

# STATUS OF THE REEFS

## REEF FISH RESOURCES

**William Tobias**  
**Department of Planning and Natural Resources**  
**Division of Fish and Wildlife**

### Introduction

#### Resources

The coral reef ecosystems of the insular shelf waters of the United States Virgin Islands provide habitat, food and shelter for a great diversity of reef fish species. Of some 350 species of shallow water reef fish identified in the Caribbean, about 180 are landed and used in quantity throughout the region and collectively comprise the most important fishery in the islands (Caribbean Fishery Management Council, 1985). The fisheries in the U.S. Caribbean are multi-species, multi-gear, artisanal in nature and principally coral reef-based (Caribbean Fishery Management Council, 2003). The U.S. Caribbean fisheries are closely linked to fisheries in the wider Caribbean region. The species targeted in the U.S. waters are also available in waters of adjacent island countries and recruitment of these species may be derived from areas distant from the area of the fishery.

#### Fishery

The assemblage of reef fish species is utilized by approximately 380 registered commercial fishers in the U.S. Virgin Islands (Tobias et. al., 2000). The commercial fishing fleet consists primarily of small-sized, open, wood or fiberglass fishing boats, which average 20-26 feet in length. Larger vessels are used for trap-based fisheries due to space requirements for traps and machinery (Caribbean Fishery Management Council, 2003). There are four major gear types in the commercial fishery, with multiple methods currently in use for some gears (Tobias et. al., 2000). The gear types include traps, line fishing, nets and diving. Most fishing gear is used to harvest reef fish species. Fish traps are the most popular gear type used (Tobias, 1997). Fish traps, known locally as pots, are generally constructed of wire mesh with a rigid wooden or metal frame. Depending on bottom conditions, traps may be set in strings, multiple traps connected by a single line, or singly. The trap strings or individual traps may or may not be buoyed. Regulations for fish trap mesh size are different for St. Thomas/St. John and St. Croix districts. Fish trap mesh size is 2-inch square or hexagonal for St. Thomas/St. John and 1 1/2-inch square or hexagonal for St. Croix. Line fishing is the second most popular fishing method employed and the only gear used to harvest pelagic fishes. Fishers use handlines, rod and reels and electric or hydraulic reels, to troll near the surface for coastal pelagic and pelagic fishes and to bottom fish for shallow water reef fish species and deepwater snappers and groupers. Methods for harvest with monofilament nets vary the most. Nets are used as purse seines, beach seines, gill nets and trammel nets. Umbrella nets and cast

nets are typically used to harvest baitfish. Scuba gear and free-diving are also used to spear fish and harvest conch, lobster and whelk. Due to the narrow island shelf, it is common for fishers to harvest both reef and pelagic fishes during a single daily trip. The majority of the offshore fisheries are composed of six species from the Scombridae (tuna-mackerel) family and one species from the Coryphaenidae (dolphin fish) family. Two longline vessels harvest additional pelagic species.

Recreational fishers are not required to have a license or permit in the U.S. Virgin Islands. As a result, accurate numbers of individuals participating in the fishery are not available. The number of boat-based recreational fishers is estimated at 2,509, based on a telephone survey conducted in 2000 (Eastern Caribbean Center, 2002). The number of boat-based and shore-based fishers was estimated to be around 11,000 recreational fishers, about 9.2% of the population (Mateo, 1999; Eastern Caribbean Center, 2002). Trolling was reported as the most common boat-based fishing method (59.7%), followed by bottom fishing (22.7%). Jennings (1992) reported that bottom fishing (70%) was more common than trolling (20%) in 1986. Approximately half of the fishing occurs in territorial waters, less than three miles from shore (Eastern Caribbean Center, 2002). The most preferred fish family was snapper, followed by dolphin and tuna. Of 563 recreational shoreline anglers interviewed in the U.S. Virgin Islands between 1995 and 1998, fishers most frequently reported catch of French grunts, jacks and yellowtail snappers (Mateo, 2000).

#### Resource Management

The Government of the Virgin Islands has jurisdiction over the marine resources in territorial waters, which extends from the shoreline seaward three miles. Fisheries regulations were first promulgated in Title 11 and 12 of the Virgin Islands Code in 1972. In the Virgin Islands Code, power was bestowed on the Commissioner of the Department of Planning and Natural Resources to enact fisheries management regulations for the conservation and protection of the resources. Local fisheries advisory committees (FACs), established in the Virgin Islands Code, have the responsibility to make management recommendations to the Commissioners of the Department of Agriculture and the Department of Planning and Natural Resources for conservation of the resources.

Under the Magnusen-Stevens Fishery Management and Conservation Act, authority was granted to regional councils to manage fisheries resources in federal waters. This is accomplished through the development of fisheries management plans. The Caribbean Fishery Management Council is responsible for the management of the fisheries resources in federal waters (Exclusive Economic Zone) around Puerto Rico and the Virgin Islands, which extend from the commonwealth and territorial boundaries, respectively, to 200 miles offshore. The Shallow Water Reef Fish Management Plan (Caribbean Fishery Management Council, 1985) includes 64 of the most commonly landed species from 14 families, which compose the bulk of the catch from Puerto Rico and the U.S. Virgin Islands, into one management unit. This management unit was expanded to include deep water snappers and groupers, aquarium trade species, a prohibition on the harvest of Goliath grouper, additional spawning area closures and gear restrictions (Caribbean Fishery Management Council, 1993). A goal of territorial and

federal fisheries management is to have compatible fisheries regulations, which ease the burden of enforcement.

#### Status of the Resources

Fishers in the U.S. Virgin Islands have targeted seasonal spawning aggregations of large grouper and snapper species since the 1960's. The continuous and unregulated fishing pressure during spawning periods has resulted in the demise of large, piscivorous, territorial species like Nassau grouper, yellowfin grouper, tiger grouper and Goliath grouper to the point where they no longer form aggregations to spawn and may be considered rare or, in some cases, fisheries extinct. Nassau grouper harvest in federal waters was prohibited since the adoption of the Shallow Water Reef Fish Management Plan (Caribbean Fishery Management Council, 1985). However, fish population numbers have not increased sufficiently in the past 15 years to allow spawning aggregations to reform.

A shallow water reef fish stock assessment for the U.S. Caribbean was conducted in 1991, focusing on comparing data from the fishing years 1985 and 1990 (Appeldoorn et.al., 1992). Overall landings in Puerto Rico decreased from a high of 5.36 million pounds in 1979 to 1.67 million pounds in 1988. Only a slight increase was noted in 1989 and 1990. Data poor conditions were noted for the U.S. Virgin Islands, especially for historical data sets. Projected reef fish landings appeared reasonably stable between 1975 and 1989 in the U.S. Virgin Islands (1.35 million pounds), averaging 0.93 million pounds for St. Thomas/St. John and 0.44 million pounds for St. Croix. Fish traps accounted for approximately 70% of the landings by weight. However, the capture size of numerous species caught in traps decreased over time in the U.S. Virgin Islands (parrotfish, grunts, surgeonfish, trunkfish and queen triggerfish). Large grouper species were absent from the fishery. Only two smaller grouper species were common, red hind and coney. Poor red hind (grouper) recruitment was also noted. The authors made the following management recommendations to improve fish stocks: (1) establish compatible regulations between federal and territorial waters, (2) reduce fishing effort on small fishes, (3) protect spawning aggregations, (4) improve compliance with minimum sizes and other regulations, (5) increase fish trap mesh size to 2 inches as soon as possible, (6) initiate marine reserve projects and (7) collect more biological information.

Commercial fishers are required by law to submit annual catch records to the Department of Planning and Natural Resources, Division of Fish and Wildlife, prior to license renewal. The frequency of catch record submittals has been increased from annual to monthly and the report forms modified to include more detailed catch and effort information. As a result, the reporting efficiency by commercial fishers has improved (96%), as well as the communication between data managers and fishers. The reported commercial landings in the U.S. Virgin Islands for the fishing years 1996-1997, 1997-1998 and 1998-1999 was 1.3 million pounds/4.9 million dollars, 1.4 million pounds/6.6 million dollars and 1.2 million pounds/ 4.8 million dollars, respectively (Tobias et.al., 2000). In 1996-1997 and 1997-1998, fish pots, line fishing and net fishing represented the most popular fishing methods employed in the U.S. Virgin Islands (29%, 30% and 19%,

respectively, of the landings on St. Croix and 45%, 20% and 8% respectively, of the landings on St. Thomas/St. John. Of the line fish landings, 18% were pelagic and 12% reef fish on St. Croix, compared to 18% reef fish and 2% pelagics on St. Thomas in 1998-1999. Landings reported for the Virgin Islands for the years 1999-2000 and 2000-2001 were 1.3 and 1.5 million pounds, respectively (Uwate and Tobias, 2002). Although separated by only a distance of 40 miles (74 km), significant differences exist in the fishery, as evident in from reported landings. Inter-island differences are the result of variations of habitat type, insular shelf platform size, proximity to deep water and geographical location. Differences also exist in the ethnic background of the fishers on the two island groups, resulting in a further disparity for preferred gear type.

Biostatistical data on the commercial reef fish and spiny lobster fisheries collected on St. Croix during 1997-2000 indicated a 10% decrease in average weight of reef fish and a 12% decrease in the average weight of lobster specimens measured during the study period (Tobias, 2000). Also the mean number of fish/trap haul and weight of fish/trap haul decreased (drops of 19% and 13% respectively from 1997/98 to 1998/99 and of 40% and 47% respectively from 1998/99 to 1999/2000). A decline was also noted in the catch/effort of the gill/trammel net fishery. The number of families and species of reef fish recorded from fish trap samples (18 families and 48 species) was greater than gill/trammel net samples (11 families and 22 species) and line fishing samples (5 families/6 species). The percent composition of reef fish from a sub-set of the biostatistical samples by fishing method indicated that two species of grunts represented 33.9% of the trap fish samples. Surgeonfish and parrotfish represented 30.0% and 24.2% of the trap fish samples. Trunkfish, snappers and groupers (red hind and coney) comprised 19.8%, 13.3% and 12.0% respectively of the trap fish samples. Gill/trammel net samples were dominated by six parrotfish species. The line fish sample was predominantly two grouper species, coney and red hind.

### Resource Impacts

Fisheries biologists and resource managers in the Virgin Islands have long understood that reef fish resources are finite, limited by available habitat and food supply and subject to recruitment pulses from upstream larval sources beyond local and federal management boundaries. The balance of nature that sustains these resources at the ecosystem level is complex and delicately intertwined at all trophic levels. Man and nature can easily upset this balance.

### Overfishing

Many commercial fishers recognize that they are catching fewer fish, lobster and conch and those that they do catch are smaller in size. Not only that, but the fishers have to travel farther from shore and fish in deeper water than they used to as well. Some of these fishers understand the concept of fisheries management and have taken an active role by serving on local fisheries advisory committees or Caribbean Fishery Management Council committees to provide their expertise on how best to manage the resources for maximum sustainable yield. Their livelihood and that of following generations of fishers depends on the ability to make their living from the sea.

Numerous management recommendations made by fishers have become drafted into regulation in the Virgin Islands. However, the impacts of unsound fishing practices, such as over-harvesting from spawning aggregations when the fish are most vulnerable to fishing pressure, take many years to reverse. As fishing gear technology advances, fishers utilize the new equipment to sustain their harvests. Scuba gear was not used in the Virgin Islands until the early 1970's for commercial harvest of marine resources. Fishers realized that they could stay down longer, cover more area on the bottom and harvest more conch and lobster and spear more fish than free-diving. As inshore resources became depleted, resources further offshore were exploited. Scuba gear is also used to set, herd fish and haul gill/trammel nets (1200-1500 ft in length), allowing the nets to be set in deeper water along daily migration pathways traveled by parrotfish from inshore feeding grounds to offshore resting grounds. Unlike fish traps that can only catch a certain quantity of fish, the gill/trammel nets are capable of removing an entire breeding school of parrotfish in one set. In addition to the desired species, protected species such as butterflyfish and federally-listed, endangered sea turtle species are also caught as by-catch. The hasty removal of the nets results in the uprooting of corals, gorgonids, sponges and other sessile organisms. Herbivorous fish, such as parrotfish, spoil quickly and over-harvesting of the resource has resulted in confirmed reports of wanton waste. As the gill/trammel net fishery increased, the corresponding species caught in fish traps decreased. Similarly, scuba gear is used to fish deep water purse seine nets, targeting large schools of carangids (jacks). Catches of several thousand pounds of fish in one purse are not uncommon. Haul seines of over a thousand feet in length are also still used in shallow, inshore waters. The seine net drags across the bottom, as it is retrieved from the beach, adversely impacting the benthic community and divers must be used to free the net from obstructions. Although the nets are supposed to be pursed in the water, most are hauled onto sand, where unwanted fish are discarded. Many fish traps in the Virgin Islands lack the necessary biodegradable escape panel and biodegradable door fastenings that would allow fish to escape if the trap is lost or can't be hauled on a regular basis. These traps, if lost, continue ghost fishing for years until the trap is destroyed.

The coastal embayments around the U.S. Virgin Islands contain extensive mangrove, seagrass and coral communities. These areas are important nursery grounds for commercial and recreationally important reef fish and invertebrate species (Adams and Tobias, 1994; Tobias, 1995; Tobias, 1999 ; Mateo, 2001; Mateo and Tobias, 2001). No longer fished by commercial fishers due to the lack of resources, these inshore areas continue to be stressed by shoreline recreational fishers with the take of juvenile reef fish and invertebrates.

#### Natural Disasters

Within the last two decades, several major hurricanes have impacted the coral reefs, mangroves, benthic communities and fisheries of the U.S. Virgin Islands, Hurricane Hugo (1989), Luis and Marilyn (1995), Bertha and Hortense (1996), Georges (1998) and Lenny (1999). Most seriously affected were the shallow water elkhorn and staghorn coral (*Acropora palmata* and *Acropora cervicornis*) colonies that comprised the bank-barrier reef system and inshore reefs around St. Croix. Environmental damage was great.

Vast sections of these shallow water reefs were reduced to rubble. Coral recruitment and recovery has been slow or non-existent. Algal growth prolifically covers the benthic substrate. A die-off of the long-spined, black sea urchin (*Diadema antillarum*) occurred Caribbean-wide in 1983. *Diadema* was the major invertebrate grazer on the coral reefs, keeping algal growth reduced which promoted coral larvae settlement and growth. The over-fishing of herbivorous parrotfishes also reduced the abundance of the major vertebrate grazers on the coral reefs to keep algal growth in check.

Commercial fishers lost significant amounts of trap gear during the hurricanes. Unable to obtain loans or federal grants to replace this gear and reluctant to sustain additional gear losses, many fishers changed from the trap fishery to the net fishery. Once the fishing techniques were adopted, fishers harvested more fish with gill/trammel nets in a shorter period of time and did not have to leave the gear in the water to be subject to storm events. The net gear returned home with the fisher after several hours of evening fishing.

#### Coastal Development and Habitat and Water Quality Degradation

Coastal development for private homes, hotels and tourism related facilities, marinas and industrial facilities have resulted in the loss of important nursery habitat for commercially and recreationally important finfish and shellfish species. Coastal mangrove communities have been and continue to be the most seriously impacted habitats. Inshore water quality has been degraded by non-point source sediment runoff, industrial discharges (rum effluent and sewage), leachate from landfills and dredging activities.

#### Resource Protection

##### Fisheries Advisory Committee Recommendations

Members of the Fisheries Advisory Committees (FAC) in the U.S. Virgin Islands recognized the signals of overfishing and made recommendations to limit fishing effort by instituting a moratorium on the issuance of new commercial fishing licenses. The moratorium went into effect in August 2001. The moratorium would remain in effect until a new license program was developed for commercial and recreational fishers. The FAC's are currently working on a licensing program that would give greater identity to commercial fishers, limit the entry into the fishery, restrict the use of certain gear types, update fisheries regulations, establish new license fees and develop a recreational license to identify the significance of this user group. The FAC on St. Croix has also recommended that gill/trammel nets be banned. Other recommendations of the FAC that have come to fruition include the establishment of seasonal closures to protect spawning aggregations of red hind and mutton snapper in the territory, seasonal closures/size limits and bag limits for conch, establishment of marine reserves and support of no take areas on the east end of St. Croix.

##### Marine Reserves and Territorial Parks

Marine reserves have been recognized as essential tools for the conservation of marine and fisheries resources and have gained popularity in the territory over the last decade. Several marine reserves have been established in the Virgin Islands (Cas Cay and Benner Bay Marine Reserve, Marine Conservation District, Salt River Marine Reserve and

Wildlife Sanctuary). In 2002, the Government of the Virgin Islands established a territorial marine park program and designated the first territorial park on St. Croix, the East End Marine Park. The East End Marine Park (The Nature Conservancy, 2002) encompasses 17 miles of shoreline and extends a distance of three miles offshore to the boundary of territorial waters. Most of the inshore waters have been designated as a no-take zone. With the development of the East End Marine Park, job opportunities may develop for fishers in a new catch and release guide fishery, or as park rangers, interpreters, concessionaires or in other related businesses.

#### National Monuments

Presidential Proclamation #7392 in January 2001 established a new national monument off St. John (Virgin Islands Coral Reef National Monument) and significantly expanded National Park Service's monument off St. Croix (Buck Island Reef National Monument). Under interim regulations, no extractive uses are permitted within the monuments.

#### Spawning Area Closures/Seasonal Closures

The Caribbean Fishery Management Council has established seasonal spawning area closures in federal waters for red hind (grouper) off the south coast of St. Thomas and off the east end of St. Croix (Lang Bank) during the months of December, January and February. A joint territorial/federal spawning area closure has also been established for mutton snapper off the southeast coast of St. Croix from March through June annually. No fishing is permitted within the closed area. Annual seasonal closures for conch during the months of July, August and September, have been established in federal waters to complement those regulations enacted in territorial waters.

#### Fisheries Enhancement Program

In an effort to redirect fishing pressure from depleted inshore reef fish resources to under-exploited, seasonally abundant offshore pelagic resources (tuna, dolphin and wahoo), the government of the Virgin Islands has developed a program to install fish aggregating devices (FADs) in offshore waters (Friedlander et.al., 1994). The FADs or fish buoys are 58" diameter steel spheres, mounted with a radar reflector and strobe light (registered with the U.S. Coast Guard as a private navigational aid) and anchored in water up to one-mile in depth. The FADs attract smaller baitfish and juvenile tunas, which in turn attract larger pelagic species for harvest. The FAD program has proved to be very effective in concentrating seasonally abundant pelagic fish species and is very popular with commercial and recreational fishers. Fishers travel a shorter distance and have reduced trip costs and greater returns for their fishing effort.

#### Essential Fish Habitat

Under the Magnuson-Stevens Fishery Management and Conservation Act (M-S Act), the fisheries councils were required to describe and identify essential fish habitat (EFH), identify actions to encourage the conservation and enhancement of EFH and identify and minimize adverse effects of fishing on EFH (Caribbean Fishery Management Council, 2003). A coalition of environmental groups brought suit challenging the NOAA Fisheries approval of the EFH Fisheries Management Plan. The court found that the EFH amendments were in accordance with the M-S Act but held that the Environmental

Assessments on the amendments were in violation of the National Environmental Policy Act (NEPA). NOAA Fisheries entered into a Joint Stipulation with the plaintiff environmental organizations that called for each affected Council to complete an Environmental Impact Statement (EIS). Within the EIS are proposed alternatives to reduce adverse effects of fishing on EFH and reduce overall fishing effort by 30% in federal waters of the Exclusive Economic Zone. These alternatives will undergo a series of reviews and public meetings prior to final adoption.

### Fisheries Challenges

The establishment of marine reserves and territorial parks, seasonal closed areas for spawning aggregations for grouper and snappers and creation and expansion of national monuments has drastically reduced the area of fishable waters in the territory and adjacent federal waters. This situation has further been compounded by the limited shelf platform surrounding the islands and non-fishable areas resulting from development or industrial impacts. There simply are too many fishers for the limited resources available. As the fishable areas become reduced in size, fishing effort becomes concentrated and competition for the available resources increases. Priority must be given to issues of licensing and fisheries regulations revision in the territory, reduction of fishing effort, use of gear that minimizes impacts to essential fish habitat and over-harvesting of resources, expansion of fisheries enhancement programs, exploration of loan or grant programs to increase fisher opportunities and research of viable employment alternatives for fishers.

Recent opinion surveys in the territory have echoed a common need for the management and conservation of the marine resources if we are to be successful. Adequate funding must be provided for the enforcement of territorial and federal fisheries regulations (Uwate et al., 2001; Gordon and Uwate, 2003; Messineo and Uwate, 2004). Many good management regulations currently exist. However, the condition of the marine resources is only as good as the enforcement provided for their protection and conservation. The Division of Environmental Enforcement was established in the Virgin Islands Code in 1972 for the sole purpose as conservation officers to protect our resources. Unfortunately, with reduced funding and manpower, and expanding Department enforcement responsibilities, little time is actually left for the purpose that they were created to perform. Respect for fisheries resources can be accomplished through a sound environmental education program and the dedication of officers with the sole responsibility of enforcing fisheries regulations.

Fisheries management is not the responsibility of only fishers, but of all resource users and those that have impacts, direct or indirect, on the ecosystem affecting those resources. We must all recognize our responsibility in the conservation and management of our marine resources so that successive generations of Virgin Islanders can experience, appreciate and enjoy what we now have, understanding that it can be so easily lost.



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