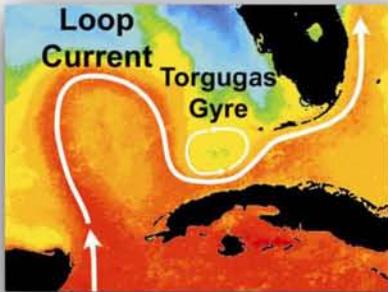




# Young Fish, Healthy Reefs

*Applying Ecosystem Level Research to  
Coral Reef Habitat Protection and Management*

Meso-American to  
FKNMS Coral Reefs



Coral Reef Fishes' Juvenile  
Habitats and MPAs



Reef Fish Distribution and  
Larval Supply, US Virgin Islands



Juvenile Reef Fish Habitat-Use

All projects supported by NOAA CRCP



# Meso-American to FKNMS Coral Reefs: Ecosystem Connectivity



## Project Overview

Coral reef fish have a complex life-cycle including a critical larval stage that is often both dispersive and pelagic. The coral reefs of the *Florida Keys National Marine Sanctuary* (FKNMS) and the Mesoamerican reefs along the Yucatan coast of Mexico are hydrographically connected by a constant oceanographic feature, the Yucatan and Loop Current. This current system may play a significant role in local and regional recruitment of reef fish into the FKNMS's *marine protected areas* (MPAs). This project provides a unique focus on the early life history and population dynamics of coral reef fishes on a regional scale.

## Management Implications

Effective management of coral reef-associated fisheries requires a recognition of the importance of both the sources and the large-scale dynamics of larval fish recruits. Understanding population connections of coral reef fishes is an integral part of an ecosystem approach to both fisheries management and coral reef habitat protection.



# Distribution and Larval Supply of Coral Reef Fishes in U.S. Virgin Islands: An Ecosystem Approach



## Project Overview

Resource managers of the *U.S. Virgin Islands* (USVI) have established a number of no-take zones and marine reserves to protect their vital fisheries and coral reef habitats. The sustainability of many coral reef fisheries is of concern due to the high level of exploitation. The continued removal of these species from the reefs has led to proposals for new, and more extensive, no-take marine reserves and closures. However, the scientific information available is insufficient to predict the adequacy of the current or planned management.

## Management Implications

This project will benefit coral reefs by focusing on the essential ecology of larval reef fish that depend on coral reefs as their adult habitat and thereby contributing to our understanding of coral reef supply dynamics in the region. The combination of larval fish and physical oceanographic data will help to determine the location and relative importance of spawning sites specific to coral reef fish, focusing on local economically important species such as the snapper and grouper among others. Results will generate products that provide baseline information on the recruitment population estimates. This project will advance management actions - specifically MPA designations and seasonal closures - by providing important ecological and physical data from USVI coral reefs thus aiding managers in developing an integrated ecosystem assessment of coral reef-based fisheries.



# Coral Reef Fishes' Juvenile Habitats and MPAs:

## Monitoring Migration Patterns

### Project Overview



Ecosystem-based coral reef fishery management and the development of MPAs as effective fisheries management tools require an in-depth understanding of coral reef fish larval sources, their early life history patterns, and their specific habitat needs from juvenile to adult stages. Analysis of otoliths (ear bones) of coral reef fish is a well documented method of providing useful information on stock structure of fishes throughout their life history.

### Management Implications

This project is designed to map the source of recruits of coral reef fishes in south Florida. These reef fish are believed to migrate to coral reefs as young adults from other areas where they spend their juvenile phase. Data from this study provide fisheries and marine reserve managers with information necessary to understand the large-scale dynamics of larval and juvenile reef fish movements within and between marine management units, both state and federal. Additionally, results provides managers with vital decision-making tools pertinent to long-term management of fish stocks and the design of effective marine reserves. For example, aging information from the otoliths provide evidence of a specific time-frame spent in adjacent nursery habitats before migrating to coral reef ecosystems as adults, thereby allowing managers to consider conservation measures more completely.



# Juvenile Reef Fish Habitat-Use: Acoustic Tagging and Telemetry

### Project Overview



Tropical coral reefs with healthy fish populations are often correlated with and supported by associated, nearby nursery habitats such as mangroves and seagrass beds. These habitats provide essential fish habitat for many ecologically and economically important reef fish species. In order to improve tropical MPAs with an ecosystem perspective – one that considers coral reefs as part of a mosaic of inter-connected habitats – we must understand the movements of reef fishes into MPAs from their juvenile habitats. To answer this question, we acoustically tag reef fishes tracking their movements through a coral reef coastal ecosystem.

### Management Implications

Quantifying and mapping reef fish movement patterns provides essential data for designing effective multi-habitat networks of MPAs and habitat corridors that link the full life-cycle of commercially and/or ecologically important fishes. By correlating reef fish site-fidelity with habitat "quality" we can also recommend coastal habitat patches to be protected that are vital for coral reef health. Additionally, we incorporate education outreach via Adopt-a-Fish, Adopt-a-School (501c3) to actively engage the local community in the process of studying, understanding, and protecting the marine resources in their own backyards ([www.adoptafish.net](http://www.adoptafish.net)).

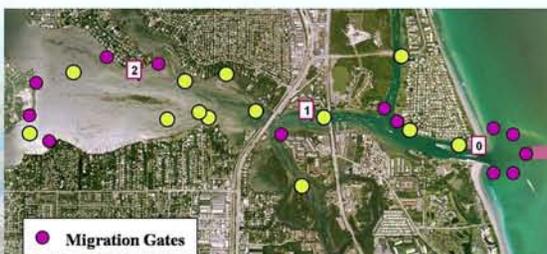


Photo: E. D'Alessandro

# Future Research Directions



## *Assessing the Ecological Fisheries Function and Conservation Value of 'Orphaned Reefs', USVI*

In the USVI, some critical coral reef habitats are managed within the boundaries of the Buck Island National Monument and the Virgin Islands National Park; these protected reefs represent approximately 37% of coral reef habitat within the territorial waters of the archipelago. Selected remaining reefs, though unmanaged and understudied, may also provide critical healthy coral reef habitat for local fisheries. These habitats, or 'orphaned reefs' are characterized by their relatively high percentage of live-coral cover, their proximity to a vital mosaic of coastal habitats such as mangroves and seagrasses, and are actively fished, yet they are not currently managed or protected. Orphan coral reefs may serve as crucial habitat for coral reef fish. In order to better understand the fisheries and conservation value of these 'orphaned' reefs, within an ecosystem context, we can apply the wide-range of expertise and tools developed by our research team. Specifically,

- Develop a baseline assessment of larval reef fish diversity as an indicator of the ecological and fisheries function/value of protected vs. orphaned reefs
- Use larval reef fish indices to characterize the health and ecology of managed vs. orphan reefs
- Track and map larval and juvenile reef fish transport and movement within and between protected and 'orphaned reefs' using satellite and ship-derived oceanographic data of spawning aggregations, otolith microchemistry, in-shore and offshore sampling techniques, and acoustic tagging and telemetry
- Utilize selected coral reef fishes as indicator species for changes in environmental conditions/health of the protected vs. 'orphaned reefs' due to coastal anthropogenic impacts

## *Community Education and Outreach: reef fish life-histories and healthy coral reefs*

This range of expertise allows team of scientists, educators, and conservation biologists to engage in local capacity building with South Florida and Virgin Islands' communities through active education outreach and participation in our long-term coral reef research projects. Our hands-on outreach programs, in conjunction with local, state, and federal partners, focuses on reef fish ecology and the importance of conservation to local, healthy fisheries and coral reef ecosystems.



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## Partners

