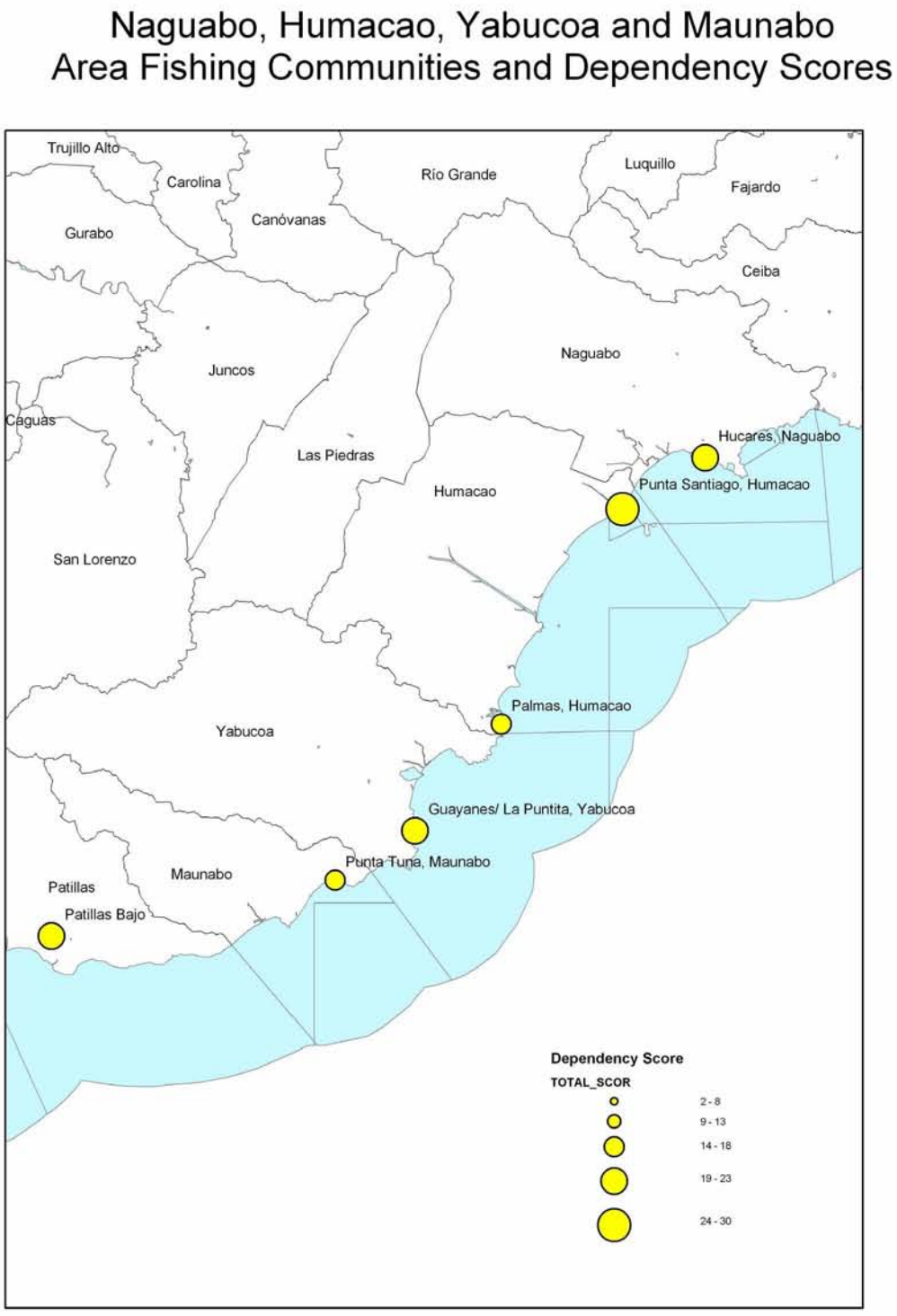
Many fishers from Juana Díaz come from long-time fishing families, skilled at making their own gear and, in some cases, their own vessels, yet few have devoted their lives to the sea on a full-time basis throughout their lives, working as security guards, emergency medical technicians, mechanics, and other positions. Nevertheless, Juana Díaz fishers continue to dedicate themselves to fishing and to pride themselves on providing high quality seafood to the local community.

Southeastern Region:

Naguabo, Humacao, Yabucoa, Maunabo

Southeast Puerto Rico includes an interesting mix of fishing sites and fishing communities nestled in among elaborate residential developments and the infrastructure of contemporary and past industry and commerce. Shell's oil tanks, port facilities, and refineries, for example, sit within a few minutes drive of what has been one of the most ambitious residential and vacation housing on the main island: Palmas Del Mar. In some parts of this region, commercial, subsistence, and recreational fishers have taken advantage of various coastal developments, either enjoying the access that canals, piers, and other infrastructures provide or benefiting economically from the tourist and other traffic through seafood sales and providing services to tourists. Many fishers in this region have been highly active and vocal in their opposition to new regulations, attending meetings, speaking with politicians, and proposing alternatives to current and proposed new laws. Fishing sites here range from the elaborate association at Palmas Del Mar, with its extensive restaurant facilities that draw residents from the residential/ resort complex, to abandoned shipping terminals where recreational fishers fish nearly every day. The facilities at *Villa Pesqueras* across this region suggest relatively robust fishing populations with strong, if irregular, ties to municipal and federal governments and the ability to garner public funds for fisheries infrastructure development. At the same time, the presence of some abandoned fisheries infrastructure and other facilities that experience little use suggests that these ties vary across the region and that their strength changes over time.

Map SE.1. Southeast Puerto Rico



Naguabo

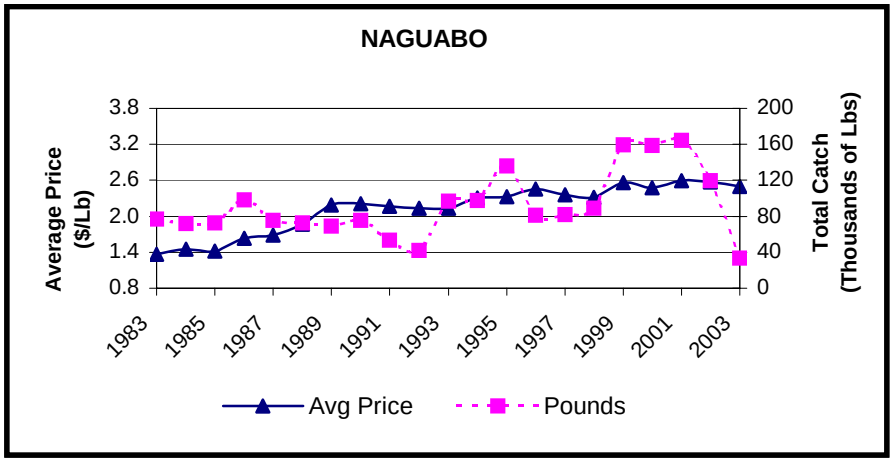
Bordering Ceiba to the south, Naguabo's Húcares and Playa Húcares, within a short drive or boat ride from one another, comprise the municipality's principal fishing community. The community sits on two bays and occupies an area that is somewhat separated from the rest of the municipality by virtue of its location on a point. Part of the community, along the principal coastal highway through Naguabo (route 192) that skirts the Húcares waterfront, consists of a string of popular seafood and other restaurants while other parts consist of areas with elaborate fishing association facilities, seafood markets, and the homes of fishers.

Table SE.1. Naguabo Census Data

NAGUABO	1950	1960	1970	1980	1990	2000
Population Characteristics						
Population [1]	21,019	17,195	17,996	20,617	22,620	23,753
Civilian Labor Force (CLF) [2]	5,183	4,200	4,059	5,074	6,541	6,447
CLF - Employed	5,032	3,944	3,881	4,172	4,915	5,059
CLF - Unemployed	151	256	178	902	1,626	1,388
Percent of unemployed persons	2.91	6.10	4.39	17.78	24.86	21.53
Industry of employed persons [3]						
Agriculture, forestry, fishing and mining [4]		2,072	640	247	334	73
Construction		424	885	776	747	891
Manufacturing		224	664	740	987	721
Retail trade		308	404	464	490	661
Socioeconomic Characteristics						
Mean travel time to work (minutes) [5]		N/A	N/A	25.3	26.0	31.0
Persons who work in area of residence [6]		3,008	1,900	1,811	2,443	1,924
Per capita Income (dollars) [7]			768	1,581	3,221	6,960
Median Household Income (dollars) [8]		738	1,898	4,106	7,763	11,461
Individuals below poverty level [9]			12,840	14,916	14,833	13,051
Percent of Individuals below poverty level			71.35	72.35	65.57	54.94

Unlike most other coastal municipalities, Naguabo has seen increased employment in its retail trade sector as well as its construction. Growth in construction is due in part to coastal development, about which fishers complain. The landings data show Naguabo to be an important landings center, ranking 7th in Puerto Rico over the past five years.

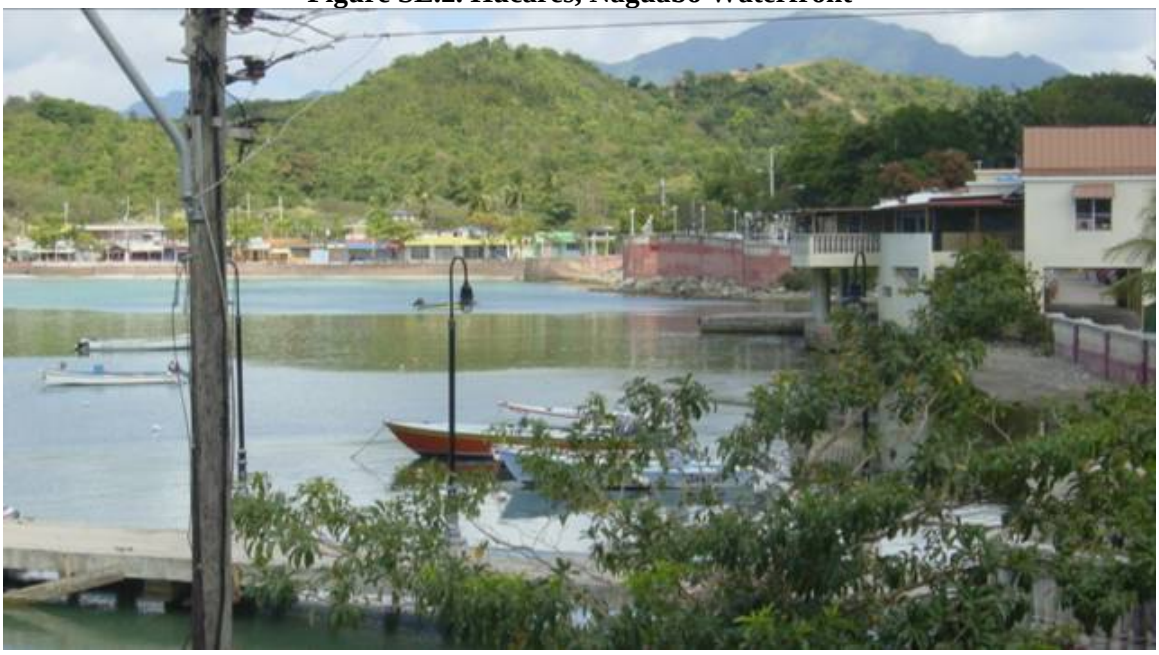
Figure SE.1. Naguabo Landings Data, 1983-2003



These data suggest that Naguabo's landings have been more or less stable over the 20-year period shown here, fluctuating less than landings in many municipalities and accompanied by gradual price increases (correlation coefficient = .4204). The drop from 2002 to 2003 is in line, however, with other places across the islands.

Húcares, Naguabo's principal fishing community, is closely tied to the sea and has recently seen its *Villa Pesquera* refurbished, at Department of Commerce expense, at the cost of $614,000. The facility now has 23 new lockers with louvered doors, at least two concrete, fully enclosed social or communal areas, an office, and a concrete pavilion. It sits beside a ramp and a long concrete muelle that, like much of the waterfront, looks built to last. A long sea wall protects the Naguabo waterfront, extending from the string of restaurants just mentioned to the boat-launching ramp, beyond which is the association.

Figure SE.2. Húcares, Naguabo Waterfront



It is a picturesque waterfront, boasting municipality investment in concrete walks and walls and a large concrete, enclosed area under a building where they advertise boat rides. While this appears to be a municipal facility, there is a seafood restaurant on the second floor of the building. People market

produce and other goods from the open area beneath, though sporadically and on foot, without booths or temporary structures of any kind.

The vessels moored along the concrete pier in Húcares, like boats along other parts of Eastern Puerto Rico, are longer and wider than the 18' vessels in the west. They seem like trap vessels and we photographed some traps inside the fishing association fence. During our first visit to the area we counted between 16 and 20 working boats, although some were in fishers' yards and may or may not have been in service. Another three were inside the association facilities, and another two were moored in a bay around the point from the waterfront, near Playa Húcares.

Figure SE.3. *Villa Pesquera* facility, Húcares, Naguabo

The above photograph pictures the facilities that we noted above have been built recently. Fishers interviewed there reported that they were built just two years ago. The current president of the association is also the president of the *Congreso de Pescadores de Puerto Rico.* This affiliation and the public investment in the facilities suggest that the fishers here, or at least their leadership, are well tied into the island's political network.

Figure SE.4. Naguabo Municipal Building Where They Advertise Boat Rides

Figure SE.5. Boat for Rides, Naguabo

While the photographs above show some tourist development, the waterfront is still more of a working waterfront oriented toward supplying seafood restaurants than one dedicated to tourist activities. Yet fishers at the association did report some moves to integrate more thoroughly with a developing tourist sector in Naguabo, which is growing. Currently, for example, there is a hotel being planned on the waterfront; the people building the hotel approached the association to discuss the possibility of selling them some land and providing boat rides to the tourists who stay there. Whatever openness to these suggestions exists may stem from two sources: first, despite the apparently new and good condition of the facilities, there have been problems with them; and, second, problems with the availability and condition of marine resources—from contamination, sedimentation, and regulation—have led them to begin considering alternative sources of income. These issues are dealt with in more detail below.

Naguabo History

Naguabo is a large, rectangular-shaped municipality that reaches east-west from the coast to the mountains, its narrow edge perpendicular to the coast. Prehistorically and historically, three rivers—Santiago, Blanco, and Daguao—enabled settlement of the Sierra de Luquillo in its interior. These mountains became known as a refuge for native Caribs as early as the 16th century.[14] The coast, by contrast, achieved an early reputation as a part of Puerto Rico's coast most likely to be in the paths of passing hurricanes, which stalled European settlement (Toro Sugrañes 1995: 289). Small numbers of Spanish settled Naguabo as early as 1512, lining the mouth of the Rio Daguao, but their settlements were ultimately destroyed by local Native Americans, and not until 1722 did Naguabo begin receiving sufficient numbers of settlers to establish a town of any significance. Through the 18th century, most settlers came from the Canary Islands, and they founded the municipality of Naguabo in 1794 (ibid.). The original site of the first town, however, was considered too far from the coast, and nearly three decades later, in 1821, they moved the principal population center two miles from the coast.

Most of its 3,078 inhabitants farmed and raised livestock during the 1820s, including the 378 slaves. During this time Naguabo was actually under the political jurisdiction of Humacao, suggesting that, together with Ceiba (formerly under Fajardo's jurisdiction), those in power considered this region of the island incapable of self-government or autonomy. Part of this may have been the region's reputation, during the 19th century, as the site of much contraband trade. This was particularly heavy during prohibition, from 1917 to 1934, when Naguabo's port and beach were heavily involved in the trade of alcoholic beverages.

While sugar was produced at 21 mills in Naguabo, and rum in 5 distilleries, the municipality was also known for its production of livestock and coffee. Livestock production founded a milk industry here in the 20th century, which, along with sugar and small-scale agriculture, provided the majority of the population with employment. While sugar production diminished through this century, beginning with the closure of mills and sugar leaving for *Centrales* in Humacao and Fajardo, milk production continues today, and the region continues to produce beef, pork, and poultry for sale throughout the island.

Tourism is more recent, but Toro Sugrañes writes that Húcares Point, discussed in more detail below, has become its most important tourist destination (1995: 290). The beach on the southern end of Naguabo's coast, between the Blanco and Daguao Rivers, has also become a popular location for weekend tourists. This development has been accompanied by the development of coastal housing and businesses, some of which the fishers view as environmentally unsound.

Fishing from Naguabo

Our interviews with Naguabo fishers revealed that between 35 and 36 bona fide fishers belong to the association, and that all own their own vessels. Around 20 vessels are kept at the association, while others are trailered and launched from the ramp. One Haitian belongs to the association. Census data suggest that association membership is quite high in the municipality, but that levels of fishing effort are variable.

[14] There is much contention over the designation "Carib" and their relationship to the Taino. The word itself comes from transcriptions of Columbus's journals, the more poorly transcribed versions of which became "canib," the root word for cannibal. Some ethnohistorians believe that the Caribs were indeed a different ethnic group, while others argue that the Spaniards lumped all renegade natives of the Caribbean into the category of Carib, leaving the name Taino to refer to those natives who cooperated with the Spaniards.

Table SE.2. Selected Fisher Characteristics of Naguabo Fishers (n=29)

Variable	Response
Association Member	93.1
Hours used for Fishing	
< 20 hours	31.0
20 – 30 hours	13.6
31 – 39 hours	10.3
40 hours	31.0
> 40 hours	13.7
Mean hours	30.24
Standard Deviation	14.394
Minimum hours	0
Maximum hours	54

Source: Puerto Rican Census of Fishers, 2002.

Locals reported that association members are primarily divers, but that they fish with traps and other gear as well, fishing a broad range that extends from off the south shore of Guayama and Arroyo to Fajardo, as far out to sea as the waters south of Vieques. This area overlaps with that fished by fishers of the northeast region, although extending further south. Census data support this, suggesting that they fish primarily the reefs along the continental shelf and its edge, with some oceanic fishing.

Table SE.3. Fishing Locations and Styles, Naguabo

Variable	Percent
Shore	0
Continental Shelf	100
Shelf Edge	100
Oceanic	41.4
Reef Fishes	100
SCUBA Diving	17.2
Skin Diving	0
Pelagic	44.8
Bait	34.5
Deep Water Snappers	31.0

Source: Puerto Rican Census of Fishers, 2002
Totals do not add up to 100% because fishers typically fish multiple locations

Census data also conform, more or less, to our ethnographic observations and interviews in Naguabo. Those we interviewed did seem to view diving as more common than trap fishing, although the census data suggest the opposite, as well as the importance of lines in the fishery. This discrepancy may derive from the fact that it was approaching the conch closure when we visited, and diving activity was frenetic and highly visible, as in Vieques, or from the possibility that diving has gained in popularity in Naguabo in the years since the census. In any case, more individuals engage in trap fishing, as well as fishing with lines, than dive. Divers in Naguabo also reported that they used spears primarily for defense under water, and generally collect conch, lobster, and other species by hand.

Figure SE.6. Fresh Conch Landed in Naguabo on June 18, 2005 (note the rolled-up diver's flag)

Table SE.4. Gear Used by Naguabo Fishers (n=29)

Variable	Percent
Beach Seine	3.4
Trammel Net	3.4
Long Line	13.7
Troll Line	41.4
Fish Trap	72.4
Gill Net	37.9
Cast Net	48.3
Hand Line	75.1
Rod and Reel	3.4
Lobster trap	19.2
Snapper Reel	0
Winch	13.8
Skin	0
Spear	20.7
Lace	20.7
SCUBA	19.2
Gaff	79.3
Basket	0

Traps accounted for slightly more than 45% of the gear reported in the landings data since 1996 as well, while diving, the second most commonly reported gear, was just under 30%. Triangulating ethnographic, census, and landings data confirms that traps and diving are two most common gear types in Naguabo, although their use varies through the year. Similarly, landings and ethnographic data tend to agree that, with this gear, Naguabo fishers target, first, lobster and conch, and second, pelagics such as sierra and deep water snapper and grouper species (commonly known as "first class fish"). When they dispose of conch shells, they place them with their openings downward, believing that the presence of many obviously emptied shells repels live conch. Fishers here also believe that the leaving the conch shells is good for the life of the reef, offering protective locations for juvenile species.

Marketing of fish in Naguabo is flexible, with the association playing a role in marketing without monopolizing the catch. Trucks from the municipality center of Naguabo, as well as San Juan, Caguas, Yabucoa, and Cayey, visit Húcares to buy their catch, and the fishers here also sell to the restaurants that line the waterfront. A second line of restaurants, opposite the beach on the southern end of the municipality, also purchase fish locally, although Punta Santiago, in Humacao, is closer to these establishments than Húcares. Still, fishers reported that tourists buy their seafood from these kiosks near the beach. Census data reveal that marketing in Naguabo is in fact quite varied, and that the association accounts for only about half of fishers' sales.

Table SE.5. Marketing Behaviors in Naguabo (n=29)

Marketing Behaviors	Percent Reporting
Fish dealer/ buyer	20.7
Association	51.7
Street vending	13.8
Restaurant	10.3
None	17.2
Sell fish gutted	13.8
Keep fish on ice	79.3

Source: Puerto Rican Census of Fishers, 2002

The apparent high levels of association membership combined with less than full use of the association as a market reflects some of the problems the association has been having. Despite the newly constructed facilities, the association has yet to utilize its resources fully. For example, although it has a diesel-powered generator, this has only been used once. Other equipment—freezers, fish processing equipment—likewise sits idle. One of the walls near the facility is considered poorly engineered and unsafe, and poor planning also resulted in too little parking for members who launch their boats from the ramp.

Exacerbating problems internal to the association are common external factors: contamination of marine resources, fish imports, problems with fish stocks, seasonal closures, size limits, and so forth. They expressed more dismay with seasonal closures than fishers elsewhere, suggesting they may be adversely affected by them; similarly, they believe that size limits are too strict. In as much as changing fish regulations cut into their incomes, they believe they should be compensated, either directly through subsidies or through tax breaks. This is doubly serious at the current time because they are feeling the bite of imported fish, some of which are fish that they are restricted from catching but that are being caught elsewhere, or by fishers from other countries, and then being sold here. They said that they had participated in studies of fish stocks, aiding the government, but that this information had been used against them at the very time the government was issuing permits for mangrove destruction for new construction.

As noted earlier, tourism is increasing in Naguabo, stimulating new construction along and near the coast. This has led to fresh water shortages for the mixing of cement. Fishers have noticed the clearing of mangroves and other forested areas and, from this, they perceive sedimentation that has been particularly damaging to coral reefs. They also list factories, naval vessels (including a submarine), and cargo ships among the polluters in the area. They see the decline in mangroves and the decline in coral reefs as going hand in hand. Nearly a quarter see pollution as a problem, and one in ten view habitat destruction a primary cause of declining fish stocks, with more citing overfishing. None in the census believed fish stocks were getting better, and slightly more than half believed they were now worse than previously.

Table SE.6. Opinions of Naguabo Fishers Regarding Fishery Resources (n=29)

Opinion	Percent Reporting
Status of Fishery Resources	
Better	0
The same	48.2
Worse	51.7
Reasons for problems in fisheries	
Pollution	24.1
Habitat Destruction	10.3
Overfishing	17.2
Laws, regulations, and licensing	3.4
Crowding	0
Seasonal factors	0

Source: Puerto Rican Census of Fishers, 2002

Summary

As Naguabo's only fishing community, Húcares has had its successes and failures in recent years, securing funds for new construction of association facilities yet still finding some components of these facilities inadequate to their needs. Their attention to the problems with mangroves and coral reefs, and their concern with fish stocks, demonstrates close and repeated interaction with the region's marine resources, an indication of fishing dependence. Equally important, they trace causal relationships between sedimentation and pollution, deteriorating water quality, and a changing species mix and abundance, recognizing the systemic dimension of local ecology.

Several other factors suggest a dependence of fishers in Húcares on fishing and the fishing way of life. They descend from boat-building and gear-building traditions and continue to use these skills today, supplementing them with purchased materials. They also report that they learned the trade from other family members and have been actively trying to reproduce the lifestyle by teaching the youth of the community. Unfortunately, they report that some youth in the community find it easier to migrate toward drug trafficking as fishing becomes less economically feasible.

Humacao

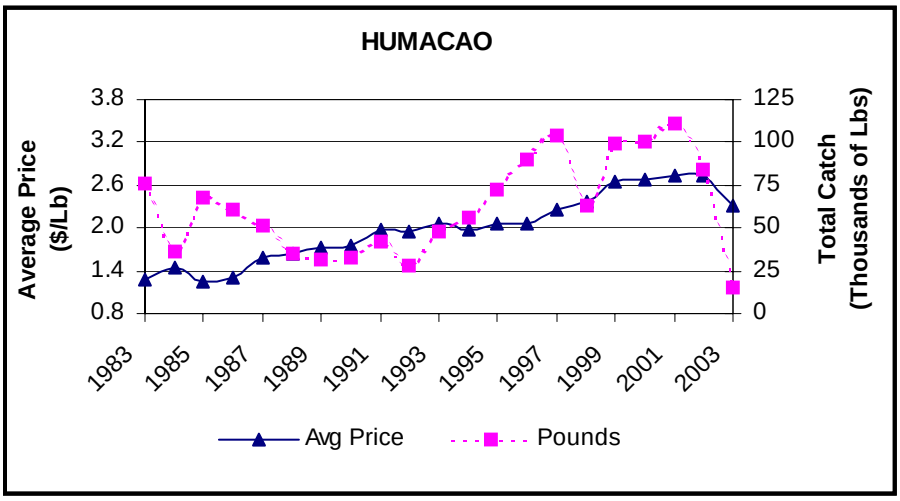
Probably best known for Palmas Del Mar, the residential and country club development on the municipality's southern coast, Humacao is also home to two significant fishing sites: Punta Santiago, a fishing community near its border with Naguabo that is important to the recreational, subsistence, and commercial fishing populations of the region; and the *Villa Pesquera Palmas Del Mar*. Inside the border of Palmas Del Mar, the *Villa* has been successful first in resisting displacement from the elaborate development surrounding them and second, as noted earlier, in taking advantage of the wealthy clientele that live in and visit the homes, golf courses, marinas, and other amenities of the gated complex. In this sense they are like La Guancha—a network-based community that has used its group membership to vertically integrate with tourism. Despite that it attracts residents from the condominiums and other luxury residences, the distinction between the commercial landing center and the gated complex is abruptly apparent as one passes by the convenience store serving the Palmas Marina and enters the fishing association's grounds: immediately the road changes from smooth, lined asphalt to rutted dirt.

Table SE.7. Humacao Census Data

HUMACAO	1950	1960	1970	1980	1990	2000
Population Characteristics						
Population [1]	34,853	33,381	36,023	46,134	55,203	59,035
Civilian Labor Force (CLF) [2]	9,190	7,748	8,753	12,300	18,144	17,345
CLF - Employed	8,753	7,164	8,241	10,559	14,559	14,115
CLF – Unemployed	437	584	512	1,741	3,585	3,230
Percent of unemployed persons	4.76	7.54	5.85	14.15	19.76	18.62
Industry of employed persons [3]						
Agriculture, forestry, fishing and mining [4]		2,272	878	238	332	118
Construction		580	1,368	804	1,319	1,501
Manufacturing		1,204	1,583	2,919	3,719	2,947
Retail trade		676	1,013	1,131	1,967	1,514
Socioeconomic Characteristics						
Mean travel time to work (minutes) [5]		N/A	N/A	23.7	20.7	25.0
Persons who work in area of residence [6]		5,784	5,691	6,706	10,584	8,853
Per capita Income (dollars) [7]			832	1,849	3,955	7,677
Median Household Income (dollars) [8]		814	2,153	4,650	8,930	14,345
Individuals below poverty level [9]			24,134	30,774	32,289	27,690
Percent of Individuals below poverty level			67.00	66.71	58.49	46.90

Humacao has a fairly large and bustling metropolitan area with considerable employment in manufacturing, construction, and retail trade. It also has a robust tourist sector with *Palmas* and two other beach areas—one a state-owned facility with inexpensive cabanas for rental. This economic profile is reflected in the above table, with somewhat lower levels of unemployment and poverty than one finds in most other coastal municipalities. Its fishery statistics, as indicated by the figure below, place it 14th out of the 41 reporting municipalities.

Figure SE.7. Humacao Landings Data, 1983-2003



Humacao History

Like Naguabo, the position of Humacao, at the doorway of most hurricanes that hit Puerto Rico, stalled large-scale settlement until the early 19th century. Its name derives from a Taino cacique named either Jumacao or Macao, whose people occupied the region when the early Spanish settlers arrived, in 1722. Also like Naguabo, these early settlers came primarily from the Canary Islands and established themselves in sufficient numbers that by the end of the 18th century, some time between 1780 and 1794 (historians are unclear exactly when), they achieved the political designation *pueblo* (small town). Slightly more inhabitants were here in the early 19th century than in Naguabo, 4,713, of whom 415 were slaves (Toro Sugrañes 1995: 197). In 1828 they received the title of "district," which had military and administrative implications, signaling a tighter tie to the central locations of empire. By the end of the 19th century they were growing more rapidly than the other municipalities in the region; by 1898, Humacao's political power extended all up and down the east coast and over some of the south coast of Puerto Rico, from Fajardo to Salinas. During this early period, residents supplemented sugar and livestock production with tobacco, which grew well in Humacao's river valleys.

During this century Humacao has continued to grow, suffering one major setback in 1956, when Hurricane Santa Clara devastated much of the municipality, including many residents houses, bridges, and roads. By 1962, however, it was growing again, with a regional college on the edge of the capitol city becoming affiliated with the University of Puerto Rico system. By the 1990s, with some 38 factories and a diverse economic base, it had become the 12th largest municipality in Puerto Rico.

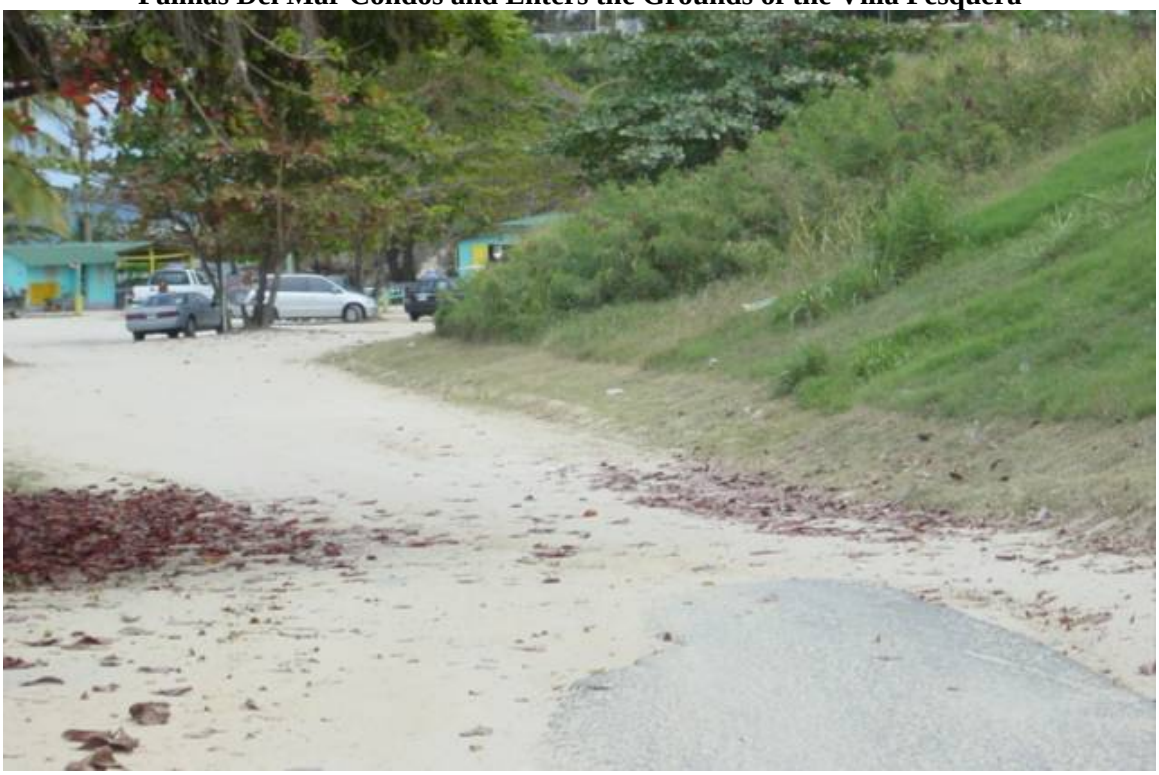
Fishing from Humacao

Villa Pesquera Palmas Del Mar

In the opening paragraph of this segment, we were careful not to call this *Villa* a fishing community. While it is one of the more significant sites of Puerto Rican fishing, the *Villa* is a landing center surrounded by one of the most developed gated communities in Eastern Puerto Rico. It sits at the southern end of the municipality's coast, near the border with Yabucoa, and the fishers here share many of the same opinions and problems with their neighbors to the south. The gated community has a golf course, a marina, an equestrian center, a nature reserve, a supermarket, 26 restaurants, 2 hotels, 42 "communities" (the gated within the gated), a country club, a racquet and fitness club, and a private

security force. Signs on the *autopista* running north-south along Puerto Rico's east coast advertise Palmas, and a long, nicely paved lane dotted here and there with professional landscaping leads from the highway to a guard station where visitors check in. People visiting the fishing association are given a pass, a map, and directed to the association's facilities. Signs deep inside the compound pointed to a marina and a Fishing Village (in English), but, as noted earlier, the nice pavement ended just before the Villa Pesquera de Palmas Del Mar:

Figure SE.8. Pavement Becoming Sand & Dirt Road as One Leaves Palmas Del Mar Condos and Enters the Grounds of the Villa Pesquera



Nevertheless, it is a testament to the power of the Villa that it has survived development on such a massive scale. Indeed, it not only survives, it has taken advantage of the residents, both permanent and seasonal/ tourist, to serve in its restaurant. Some of the families who eat there arrive in golf carts and speak only English. (It is common, of course, for people in communities of this type to own their own golf carts for both golf and transportation around the grounds; Palmas literature that they distribute at the main gate and elsewhere around the compound advertise golf cart sales). In the brochure advertising Palmas they list 25 restaurants; the Villa Pesquera's isn't named, nor is it mentioned elsewhere in the brochure. Yet it survives and perhaps even flourishes from some of the wealthy traffic.

The restaurant facilities are more extensive than most other Villas Pesqueras, with outdoor seating for upwards of 50 people, a full kitchen, and display cases that are maintained with a discriminating clientele in mind. They do a brisk lunch business as well as sell fresh fish. The fishers' lockers and other equipment extend from the back of the restaurant.

Figure SE.9. Seafood/Empanadilla Counter in Villa Pesquera de Palmas Del Mar

People interviewed at the Villa reported a membership of 30 fishers, who fish mostly with fish traps, lines, and SCUBA equipment. Recent landings data (2000- 2003) for Humacao confirm this, with 47.5% of landings caught with fish pots, 36% with bottom lines, and 13.2% by SCUBA diving. Census data show similar gear types, which they use to target lobster, yellowtail snapper, grunts, mackerel, and box fishes. The fishers' vessels, like others of the west coast, are larger than the yolas of the west, more like 25 feet than 18, and wider, as the pictures below depict.

Figure SE.10. Commercial Vessels at Villa Pesquera Palmas Del Mar (see condos in background)

Figure SE.11. Traps at Villa Pesquera Palmas del Mar

Figure SE.12. Lockers at Villa Pesquera Palmas del Mar

Clearly they have a ready customer base for the association's seafood sales, and 70% who answered the census reported that they sold to the association. Another advantage to occupying this space is, like La Guancha in Ponce, it is a sheltered location for their vessels, the inlet stabilized with a jetty, and other infrastructure (e.g. diesel sales) that will are unlikely to close or fall into disrepair because of the marina traffic. The marina itself, which adjoins the Villa's grounds, is upscale, with yachts and some fishing vessels that may be recreational fishers, but more commonly the kind used by deep water sport fishermen who fish for the big game fish (marlin, swordfish, etc.). The marina has a store like a convenience store attached to it, and plenty of parking. They also have a dry dock storage facility.

Figure SE.13. Sign at Villa Pesquera de Palmas del Mar Advertising in English & Spanish

Figure SE.14. Marina Adjacent to Palmas *Villa Pesquera*

We discuss the problems voiced by Palmas del Mar fishers in more detail in the section on Yabucoa, which adjoins Humacao to the south. At the association in Yabucoa, La Puntita, we held two group interviews (impromptu focus groups); at one was the president of the *Villa Pesquera Palmas Del Mar*. Here, between discussions of the two significant sites, we present census data on Humacao, including their views of the islands' fishery resources.

Table SE.8. Fishing Locations and Styles, Humacao (n= 50)

Variable	Percent
Shore	10
Continental Shelf	86
Shelf Edge	12
Oceanic	42
Reef Fishes	90
SCUBA Diving	18
Skin Diving	10
bPelagic	44
Bait	78
Deep Water Snappers	42

Source: Puerto Rican Census of Fishers, 2002
Totals do not add up to 100% because fishers typically fish multiple locations

Table SE.9. Selected Humacao Fisher Characteristics

Variable	Response
Association Member	92
Hours used for Fishing	
< 20 hours	4
20 – 30 hours	22
31 – 39 hours	16
40 hours	54
> 40 hours	4
Mean hours	35.42
Standard Deviation	7.877
Minimum hours	6
Maximum hours	48

Source: Puerto Rican Census of Fishers, 2002

Table SE.10. Gear Used by Humacao Fishers

Variable	Percent
Beach Seine	18
Trammel Net	18
Long Line	18
Troll Line	62
Fish Trap	72
Gill Net	36
Cast Net	80
Hand Line	92
Rod and Reel	14
Lobster trap	0
Snapper Reel	10
Winch	10
Skin	0
Spear	22
Lace	22
SCUBA	18
Gaff	78
Basket	2

Table SE.11. Marketing Behaviors of Humacao Fishers

Marketing Behaviors	Percent Reporting
Fish dealer/ buyer	6
Private	0
Association	70
Street vending	24
Restaurant	6
None	34
Sell fish gutted	6
Keep fish on ice	64

Source: Puerto Rican Census of Fishers, 2002

Table SE.12. Opinions of Humacao Fishers Regarding Fishery Resources

Opinion	Percent reporting
Status of Fishery Resources	
Better	2
The same	80
Worse	18
Reasons for problems in fisheries	
Pollution	10
Habitat Destruction	8
Overfishing	4
Laws, regulations, and licensing	0
Crowding	2
Seasonal factors	2

Punta Santiago

Situated within a stone's throw of the border between Humacao and Naguabo, on the northernmost section of Humacao's coast, Punta Santiago was the site of a short ethnographic study in the mid-1980s (Cruz Torres 1985). The title, *La Comunidad Pesquera de Punta Santiago*, accurately designates the town as a fishing community, a designation that continues to the present. Residents of Punta Santiago enjoy not only the presence of a viable *Villa Pesquera*, but across from the Punta Santiago post office a recreational pier stretches away from the grounds *Villa*, the end point of a string of boats tied to informal landing centers extending from near the Playa Punta Santiago (just north of town) to the municipal pier. The pier itself looks like it was quite an investment of public funds, from which recreational/ subsistence fishers land several species of fish. Those interviewed reported catching shark and mutton snapper. The photographs below depict the community's varied fishing infrastructure.

Figure SE.15. "Pescadería Geño" — Informal Landing Center Near Playa Punta Santiago (see Caya Santiago in the background)

Figure SE.16. Muelle at Punta Santiago (man in center well is netting bait with *atarraya*)

The first time we visited Punta Santiago, two men were working at the *Villa Pesquera de Punta Santiago*. One, the association president, said there were 20 members, and at the time of our visit he and the other man working with him were engaged in two tasks: packaging ballyhoo for bait and cutting up small *sierra*, which he said they sold as food. They catch them with nets, he said, and some of the big nets were scattered around the grounds, but there were traps there as well, and census and landings data both suggest that traps continue to be the most important gear in Punta Santiago. This was true when Cruz Torres conducted her research here in the early 1980s. "In this community the fishers utilize mainly the trap as fishing gear," she wrote. "They also utilize lines (*el cordel*), beach seines (*chinchorro*), cast nets (*atarraya*), and one fisher devotes his time to fishing by diving" (1985: 4). Since her study, diving has increased in importance in Punta Santiago, as across the islands, while traps and lines remain important.

Cruz Torres also reported that slightly under half of the fishers she interviewed in the mid-1980s engaged in other economic pursuits to supplement fishing incomes, including agriculture, boat-building, and

construction and mechanic work. Others had worked in the past, mostly in agriculture. Half were born into fishing families, and the majority characterized fishing as a labor of love that nevertheless required hard work, sacrifice, and the ability to take risks. Those fishers who did take risks were perceived by others to be the more successful fishers.

Figure SE.17. Villa Pesquera Punta Santiago (barely visible, at the point of the boat on the right, is an altar to the Virgen del Carmen)

Figure SE.18. Fishing and Recreational Boats Stored at Villa Pesquera Punta Santiago

Again, like Húcares, Playa Santiago is a fishing community with multiple attachments to the sea. It includes a long, narrow neighborhood where many of the houses have some involvement with marine resources, including providing bait and other services to recreational fishers (both those who use the municipal pier and those who are sportfishers). One individual, for example, advertises *jueyes* (land crabs) among sales of a variety of fish and seafood products, including bait, and has his own boat in his yard. The fishing association packages ballyhoo for big game fish, and they also allow some sport and recreational vessels to use their facilities in some capacity, including storage.

Figure SE.19. Yard in Punta Santiago, Advertising Fishery and Other Products

Figure SE.20. Ballyhoo Being Processed, Villa Pesquera Punta Santiago

A sign on the fence of the association advertises romantic cruises on Friday and Saturday nights that leave from the pier, indicating other kinds of ties to the community. On weekend, the beaches to either side of the pier are crowded with bathers and people selling pinchos, pina coladas, empanadillas, etc. Jet skis ply the waters near shore. The Villa Pesquera operates a small restaurant that sells seafood empanadillas and beers to people visiting the beach and to association membership. When Cruz Torres was conducting her

research, the association had just been founded and was getting off to a rocky start. Fishers founded the association in response to increasing seafood demand, in part stimulated by the growing tourist traffic to the community's beaches. The original facilities were located in an old school and only 10 of the 19 fishers she interviewed belonged to the association. At the time, at the top of their list of problems was a lack of help from the government, followed by contamination of the resource from factory production, poor port facilities, and a lack of freezers (1985: 4-5). Combined with the small vessels they were operating at the time, these problems constrained their fishing activities to daily excursions in the waters between Yabucoa and Vieques.

Figure SE.21. Recreational Fishers at Punta Santiago Municipal Pier, Sunday, Father's Day, 2005

There are at least four upscale seafood restaurants in the town, along main street, and about twice that many smaller places selling fish dinners and seafood empanadillas. At one of these I asked the owner where he bought his fish, and he said the local *pescadería/ Villa Pesquera.* In addition to the association, there are other seafood markets in the town as well. The local hardware store sells fishing equipment along with its other hardware. All of these features indicate a fishing-dependent community. In addition to the 20 or so members of the association, at least another ten families depend on the fisheries to serve their restaurants and many use the pier and recreationally/ subsistence fish on a daily basis. The evident improvement and public investment in fishing infrastructure since Cruz Torres's ethnographic account suggests that the state has recognized fishing's importance to the community.

Yabucoa

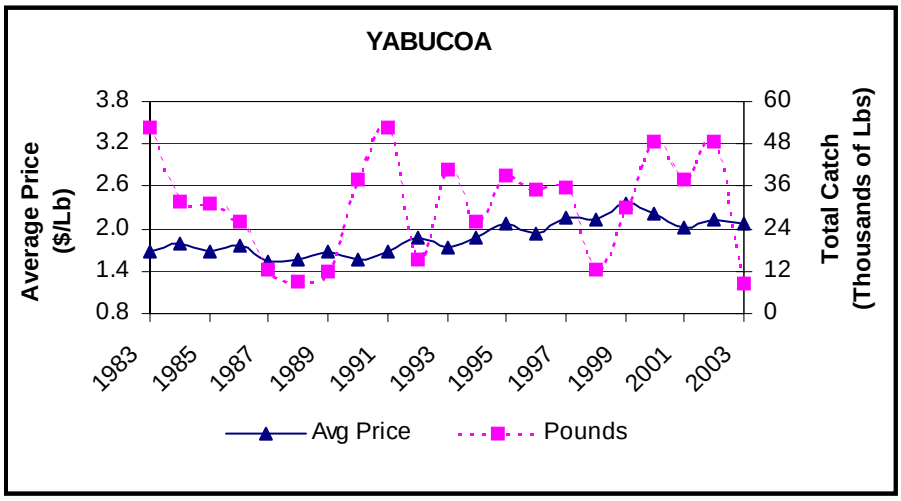
Over the years, the commercial traffic in and out of Puerto Yabucoa has created the ruins of warehouse and milling facilities along with working refinery ports that have benefited local recreational/ subsistence fishers while creating some problems for the associated commercial fishers of La Puntita, Yabucoa's *Villa Pesquera.* The municipality is blessed with two large beaches and several smaller access points where fishing takes place on a regular basis; near one of the beaches is a quiet, nice, but fairly isolated parador called Palmas de Lucia, and near this stand what appear to be abandoned facilities of a former *Villa Pesquera*.

Table SE.13. Yabucoa Census Data

YABUCOA	1950	1960	1970	1980	1990	2000
Population Characteristics						
Population [1]	28,810	29,782	30,165	31,425	36,483	39,246
Civilian Labor Force (CLF) [2]	7,109	5,652	5,227	6,816	10,455	9,498
CLF – Employed	7,006	5,444	4,999	5,493	7,980	7,242
CLF - Unemployed	103	208	228	1,323	2,475	2,256
Percent of unemployed persons	1.45	3.68	4.36	19.41	23.67	23.75
Industry of employed persons [3]						
Agriculture, forestry, fishing and mining [4]		3,036	828	287	333	178
Construction		224	1,219	230	691	749
Manufacturing		644	947	2,000	2,393	1,749
Retail trade		464	475	577	970	583
Socioeconomic Characteristics						
Mean travel time to work (minutes) [5]		N/A	N/A	23.4	25.8	29.2
Persons who work in area of residence [6]		4,680	3,661	3,230	4,668	2,777
Per capita Income (dollars) [7]			496	1,420	3,045	6,125
Median Household Income (dollars) [8]		506	1,341	4,136	7,808	12,292
Individuals below poverty level [9]			26,500	22,957	24,381	21,325
Percent of Individuals below poverty level			87.85	73.05	66.83	54.34

Yabucoa's economic profile is more or less in line with other coastal municipalities: high rates of unemployment and poverty, long average commute times to work, with declining industrial sectors in all but construction. Against this background, Yabucoa's fishers provide an important source of income, despite that it ranks only 25th in the landings data.

Figure SE.22. Yabucoa Landings Data



The current commercial fishers of Yabucoa are among the most politically engaged in Puerto Rico and genuinely interested in addressing the problems they perceive with new fisheries regulations; their leaders routinely meet with politicians and officials in the Department of Agriculture, and attend public hearings about the islands' fisheries. They are politically aligned with members of the *Villa Pesquera Palmas del Mar*, possibly in part because their facilities are close to one another: Palmas sits near the southern border of Humacao, north of Yabucoa, and La Puntita sits near the northern border of Yabucoa, south of Humacao. Like other east coast fishers, they have access to some of the most productive waters of Puerto Rico, yet the proximity of the south coast also opens up other territorial alternatives to them.

Yabucoa History

Though part of the dominion of Güaraca, a Taino cacique, Spanish intrusion into Yabucoa occurred even later than in other southeastern municipalities. Not until 1793 was Yabucoa founded, and because its original city was situated in a river valley prone to flooding, Yabucoa didn't begin to increase in size until the 19th century. In 1828 there were under 5,000 inhabitants, and over the next seventy years this did not even triple in size (Toro Sugrañes 1995: 423).

"Yabucoa always has been know for its great production of all types of livestock," writes Toro Sugrañes (ibid.). "Also it has good fishing from Guyanés Beach [where the current fishing association is located]." That Toro Sugrañes mentions fishing in his capsule history of Yabucoa is important, in that his coverage of municipality histories is relatively brief.

Added to this economic mix was tobacco, which was important in Yabucoa from the 1920s to the 1950s, and, more importantly, sugar. Sugar milling and refining lasted longer in Yabucoa than in other municipalities, and its importance is still recognized in an annual Festival of the Cane. It still had a refinery when Toro Sugrañes was writing in the 1990s, although at that time the petroleum industry had begun to establish a foothold in the area. The port of Yabucoa became an important port for importing petroleum for Sun Oil and later Shell refineries, which persist today.

Tourism has not been a major force historically in the municipality, although its beaches and its guesthouses are becoming increasingly popular today.

Fishing from Yabucoa

Blessed with a number of recreational fishing sites as well as a politically active fishing association aligned with the fishers of Humacao, Yabucoa's fishing profile is varied and complex. Below we describe one recreational fishing location that has developed from the ruins of abandoned shipping infrastructure yet which takes advantage of the fact that a working port maintains the canal where people fish. Reliance on both old and new, abandoned and functioning infrastructure, reflects the status of recreational and subsistence fishing in Puerto Rico as an activity that takes place in the interstices of outdoor life, with gradients from professional sportfishing to the casual recreational fishing with the beer can portrayed in the history section above (Griffith, et al. 1988).

Recreational Fishing Site

This area is an ex-shipping/ loading center with large abandoned warehouse-like buildings and a conglomeration of chutes and storage bins that resemble a feed mill. It might have been an old facility for processing and/or loading agricultural produce, such as sugar or bananas, both of which grow here (now in reduced quantities than formerly). Surrounded by a chain link fence, it is nevertheless open and the guard station is unmanned. The fence and guard station are overgrown with vines. Recreational fishers fish all along the bulkhead where, in earlier times, large vessels moored. Across the water was the kind of vessel we imagine used to tie up here: ocean-going barges, as in the following photo:

Figure SE.23. Barge Anchored across from Recreational Fishing Site, Yabucoa

The barge across the channel was docked at a Shell Oil refinery that is still in operation and that takes up most of the rest of the area. Across the road from the abandoned area is a dirty beach that may be used by drug users or dealers and such, as its garbage heaps contain needles and other drug paraphernalia, and it is fairly isolated, down a road leading into the ocean. Brief interviews with recreational fishers at this site revealed that they caught "todo" (everything) here, including *tiburón*. Those we observed used shrimp for bait and fished with multiple poles.

Figure SE.24. End of the Bulkead from which Recreational Fishers Fish (notice the refinery tanks in the background and the mooring for ships in the foreground)

Abandoned Villa Pesquera

Not only have the agricultural loading companies abandoned their infrastructure, the two photos taken near the Parador Palma de Lucia show that fishers too seem to have abandoned their facilities. The juxtaposition of these two cases of abandonment certainly must carry some symbolic weight in changes taking place along these coastlines. Not only small-scale fishing activities but also large corporate firms have been driven from production, dilemmas for both moral economies and capitalist systems.

This part of the coast has been gentrified for some time, with several places catering to both seasonal home buyers and tourists. There is a great deal of construction going on, yet there are far fewer of the roadside food stands that Griffith and Valdes Pizzini reported some years ago (2002). Most have been replaced, or displaced, by seafood restaurants.

Figure SE.25. Abandoned Villa Pesquera, Yabucoa

Figure SE.26. Abandoned Pescadería in Villa Pesquera, Yabucoa

La Puntita: Functioning Yabucoa Villa Pesquera

This facility is off highway 906, between Playa de Guayanes and Punta Guayanes, just around the point, south, from Palmas del Mar in Humacao. It is a functioning association, with a pescadería and a muelle

along with several fishing boats and new traps. On our first visit the seas were rough, with westerly winds blowing hard towards the shore, and there was little activity. Several boats were moored there. One man was fishing recreationally from the shore near the facility, but otherwise there were only four men socializing under a small tent.

Figure SE.27. La Puntita (The Little Point) Fishing Association

Figure SE.28. Recreational Fisher Checking His Bait Traps from the Pier at La Puntita

Figure SE.29. Yolas at La Puntita

Figure SE.30. Fish Traps at La Puntita

On our second visit we were much luckier in terms of interviews, conducting an impromptu focus group with the Association President, the Treasurer, an outspoken member, and two other fishers, one elderly and one around 50, the latter carrying a clipboard. They reported that this is the only Villa Pesquera in Yabucoa, and they have 18 members. From the gear scattered around, they looked like primarily line and trap fishers, which we later confirmed was the case. The Villa does have a pescaderia, however, lockers, a pier, and other facilities. It also handles fishers' Social Security records and other benefits and is run,

they reported, by three people: a president, a treasurer, and a third (possibly a secretary). The association also has a restaurant that is run by family of the membership and which competes with others in Yabucoa: in particular, the scenic coastal road between Yabucoa and Maunabo has at least four upscale seafood restaurants that overlook the sea. Our experience at this association, with the second and third visits, was remarkable enough to describe it in detail. Griffith visited by himself the first and second times, returning on a third visit with Carlos Garcia Quijano for more in-depth interviewing. Griffith's field notes record the meeting as follows:

"When I first arrived and told them I was writing a report about Puerto Rican fishers, and that I was working with Sea Grant and with NOAA, Geño (pseudonym) said, 'We've been waiting for you,' and led me to a shaded table where the others gathered around. He slapped a copy of Ley 278 and the DRNA Regulations down in front of me and, indicating first the regulations and then the law, he said, "We've been trying to get these [the regulations] changed for 10 years, but first we have to change this [the law]." Evidently the latter gives authority to the former.

Geño and the others believe that NOAA seems to be trying to turn the entire island of Puerto Rico into an "aquarium"—that is, a sanctuary. They have had problems most immediately with the vedas, because there are so many of them: he said for sama, for sierra, for jueyes, etc. This results, said the treasurer, in "Reduce salario…" (Reducing pay).

Geño said, however, that "Cada pescador tiene una problema diferente." (Each fisherman has a different problem), although they were in agreement on a few issues:

- *Like fishers in Naguabo, they said that if the government wanted to close the fisheries for a few weeks, they should compensate them for the loss of income. The catch to this plan, he said, was that "instead of 18 bona fide fishermen, there would be 100 here saying they were fishermen."*
- *They believe that NOAA gave $50,000,000 to the government of Puerto Rico to make the entire island a sanctuary. They prefaced this statement with, "The problem is, NOAA is rich and the fishermen are poor." The Puerto Rican government is supposed to be distributing the 50 million to fishermen, but they haven't seen a penny. They said that not too many people know about this, and that the government wants to keep it quiet, suggesting that it is a conspiracy.*[15]
- *They agreed that Dr. Martin, the head of the association at Palmas del Mar, has written a very good proposal to deal with the regulations.*
- *Japanese long-liners off the coast of Puerto Rico, in international waters, are taking a greater share of the catch than they (the Puerto Rican fishers) can. Puerto Rican fishers have to leave every morning at 3:00 am and return by 12:00 noon, because if they get caught out at sea in one of those little 18' foot boats, it's dangerous.*
- *The lanchas from the Shell refinery, just down the coast, cause problems when they pass, cutting lines, spilling oil, etc. There was recently a huge fish kill in one of the rivers that the government wanted to keep quiet: they believe it was related to the refinery.*
- *Licenses can be a problem: almost none of the older fishermen have the kinds of information (or plans) that they need for licenses.*

They are actively involved in the political process. Geño himself went to the president of the senate, a man named Javier Vizcarrando Colondrió, and he had his card stapled to the law 278. In addition, he's on a "junta," a group that has been trying to change the law, and he is attending a meeting this coming Friday to solicit aid in their struggle from the Department of Agriculture.

[15] It should be noted that conspiracy theories are common among fishers and others who believe that they are being marginalized or forced out of existence, such as small farmers. Griffith (1999) extended discussion of conspiracy theories among Mid-Atlantic coast fishers offers some explanation for this.

Across the bay there is a large building that he said was a fish hatchery. They are involved in that as well as in a project to protect the mangroves. They have worked closely with Walter Padilla and others at the Department of Agriculture. They had a list of all the Villas Pesqueras in Puerto Rico, some of them highlighted in yellow, that Padilla had produced for them, and they described Padilla as "pro-pescador" (for the fishers)" (Griffith's field notes, June, 2005).

On the following visit to La Puntita we were able to flesh out some of the above themes as well as address others. Again, this was a focus group, although this time it included different members of the association as well as a high ranking official in the Villa Pesquera Palmas Del Mar. Again, Griffith's field notes record the focus group in detail:

"Carlos & I spent a wonderful three to four hours at this Villa Pesquera, *where when we arrived several fishermen and a teenager were munching on a communal plate of fried fish: sierra, mostly, their most prized species, and a smaller whitefish, possibly snapper. They offered us some. The communal spirit of this initial impression was typical of the entire day, with many fishers coming and going, ordering drinks, sharing ideas, and sharing more plates of fried fish, empanadillas, and the like. A woman cooked, and another teenaged boy assisted her; later they said she was a full-fledged fisher herself, with a commercial license.*

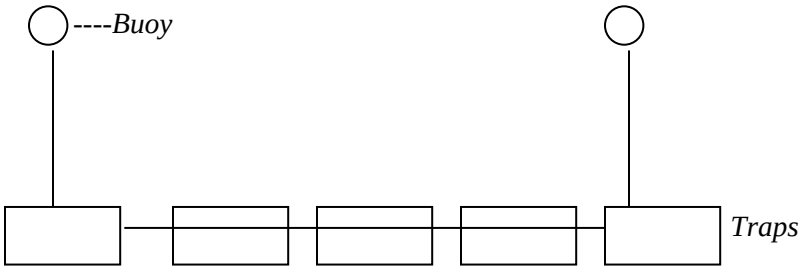
Today, like the other day, became an impromptu focus group, with primarily two fishers and eventually three. The president was there, but joined and left the group from time to time, tending to the pescadería when there were customers and replenishing the fish supplies at the restaurant. The restaurant has but three tables—long as picnic tables, with seating for around six at each.

Several important themes emerged again and again:

- Conocimiento: *Fishers' knowledge. They kept contrasting the knowledge of "the field"* (el campo)*—by which they meant experiential knowledge from fishing—to the knowledge of the biologists and the DRNA people. [This use of the word "field," as in field knowledge, is interesting in light of what we are doing as anthropologists, and it resonates with sentiments of fishers in Rincón, who suggested that one needed to get out into the field to understand what was going on—that you couldn't just look at the landings data and extrapolate from that… As important, field knowledge implied superior knowledge based on repeated, daily, lifetime observations, similar to anthropological fieldwork that tends to be longer than sociological or economic field work and based on direct observation.]*
- *The market. Following from what they said above, they said that they knew where the fish were and they knew how to catch fish,* "pero el problema numero uno es para vender su producto." *From here they launched into a protracted and reoccurring discussion of the market, which is plagued by two main problems: imports, and the problem of sport & part-time fishers dumping their fish on the market to cover their trip expenses. The number one species here is* sierra *(kingfish), and they sell imported* sierra *in the supermarkets for 79 cents per pound, while they charge $2.00 for the fresh stuff. [Interestingly, when I checked the landings data, sierra wasn't the most frequently landed species, which must mean it's important in another sense]. This fish is central to Puerto Rican diets: it is the one you find at almost all kiosks. They propose that the big supermarkets not be allowed to sell sierra during the big catching months of April to August.*
- *Department of Agriculture programs, etc. should apply to them as well as to the farmers. It's easy for a farmer to reckon the value of his holdings in land and number of, say, planted plantain trees; not so for a fisherman.*

These were the reoccurring themes of the interviews. They also discussed, of course, the dynamics of their work and other problems. They are mainly trap fishermen, but they have been experiencing problems with boats cutting their buoys and have to assess the risk and problems associated with different trap setting protocols:

Figure SE.31. Five Fish Traps Tied Together Marked by Two Buoys



This was the one he drew for us, which is a number of traps strung together and bound with two buoys. If a boat cuts one buoy, at least they have the other, but this still makes checking the traps more labor intensive. It's best to have one buoy per trap, but that means that you lose your trap when they are cut. They described the traffic from Palmas del Mar as going every which way when they leave the marina. When they lose the pot, they also lose the catch, which is almost as bad as the trap itself. The trap also becomes a ghost trap.

Figure SE.32. Fisherman's Locker at Yabucoa

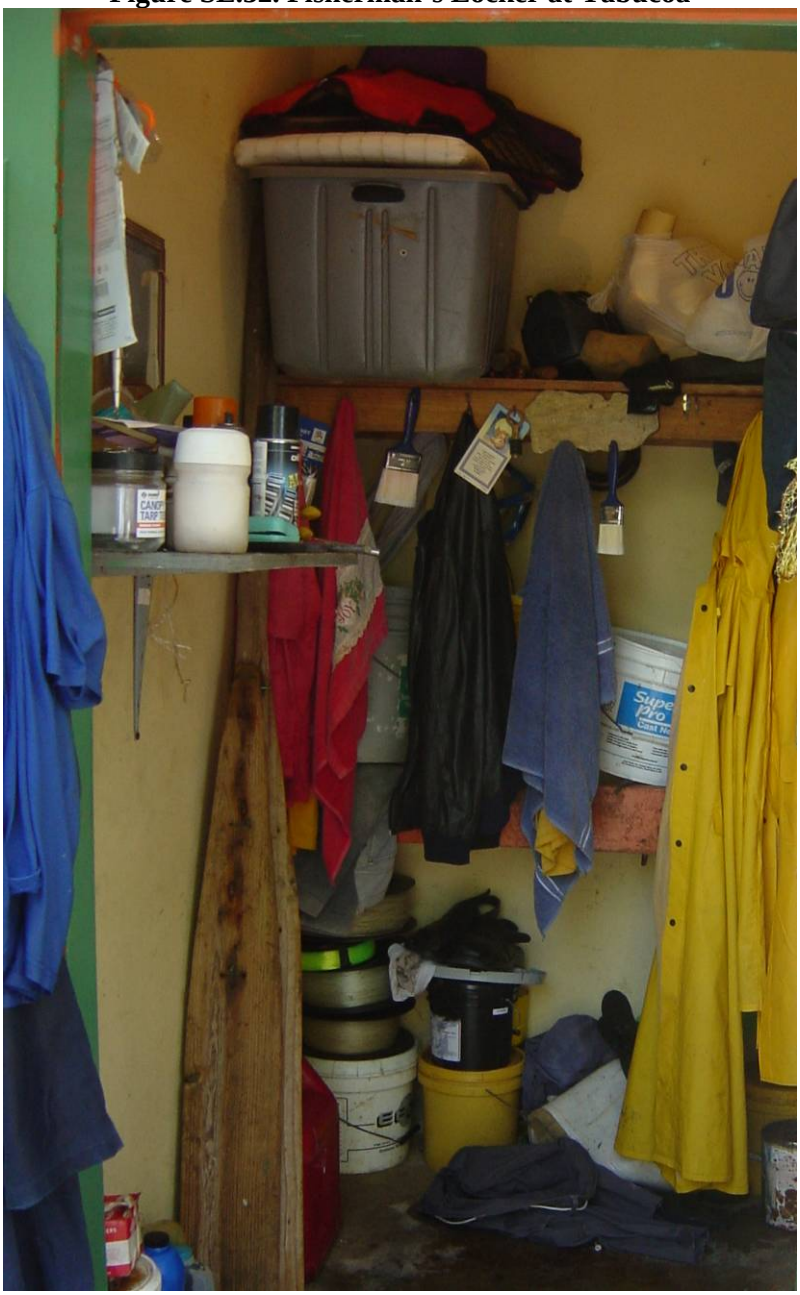


Figure SE.33. Plastic Trap at Yabucoa Association

In addition to traps, they use the cordel *(long line), which is necessary to catch what they consider their most important fish: sierra. Despite that they love sierra, they certainly have been experimenting with various trap designs. The above figure shows a plastic trap, but they spoke of traps of* madera *(wood) and have begun to experiment with crates for carrying chicks as traps (see photo). The president of the association from Palmas, wearing a yellow shirt embroidered with "Fishing Village, Palmas Del Mar," over the heart, was there as Yabucoa fishers explained the problems that trap fishers had. This Palmas president said earlier, "Soy buzo," (I'm a diver), and Yabucoa fishers began talking about the problems between divers and trap fishers, saying that it was one of their most pressing problems. He did qualify this with the statement that "not all" divers were thieves, but throughout this critique the diver remained very silent. Despite that he dives and these guys are trap fishers, they are obviously good friends.*

The diver's principal concern was not traps so much as the contradictions between NOAA regulations and Puerto Rican regulations, as well as licensing. They have to have special licenses, like duck stamps, for several species: sierra, langosta, carrucho, etc. Each of these costs around $10 - $15. A more pressing issue was the issuing of "beginners licenses" to experienced fishers, because their tax forms weren't available.

Figure SE.34. Traps at Yabucoa Association (the orange one is a prototype of a trap made from chicken cages)

Giving a highly experienced commercial fisher a beginner's license is insulting to them, but then they have to show their tax records for around five years before they work up to an intermediate and then advanced license.

*They said that Camuy fishers just received $1,000,000 for new facilities from the government, and that they developed a cheap ($300) winch (*malacate*) that they are using now. Dr. Martin, in Humacao, developed a crystal fish that attracted snapper like nothing else; for awhile he was able to corner the market, but now other fishers are using it. Hence, they are always innovating. As we were sitting around, the fishers began making rigs with hooks and lines. These weren't* palengres *(multi-hook long-lines), but single hooks dangling from single lines, for deep water fishing rather than trolling. Despite that they only mentioned traps, diving (Palmas fisher), and* la cordel *(trolling lines), obviously they fish for snapper and other demersal species with these lines" (Griffith's field notes, June, 2005).*

Figure SE.35. Fisher Locker, Showing Motors and Equipment, La Puntita, Yabucoa

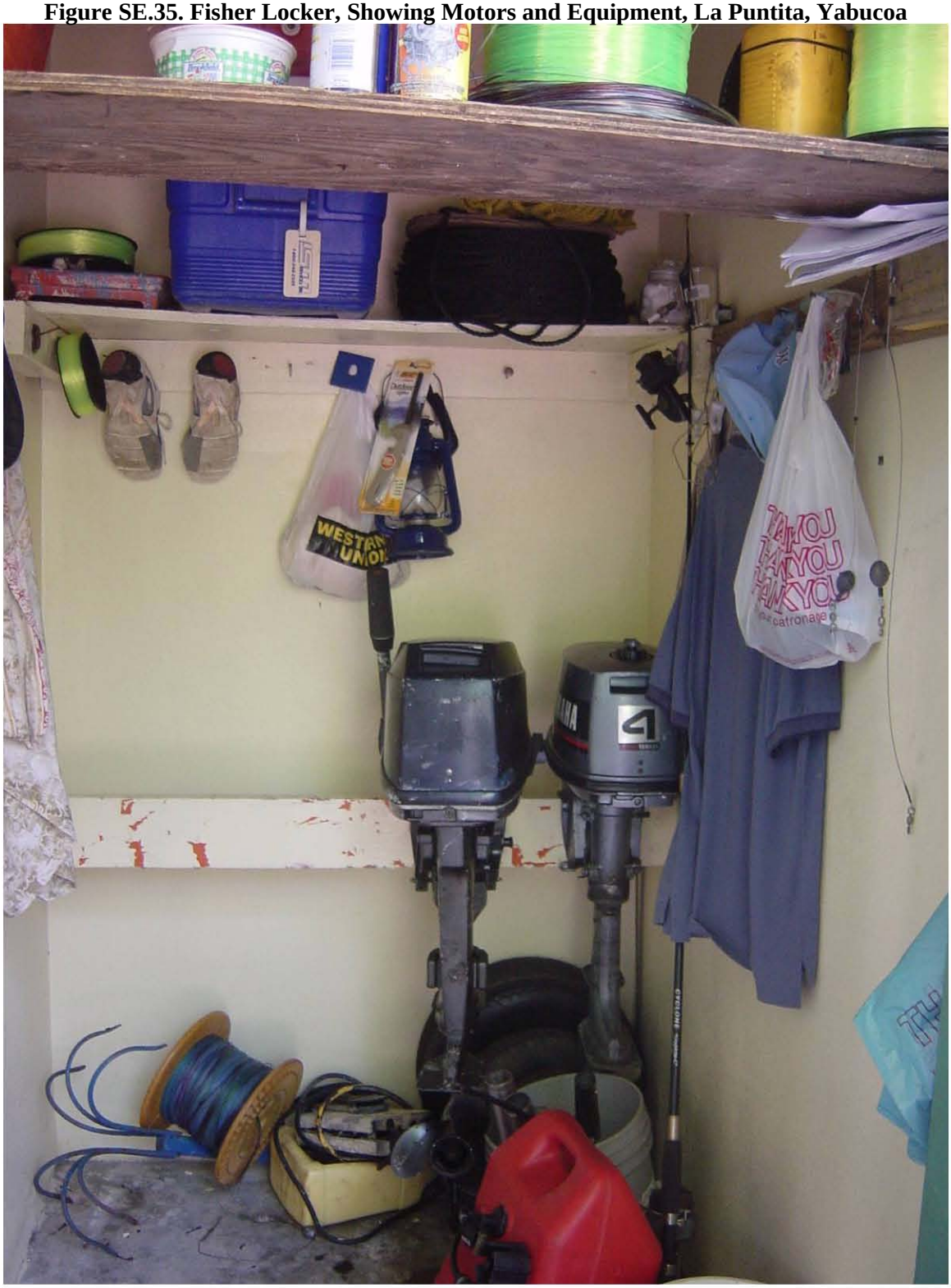


Figure SE.36. Some of Today's Catch, La Puntita

Figure SE.37. Frozen Fish (mostly *sierra*), La Puntita

Yabucoa Census Data

Table SE.14. Fishing Locations and Styles, Yabucoa (n= 12)

Variable	Percent
Shore	25
Continental Shelf	83.3
Shelf Edge	16.7
Oceanic	66.7
Reef Fishes	91.7
SCUBA Diving	0
Skin Diving	16.7
Pelagic	75
Bait	83.3
Deep Water Snappers	66.7

Source: Puerto Rican Census of Fishers, 2002
Totals do not add up to 100% because fishers typically fish multiple locations

Table SE.15. Selected Yabucoa Fisher Characteristics

Variable	Response
Association Member	83.3
Hours used for Fishing	
< 20 hours	16.7
20 – 30 hours	50
31 – 39 hours	16.7
40 hours	16.7
> 40 hours	0
Mean hours	26.5
Standard Deviation	10.959
Minimum hours	6
Maximum hours	40

Source: Puerto Rican Census of Fishers, 2002

Table SE.16. Gear Used by Yabucoa Fishers

Variable	Percent
Beach Seine	8.3
Trammel Net	25
Long Line	8.3
Troll Line	66.7
Fish Trap	25
Gill Net	25
Cast Net	75
Hand Line	75
Rod and Reel	25
Lobster trap	0
Snapper Reel	16.7
Winch	8.3
Skin	0
Spear	0
Lace	8.3
SCUBA	0
Gaff	75
Basket	0

Table SE.17. Marketing Behaviors of Yabucoa Fishers

Marketing Behaviors	Percent Reporting
Fish dealer/ buyer	0
Private	8.3
Association	83.3
Street vending	8.3
Restaurant	0
None	16.7
Sell fish gutted	33.3
Keep fish on ice	75

Source: Puerto Rican Census of Fishers, 2002

Table SE.18. Opinions of Yabucoa Fishers

Opinion	Percent reporting
Status of Fishery Resources	
Better	0
The same	25
Worse	50
Reasons for problems in fisheries	
Pollution	33.3
Habitat Destruction	8.3
Overfishing	8.3
Laws, regulations, and licensing	0
Crowding	0
Seasonal factors	8.3

Summary

Several points emerge from these focus groups, with what was not listed as a concern as important as what was. For example, during all the time spent criticizing regulations, the only reference to MPAs was the assertion, couched in conspiracy theory, that NOAA wanted to make a sanctuary out of all Puerto Rican waters. Instead, the fishers of Yabucoa and Humacao listed licensing problems and the importance of fishers' knowledge of marine resources.

Maunabo

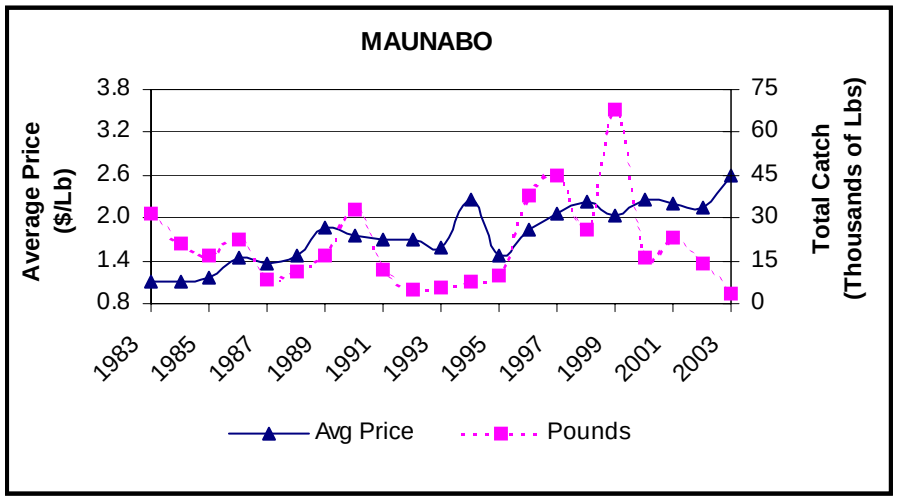
Maunabo is one of those municipalities where our ethnographic work yielded little information. Repeated visits to the fishing association at Punta Tuna, just outside the principal city, resulted in information from just one fisher, who was not that informative. Nevertheless, our visits did confirm that the association's site is both a recreational and commercial location, and that the association is involved in the seafood restaurant business in a limited capacity, indicating that they have the capability for a viable association even if the association is functioning in a reduced way at this time.

Table SE.19. Maunabo Census Data

MAUNABO	1950	1960	1970	1980	1990	2000
Population Characteristics						
Population [1]	11,758	10,785	10,792	11,813	12,347	12,741
Civilian Labor Force (CLF) [2]	2,703	2,072	2,111	2,345	3,204	3,286
CLF - Employed	2,671	2,004	1,983	1,662	2,336	2,427
CLF – Unemployed	32	68	128	683	868	859
Percent of unemployed persons	1.18	3.28	6.06	29.13	27.09	26.14
Industry of employed persons [3]						
Agriculture, forestry, fishing and mining [4]		1,200	576	140	166	88
Construction		100	173	186	140	303
Manufacturing		40	206	273	300	479
Retail trade		144	202	185	300	176
Socioeconomic Characteristics						
Mean travel time to work (minutes) [5]		N/A	N/A	21.8	24.6	34.4
Persons who work in area of residence [6]		1,808	1,438	905	1,468	965
Per capita Income (dollars) [7]			506	1,154	2,528	5,400
Median Household Income (dollars) [8]		486	1,286	3,171	6,731	11,638
Individuals below poverty level [9]			8,788	9,278	9,226	7,517
Percent of Individuals below poverty level			81.43	78.54	74.72	59.00

Any problems the association may be having are set against higher than common rates of poverty, nearly 60%, with more than one quarter of its workers unemployed. Its fisheries contribute to the economy, even if its landings ranked only 31st out of 41.

Figure SE.38. Maunabo Landings Data, 1983-2003



These statistics show a mixed performance among Maunabo fishers, with the 21st century declines reflecting what was reported to us to be a struggling association. The early to mid-1990s also appear to have been difficult years.

Maunabo History

Like Yabucoa, Maunabo was part of the dominion of the cacique Güaraca and also settled by the Spanish late in the 18th century. Its economic base, agricultural and heavily dependent on sugar cane and tobacco (again like Yabucoa), had a large sector oriented toward producing bananas and raising livestock for meat. Toro Sugrañes suggests that tourism has always been somewhat of a force in its economy, blessed with lovely beaches, good restaurants, and guesthouses. In 1893 the Spanish built a lighthouse there, which is currently closed, and two other sites—the sugar mill Batey Columbia, built in 1901, and the central city, typical of Puerto Rican towns of the 1930s—continue to be of importance to tourists today. Much of the city was rebuilt after the 1928 hurricane San Felipe.

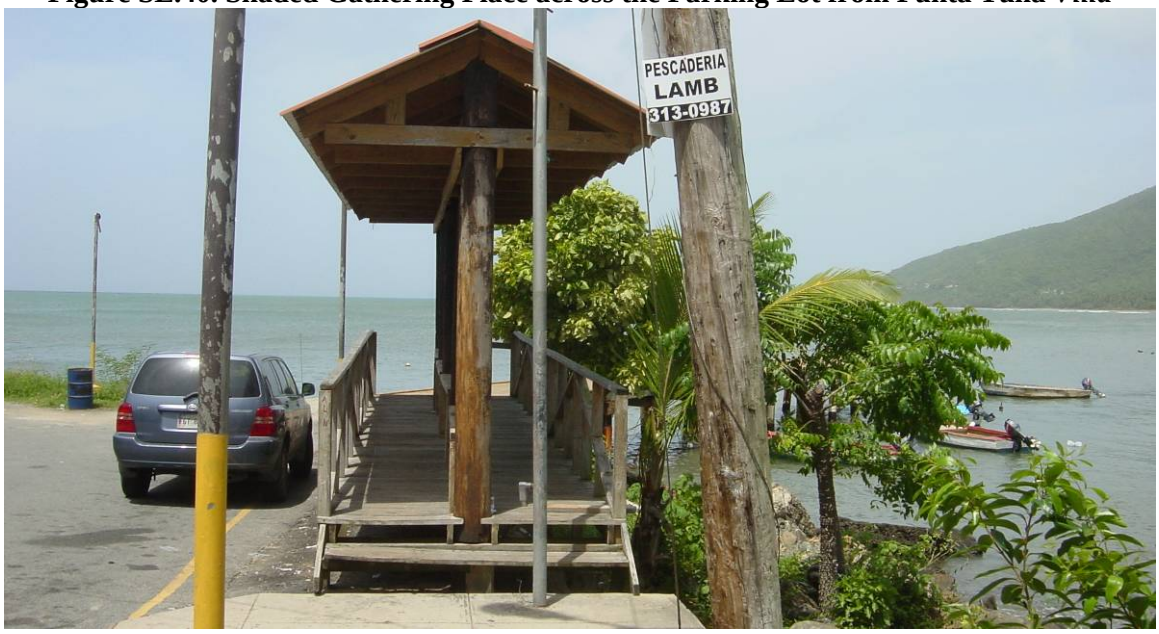
For many years, Maunabo's coast was blessed with a large land crab or *jueyes* population, which occupied the center of coastal dwellers' diets. While the consumption and sale of these fallen in recent years, it was important enough that residents of Maunabo's coast earned the designation, *jueyeros*—crabbers. This indicates a long and critical link to the sea.

Fishing in Maunabo

Maunabo's Punta Tuna is an association with 25 members, according to one fisherman who was talking to three other men on the porch of the house nearest the ramp. He was the only one of the four who said he was a fisherman, and from others knowledgeable about Maunabo's fishery we heard that the association was not functioning at its full capacity. In any case, its facilities include a restaurant that is open from Friday to Sunday only, and there are two other seafood restaurants (one open today, a Tuesday, and one not) neighboring the association's. Other seafood restaurants are along the main road (901) and near the association, down a small lane off of Route 760. Maunabo, like the others, has a diversity of restaurants, from the fancy to the open-air/ family run (medium) places to the pincho stands and other temporary units. In fact, the association seems to run a pincho stand itself, which sits between the facility building and the sea.

Figure SE.39. Ramp at Punta Tuna

Figure SE.40. Shaded Gathering Place across the Parking Lot from Punta Tuna *Villa*



From the gear in the vessels and scattered around, it looks as if filetes are a major gear, along with some traps. Recent landings data (2000-2003) confirm that gill nets are the most commonly used gear, accounting for about one-third of the landings, followed by fish pots (22.4%) and bottom lines (12.6%). With these gear and others they catch, most often, snappers, white grunts, lobster, parrotfish, and king mackerel. Other important gears are trammel nets, SCUBA gear, and beach seines. The day we visited, in fact, there was a *chinchorro* (beach seine) drying in the distance, near a few other yolas lining the shore beside the ramp. The muelle is also a recreational fishing site, which is common. A man and his son were there fishing. I asked if he was having any luck and he pointed to the pelicans and said, *"Ellos tienen mas suerte."* ("They are having more luck").

Figure SE.41. Association Facility & Restaurant, Punta Tuna, Maunabo

Figure SE.42. Chinchorro Drying Along the Shore near Punta Tuna Ramp

Figure SE.43. Yola with Gill Net just off the Punta Tuna Muelle

Figure SE.44. Recreational Fishers (father & son) Fishing from the Punta Tuna Muelle (note the pincho stand in the background)

Figure SE.45. Close-up of *Pincho* Stand