Society and Natural Resources, 28:797–806
ISSN: 0894-1920 print/1521-0723 online
DOI: 10.1080/08941920.2014.970737

Routledge
Taylor & Francis Group

Insights and Applications

Anticipating Exit from North Carolina's Commercial Fisheries

SCOTT CROSSON

National Marine Fisheries Service, Miami, Florida

Downloaded by [NOAA NMFS La Jolla] at 07:43 02 July 2015

If access to commercial licenses has been limited, then understanding the factors that contribute to movement out of these fisheries (fisheries exit) has value for managers. Studies on the causes of fisheries exit have focused on economic or social factors, but rarely both. I test the relative influence of 15 social and economic attributes from the fisheries exit and job satisfaction literature on fishermen's expectation of eventual exit from fisheries, with the hope that this will contribute to better predictions of fisheries participation and useful feedback for current management. I use available data from four comprehensive demographic and attitudinal surveys in North Carolina. Participation in the state's limited-access commercial fisheries has steadily declined since 2000, leading to concerns that the long-term infrastructure of the industry may be collapsing.

Keywords co-management, exit, fisheries management, fishing communities, human dimensions of fish and wildlife, limited access, limited entry, multicriteria decision making

Theorists have long proposed that in the absence of a regulatory regime that limits participation, fisheries will tend toward overexploitation (Gordon 1954; Scott 1955), and fisheries economists have consistently supported limiting access to exploited fisheries as a management tool (for a review see Townsend 1990). Under a limited-access system, effort is partially controlled by restricting the number of active licenses, which in turn limits harvest and creates wealth (Waters 1991). Commercial license limitation has a long history in North America and has been supported by both fisheries managers and fishermen alike (Rettig 1984).

The open-access fisheries of the state of North Carolina experienced surges in gear use and exploitation in the 1980s and early 1990s that led to the perception of a crisis (Johnson and Orbach 1996). In response, a moratorium on new commercial fishing licenses was enacted in 1994 while a Moratorium Steering Committee considered reforms to the fisheries management process, and the resulting Fisheries Reform Act of 1997 implemented most of the committee's recommendations (Johnson and Orbach 2002). New entrants must purchase or lease an existing license,

This article not subject to U.S. copyright law.
Received 4 November 2013; accepted 10 May 2014.
Address correspondence to Scott Crosson, NOAA Southeast Fisheries Science Center, 75 Virginia Beach Drive, Miami, FL 33149, USA. E-mail: scott.crosson@noaa.gov

or meet the eligibility requirements of a state-approved board to receive a new license provided the number of total licenses does not exceed a permanent cap (Street et al. 2005; North Carolina Department of Environment and Natural Resources [NC DENR] 2013). Recognizing that "older commercial fishermen often do not retire completely, but continue to fish on a part-time basis in order to supplement their Social Security benefits" (North Carolina Sea Grant College Program 1996, 41), the Fisheries Reform Act of 1997 also provided for a cheaper nontransferable commercial license for retired fishermen. Co-management was strengthened by revising the membership and responsibilities of the state's Marine Fisheries Commission, which consists of commercial and recreational fishermen as well as a fisheries scientist. Taken as a whole, the committee and the Fisheries Reform Act sought to limit the number of licenses to control fishing effort, professionalize the state's commercial fleet ("only professional, commercial fishermen who depend on fishing for their livelihoods should be permitted to sell the fish they harvest"; North Carolina Sea Grant College Program 1996, 55), and provide a means for graceful retirement from fishing while allowing qualified new entrants, thereby producing a healthy and sustainable fishing fleet.

Instead, participation in North Carolina's commercial fisheries has steadily declined since 2000 (NC DENR 2012, I-10), leading to concerns that the long-term infrastructure of that industry may be collapsing (Garrity-Blake and Nash 2007). The state's commercial fishermen are increasingly unhappy with the current state of affairs and many are declining to participate in co-management (West and Garrity-Blake 2003; Andreatta and Parlier 2010; May 2012; May 2013). If the number of commercial fishermen continues to drop far below the number of available licenses, then understanding the factors that contribute to movement out of these fisheries (fisheries exit) has value for managers. Studies on the causes of fisheries exit have focused on economic or social factors, but rarely both. I test the relative influence of 15 economic and social attributes on North Carolina fishermen's long-term plans to exit from commercial fisheries, with the hope that this will contribute to better predictions of future fisheries participation and useful feedback for current management. I use data from four comprehensive demographic and attitudinal surveys that the state has conducted since 2007.

Methods

North Carolina's Division of Marine Fisheries surveys a regional selection of its commercial fishermen on a rotating basis (Cheuvront 2007). The region covered by the socioeconomic survey varies from year to year, with the goal of revisiting any particular area every fifth year. Beginning with Diaby's (2000) investigation of the Albemarle Sound area, the state has surveyed commercial fishermen active in every area of the coast at least once (for a review see Crosson 2010).

The results in this article are based on access to data from four sequential surveys covering fishermen active in all of the state's coastal regions: the estuarine waters of the northeast, central, and southeast coasts; and the ocean waters extending from the beaches to the end of the U.S. exclusive economic zone 200 miles offshore. The total sample consisted of 765 completed surveys. For detailed information on the survey instruments and response rates, see Crosson (2007a, 2007b, 2009, 2010).

The original surveys are long (more than 75 questions), vary slightly by region and year, and contain many variables not of interest to this study. The initial task

Downloaded by [NOAA NMFS La Jolla] at 07:43 02 July 2015

of this meta-analysis was to winnow down the data set to a smaller set of variables applicable to the study of fisheries exit.

The literature on fisheries exit (and its inverse, entry) consists of studies that examine actual entry and exit activity by analyzing the relationship between past participation and concurrent economic variables such as prices and wages, and studies that survey fishermen on what might lead them to leave their current livelihoods. Research in the first category has searched for an inverse correlation between existing fleet size and new entrants (Berck and Perloff 1984; Ward and Sutinen 1994; Pradhan and Leung 2004; Tidd et al. 2011). Most businesses expect profits, so researchers have also examined the use of catch values (Daw et al. 2012), revenues (Holland and Sutinen 1999), and operating costs (Tidd et al. 2011) as predictors of entry and exit from fisheries.

For researchers in the second category, fishermen's perceptions of resource abundance are an obvious consideration (Pradhan and Leung 2004; Cinner et al. 2009). Community support (Smith and Hanna 1993) and job satisfaction (Pollnac et al. 1975; Pollnac and Poggie 2006; Smith and Clay 2010) also affect fishermen's views of their fisheries and hence their likelihood of continuing to fish. Ikiara and Odink (1999) found the opportunity costs of exiting, past fishing experience, and whether the skipper of a fishing unit is its owner or an employee to be significant determinants of resistance to exit from fisheries. Daw et al. (2012) and Cinner et al. (2009) also found opportunity costs and declining catches to be factors for the same. Fishing effort controls such as gear restrictions and closed seasons reduce profitability and hence make the business less attractive (Branch et al. 2006).

This study is firmly in the category of studying what might lead fishermen to exit commercial fishing. All of the surveys in this data set asked fishermen a yes/no question on future activity: "Do you think you will be a commercial fisherman 10 years from now?"

I chose this as my indicator variable, then selected a list of variables from the survey and tested them for an influence on fishermen's answers to that particular question. In the original surveys, fishermen working the Atlantic Ocean were most likely (58%) to believe this, and those working the Core Sound area the least likely (42%). A complete list of variables tested here, and comparisons with previous results from the fisheries exit literature, can be found in Table 1.

I tested six sociodemographic variables for an influence on the "expectation of fishing in 10 years" variable. Current age was included because of its estimated inverse correlation on any laborer's expectations of future physical work: Fishing is known to be a physically hazardous and demanding activity. Years of education was also expected to be a negative influence on future expectations of commercial fishing, as increased education was expected to increase other (nonfishing) economic opportunities. The existence of previous generations of commercial fishing in a fisherman's family was shown to be strongly correlated with attitudes toward individual transferable quotas (ITQs) in North Carolina (Crosson 2011); here, it was expected to act as a proxy for family support. Years lived in the present community was expected to perform the same role for community support, as was the presence of a "share" system on the boat where the captain and crew split the harvest profits. Years of experience in commercial fishing were expected to increase the likelihood of continuing to fish as well.

I also examined five economic variables measuring financial stability, and hence expected to be associated with an expectation of fishing in 10 years. Household

Downloaded by [NOAA NMFS La Jolla] at 07:43 02 July 2015

Downloaded by [NOAA NMFS La Jolla] at 07:43 02 July 2015

Table 1. Selected variables of the North Carolina sample

Variable	Expected influence on future fishing	Related findings in literature
Age	Negative	Age a positive predictor of fisheries job satisfaction (Pollnac and Poggie 1988)
Education	Negative	Educated fishermen have other opportunities (Terkla et al. 1988); education can be a weak predictor for exit (Pita et al. 2010)
Family history in fishing	Positive	Family traditions important (Pita et al. 2010; Marshall et al. 2007)
User of share systems	Positive	Profit sharing lowers fisheries exit (Doeringer et al. 1986)
Years lived in present community	Positive	Strong attachment to community is important to fishermen (Terkla et al. 1988)
Years of fishing experience	Positive	Fisheries job satisfaction related to years of experience (Pollnac and Poggie 1988)
Household income	Negative	Outside opportunities facilitates fisheries exit (Almeida et al. 2003)
Other employment besides fishing	Negative	Outside opportunities facilitates fisheries exit (Almeida et al. 2003)
Received nonlabor income	Negative	Outside opportunities facilitates fisheries exit (Almeida et al. 2003)
Boat and gear value	Positive	Capital investment not a good predictor of entry/exit (Cinner et al. 2009);
Catch landings value	Positive	Fishing income positive influence on job satisfaction (Smith and Clay 2010; Pollnac et al. 2001); low catch leads to exit (Cinner et al. 2009)
Perception that overfishing affects personal business	Negative	Overcrowding in fishery increases likelihood of exit (Pradhan and Leung 2004; Tidd et al. 2011; Pollnac et al. 2001); lower catch values lower opportunity cost of exit (Daw et al. 2012; Ikiara and Odink 1999); declining catch can lead to exit (Cinner et al. 2009)
Perception that fishing is economically important in community	Positive	Community support important for job satisfaction (Smith and Clay 2010); community affects transfer of information in fisheries (Smith and Hanna 1993)
Perception that gear restrictions affect personal business	Negative	Regulations lessen fleet efficiency and profits (Branch et al. 2006)
Perception that closed seasons affect personal business	Negative	Regulations lessen fleet efficiency and profits (Branch et al. 2006)

income (in dollar terms) and the presence of a nonfishing job or other source of nonfishing income such as Social Security or a pension influence employment decisions. Investments in fishing capital in the form of boats and harvesting gear were also tested for a positive influence on future fishing, although Cinner et al. (2009) did not find this to be the case. Fishing income from the previous year originated from the state's trip ticket program and not the survey itself. The expectation was that fishermen with larger landings are more dependent on fisheries income and hence more likely to remain in the business in the future, all else being equal.

The surveys ask a number of attitudinal questions on fishermen's perceptions of the business of fishing. Responses are on a 10-point Likert-type scale, from 1 (*strongly disagree* or *it's not important or doesn't affect me*) to 10 (*strongly agree* or *it's extremely important or it affects my business a great deal*). I incorporated the responses to four questions: fishermen's perception of overfishing (as a proxy for perceptions of resource decline, expected to be negatively associated with expectations of future fishing), "commercial fishing is important economically in my community" (expected to be another proxy for community support and hence a positive influence), and personal impact of gear restrictions and closed seasons (expected to be negative influences).

Downloaded by [NOAA NMFS La Jolla] at 07:43 02 July 2015

Results

The means and standard deviations of fishermen's responses to the selected questions can be found in Table 2. Because this is a analysis of responses from previous studies, demographics are not reported here other than those selected for testing. Education levels were changed from an ordinal to numerical scale as follows: less than high school diploma = 8 years, high school diploma = 12 years, some college/technical school = 14 years, and college diploma (or more) = 16 years. People are sometimes unwilling to provide household income figures, and if a respondent was reluctant to provide an exact number, the interviewers asked whether the respondent could choose from income ranges of increasing value. The median income for that age was then applied to the data set. Most fishermen accepted this approach to a very sensitive question, with only 32 unwilling to give any household income figures at all. The only other variable with more than six missing cases was that of landings value, as I lacked trip ticket information for 51 cases.

For the final specification of the model, I coded the variable "Do you think you will be a commercial fisherman 10 years from now?" as a binary (1 = yes, 0 = no) and did the same for variables for the presence/absence of previous generations of commercial fishing in the respondent's family, nonfishing employment, nonlabor income, and the use of the share system on the boat. Interval-level data such as age, education, boat/gear value, household income, gross fishing revenue, and years of fishing and living in their present community were recoded or left alone as indicated earlier. The four attitudinal questions were also tested as recorded.

Table 2 also reports test results comparing the results of statistical tests for differences between answers on the test variables for fishermen who do and do not expect to be commercially fishing in 10 years. Respondents were nearly evenly split on this question, with 53% of respondents expecting to be commercially active at that point. Interval-level variables were tested using two-sample t tests for differences in means, and binary-level variables were tested using chi-squared tests for independence. Most

Table 2. Comparison of means for responses to the binary variable (1 = yes, 0 = no) "Do you think you will be a commercial fisherman 10 years from now?"

Variable	Mean (standard deviation)
Age	51.40 (13.17)***
Education (years)	11.88 (2.61)†
Previous generations of commercial fisherman (1 = yes, 0 = no)	0.63 (0.48)
Use share system on my boat (1 = yes, 0 = no)	0.33 (0.47)
Years lived in present community	35.79 (19.32)***
Years of commercially fishing	25.91 (13.77)***
Household income ($)	$41,145 ($26,269)***
Other employment besides fishing (1 = yes, 0 = no)	0.47 (0.50)**
Received nonlabor income such as disability, social security, pensions (1 = yes, 0 = no)	0.18 (0.39)***
Boat and gear value ($)	$59,117 ($130,616)**
Catch landings value the previous year ($)	$26,978 ($57,917)*
Overfishing affects personal business (Likert scale, from 0 to 10)	3.95 (3.24)
Fishing is economically important in community (Likert scale, from 0 to 10)	8.02 (2.52)***
Gear restrictions affect personal business (Likert scale, from 0 to 10)	4.62 (3.55)
Closed seasons affect personal business (Likert scale, from 0 to 10)	4.71 (3.53)

Note. Two-sample t tests for differences in means for interval-level data, chi-square tests for independence for binary-level data, with significant differences indicated by $^{***}p < .001$, $^{**}p < .01$, $^{*}p < .05$, $^{\dagger}p < .1$.

variables showed significant results, with the exceptions of responses to the previous generations, share system, and overfishing questions.

Regression Results

Because many of these questions may be correlated with one another, and particularly with the age variable, I reviewed a correlation matrix. Other than correlation coefficients ~.5 for age with the social insurance, years in community, and years of fishing experience variables, multicollinearity appeared to not be an issue. I then used a probit model to test the influence of the social and economic variables. Coefficient estimates and associated significance results are reported in Table 3. As the dependent variable in the regression, the model is designed to specify the influence of the independent variables on the increased likelihood of answering "yes" to "do you think you will be a commercial fisherman 10 years from now?"; in theory, I tested the degree to which these variables had an influence on a fisherman's long-term expectation of remaining in or exiting the state's limited-license program. The result estimates the likelihood that a fisherman thinks he or she will or will not be commercially fishing in 10 years.

Ten of the tested variables did not produce a significant influence on the probability of affirming the dependent variable question. Five variables did produce

Downloaded by [NOAA NMFS La Jolla] at 07:43 02 July 2015

Table 3. Determinants for the binary variable (1 = yes, 0 = no) "Do you think you will be a commercial fisherman 10 years from now?"

Variable	Coefficient
Intercept	0.5111
Age	–0.0215***
Education	0.0170
Previous generations of commercial fisherman?	0.2231†
Use share system on my boat?	–0.1852
Years lived in present community	–0.0037
Years of commercially fishing	0.0037
Household income (units of $10,000)	0.0823***
Other employment besides fishing?	–0.0814
Received nonlabor income?	–0.5279**
Boat and gear value (units of $10,000)	0.0016
Catch landings value (units of $10,000)	0.0118
Overfishing affects personal business	0.0082
Fishing is economically important in community	0.0468*
Gear restrictions affect personal business	–.0200
Closed seasons affect personal business	–.0010

Note. Probit model results. Coefficient significance indicated by $^{***}p < .001$, $^{**}p < .01$, $^{*}p < .05$, $^{\dagger}p < .1$.

statistically significant results. Among the sociodemographic variables, age proved to be a significantly ($p < .001$) negative influence on future fishing expectations, as was expected; it is difficult to imagine a model where older fishermen are not more likely to foresee their own retirement than younger fishermen. The family history binary also proved to be a marginally significant ($p < .1$) positive influence on future expectations. Other sociodemographic variables were not influential, include education, the use of share systems, and years in the community and of commercial fishing. Two of the economic variables also proved to be significant predictors: household income ($p < .001$), and the presences of nonlabor income ($p < .01$). Outside employment was not an influence, perhaps reflecting the common practice of many commercial fishermen to rotate in and out of "land-side" employment labor markets. Neither of the business-type economic variables (gross catch value and boat/gear value) proved to be significant influences. Of the four Likert-scale attitudinal questions, the perception of community support tested positive ($p < .05$), but the questions on the impact of overfishing, gear restrictions, and closed seasons did not. I reviewed the square roots of the variance inflation factors to check again for multicollinearity issues, but none exceeded 1.3, and multicollinearity does not appear to be problematic with this model.

Discussion and Conclusion

In comparison with previous studies on fisheries exit, the results here further strengthen the argument that family (Pita et al. 2010; Marshall et al. 2007) and community (Smith and Clay 2010; Smith and Hanna 1993) are important supporters of

Downloaded by [NOAA NMFS La Jolla] at 07:43 02 July 2015

commercial fisheries job satisfaction and the likelihood of continuing to actively fish, and may be more important than landings values or issues with fishing regulations. If the diversification of coastal communities lessens that social network (Griffith 2000; Johnson and Griffith 2010), then recent development may hasten long-term fisheries exit even if economic or regulatory factors become otherwise more favorable for the commercial fishing industry in the future. Surprisingly, increased household income levels can be a positive influence on expectations of future fishing even when a proxy for the size of the fishing business (catch values) is included in the regression. This was the case here despite the presence of a fisherman's nonlabor income being a negative influence on future fishing expectations as was predicted, indicating that the small business models that are prevalent in the southeastern region are partially dependent on spousal or other family support to stay viable.

North Carolina currently uses various criteria to determine eligibility for commercial fishing licenses, including recent industry involvement, household dependence on fishing income, and family history (NC DENR 2014). The model shown here illustrates which attributes to emphasize, depending on policy goals. If participation rates are still considered too high to be biologically or economically sustainable, then a preference for applicants who are heavily dependent on fishing income ("professional fishermen," in the Moratorium Steering Committee's language) will continue to shrink the fleet. Conversely, if the state wishes to reverse the decline in participation, it needs to attract younger fishermen who are not the sole source of family income, which lessens the personal risks of depending on an uncertain supply of income (Allison and Ellis 2001), and should emphasize applicants from established fishing families and communities. As noted by Cinner et al. (2009), "Fishing is a choice, not purely a necessity, and must be viewed in this context when considering the person's motivations and decisions to enter or exit" (128).

Downloaded by [NOAA NMFS La Jolla] at 07:43 02 July 2015

Acknowledgments

I thank the North Carolina Division of Marine Fisheries for continued access to the survey and landings data. The views expressed herein are mine and do not necessarily reflect the views of NOAA or any of its subdivisions.

References

Allison, E. H., and F. Ellis. 2001. The livelihoods approach and management of small-scale fisheries. *Mar. Policy* 25(5):377–388.

Almeida, O. T., K. Lorenzen, and D. G. McGrath. 2003. Commercial fishing in the Brazilian Amazon: Regional differentiation in fleet characteristics and efficiency. *Fish. Manage. Ecol.* 10(2):109–115.

Andreatta, S., and A. Parlier. 2010. The political ecology of small-scale commercial fishermen in Carteret County, North Carolina. *Hum. Organization* 69(2):180–191.

Berck, P., and J. M. Perloff. 1984. An open-access fishery with rational expectations. *Econometrica: J. Econometric Society* 52(2):489–506.

Branch, T. A., R. Hilborn, A. Haynie, G. Fay, L. Flynn, K. Griffiths, K. Marshall, J. Randall, J. Scheuerell, E. Ward, and M. Young. 2006. Fleet dynamics and fishermen behavior: Lessons for fisheries managers. *Can. J. Fish. Aquat. Sci.* 63(7):1647–1668.

Cheuvront, B. 2007. A state-managed program for conducting interviews with commercial fishermen. *NAPA Bull.* 28(1):99–108.

Cinner, J. E., T. Daw, and T. R. McClanahan. 2009. Socioeconomic factors that affect artisanal fishers' readiness to exit a declining fishery. *Conserv. Biol.* 23(1):124–130.

Crosson, S. 2007a. *A social and economic analysis of commercial fisheries in North Carolina: Albemarle and Pamlico Sounds*. Morehead City, NC: North Carolina Division of Marine Fisheries.

Crosson, S. 2007b. *A social and economic analysis of commercial fisheries in North Carolina: Core Sound*. Morehead City, NC: North Carolina Division of Marine Fisheries.

Crosson, S. 2009. *A social and economic analysis of commercial fisheries in North Carolina: Atlantic Ocean*. Morehead City, NC: North Carolina Division of Marine Fisheries.

Crosson, S. 2010. *A social and economic analysis of commercial fisheries in North Carolina: Beaufort Inlet to the South Carolina state line*. Morehead City, NC: North Carolina Division of Marine Fisheries.

Crosson, S. 2011. Resistance to alternative management in fisheries: Economic and cultural considerations of North Carolina's commercial fishers. *Polit. Life Sci.* 30(2):31–42.

Daw, T. M., J. E. Cinner, T. R. McClanahan, K. Brown, S. M. Stead, N. A. Graham, and J. Maina. 2012. To fish or not to fish: Factors at multiple scales affecting artisanal fishers' readiness to exit a declining fishery. *PLOS ONE* 7(2):e31460.

Diaby, S. 2000. *An economic analysis of commercial fisheries in the Albemarle Sound Management Area, North Carolina*. Morehead City, NC: North Carolina Division of Marine Fisheries.

Doeringer, P. B., P. I. Moss, and D. G. Terkla. 1986. Capitalism and kinship: Do institutions matter in the labor market. *Ind. Labor Relations Rev.* 40(1):48–60.

Garrity-Blake, B. J., and B. Nash. 2007. *An inventory of North Carolina fish houses*. Raleigh, NC: North Carolina Sea Grant.

Gordon, H. S. 1954. The economic theory of a common-property resource: The fishery. *J. Polit. Econ.* 62(2):124–142.

Griffith, D. 2000. Social capital and economic apartheid along the coasts of the Americas. *Urban Anthropol.* 29(3):255–284.

Holland, D. S., and J. G. Sutinen. 1999. An empirical model of fleet dynamics in New England trawl fisheries. *Canadian J. Fish. Aquat. Sci.* 56(2):253–264.

Ikiara, M., and J. G. Odink. 1999. Fishermen resistance to exit fisheries. *Mar. Resource Econ.* 14(3):199–214.

Johnson, J. C., and D. C. Griffith. 2010. Finding common ground in the commons: Intracultural variation in users' conceptions of coastal fisheries Issues. *Society Nat. Resources* 23:837–855.

Johnson, J. C., and M. K. Orbach. 1996. *Effort management in North Carolina fisheries: A total systems approach*. Raleigh: NC Sea Grant College Program.

Johnson, J. C., and M. K. Orbach. 2002. Perceiving the political landscape: Ego biases in cognitive political networks. *Social Networks* 24(3):291–310.

Marshall, N. A., D. M. Fenton, P. A. Marshall, P. A., and S. G. Sutton. 2007. How resource dependency can influence social resilience within a primary resource industry. *Rural Sociol.* 72(3):359–390.

May, C. K. 2012. Active non-participation among local natural resource-dependent communities: the case of North Carolina fisheries governance. *J. Environ. Manage.* 113:407–416.

May, C. K. 2013. Power across scales and levels of fisheries governance: Explaining the active non-participation of fishers in Two Rivers, North Carolina. *J. Rural Stud.* 32:26–37.

North Carolina Department of Environment, and Natural Resources. 2012. *License-statistics annual report*. Morehead City, NC: Division of Marine Fisheries.

North Carolina Department of Environment, and Natural Resources. 2013. *Commercial Fishing license frequently-asked questions*. http://portal.ncdenr.org/web/mf/commercial-fishing-faqs (accessed 19 September 2013).

North Carolina Department of Environment, and Natural Resources. 2014. Eligibility pool process. http://portal.ncdenr.org/web/mf/eligibility-pool-process (accessed 6 May 2014).

Downloaded by [NOAA NMFS La Jolla] at 07:43 02 July 2015

North Carolina Sea Grant College Program. 1996. Final report of the Moratorium Steering Committee to the Joint Legislative Commission on Seafood and Aquaculture of the North Carolina General Assembly, Raleigh, NC.

Pita, C., J. Dickey, G. J. Pierce, E. Mente, and I. Theodossiou. 2010. Willingness for mobility amongst European fishermen. *J. Rural Stud.* 26(3):308–319.

Pollnac, R. B. C., Gersuny, and J. J. Poggie. 1975. Economic gratification patterns of fishermen and millworkers in New England. *Hum. Organization* 34(1):1–7.

Pollnac, R. B., and J. J. Poggie. 1988. The structure of job satisfaction among New England fishermen and its application to fisheries management policy. *Am. Anthropol.* 90(4): 888–901.

Pollnac, R. B., and J. J. Poggie, Jr. 2006. Job satisfaction in the fishery in two southeast Alaskan towns. *Hum. Organization* 65(3):329–339.

Pollnac, R. B., R. S. Pomeroy, and I. H. Harkes. 2001. Fishery policy and job satisfaction in three southeast Asian fisheries. *Ocean Coastal Manage.* 44(7):531–544.

Pradhan, N. C., and P. Leung. 2004. Modeling entry, stay, and exit decisions of the longline fishers in Hawaii. *Mar. Policy* 28(4):311–324.

Rettig, R. B. 1984. License limitation in the United States and Canada: An assessment. *North Am. J. Fish. Manage.* 4(3):231–248.

Scott, A. 1955. The fishery: The objectives of sole ownership. *J. Polit. Econ.* 63(2):116–124.

Smith, C. L., and P. M. Clay. 2010. Measuring subjective and objective well-being: Analyses from five marine commercial fisheries. *Hum. Organization* 69(2):158–168.

Smith, C. L., and S. S. Hanna. 1993. Occupation and community as determinants of fishing behaviors. *Hum. Organization* 52(3):299–303.

Street, M. W., A. S. Deaton, W. S. Chappell, and P. D. Mooreside. 2005. *North Carolina coastal habitat protection plan*. Morehead City, NC: NC Department of Environment and Natural Resources, Division of Marine Fisheries.

Terkla, D. G., P. B. Doeringer, and P. I. Moss. 1988. Widespread labor stickiness in the New England offshore fishing industry: implications for adjustment and regulation. *Land Econ.* 64(1):73–82.

Tidd, A. N., T. Hutton, L. T. Kell, and G. Padda. 2011. Exit and entry of fishing vessels: An evaluation of factors affecting investment decisions in the North Sea English beam trawl fleet. *ICES J. Mar. Sci.* 68(5):961–971.

Townsend, R. E. 1990. Entry restrictions in the fishery: A survey of the evidence. *Land Econ.* 66(4):359–378.

Ward, J. M., and J. G. Sutinen. 1994. Vessel entry–exit behavior in the Gulf of Mexico shrimp fishery. *Am. J. Agric. Econ.* 76(4):916–923.

Waters, J. R. 1991. Restricted access vs. open access methods of management: Toward more effective regulation of fishing effort. *Mar. Fish. Rev.* 53(3):1–10.

West, S. B., and B. J. Garrity-Blake. 2003. *Fish house opera*. Mystic, CT: Mystic Seaport.

Downloaded by [NOAA NMFS La Jolla] at 07:43 02 July 2015