

# FISHERIES OF THE VIRGIN ISLANDS

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The northeastern Caribbean from Puerto Rico to Antigua has been extensively explored during the past 10 years by various interests seeking to locate exploitable stocks of fish. From a large-scale commercial standpoint, these efforts have been fruitless. Consistently small catches have been reported by the Puerto Rico Department of Agriculture, the UNDP/FAO Caribbean Fishery Development Project, the Japanese fishing operation based on St. Martin, and the National Marine Fisheries Service following exploratory cruises.

Plankton productivity is very low in this region relative to known productive fishing grounds of the world. Hargraves, Brody, and Burkholder (1970) have shown that nutrients are extremely limited due primarily to sparse runoff from the islands, lack of upwelling, and unfavorable currents that carry nutrients out of the region).

## The Problems

Given the restricted natural productivity of the area, the effects of man-imposed limiting factors are intensified. Minor fishing pressure from handline and pot fishing efforts already appears to have diminished the stocks of reef fish in the shallow shelf waters south of St. Thomas, where much of the small-boat Virgin Islands fleet operates. Pollution from dredging, municipal sewage, garbage dumping, and oil spills has rendered the marine environment intolerable for most commercially important fishes around several bays of the south coasts of St. Croix and St. Thomas. The reclamation of shallow bays and mangrove forests for residential, resort, and industrial development poses an ever-increasing threat to the fisheries. These protected areas, so important as nursery and feeding grounds for fish and shellfish, are methodically being destroyed in the Virgin Islands by man-induced siltation and filling.

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This study was conducted in cooperation with federal assistance programs of the National Marine Fisheries Service (Public Law 88-309) and Bureau of Sport Fisheries and Wildlife under Dingell-Johnson Program. The V. I. Government provided matching funds.

## Ciguatera Fish Poisoning

The fishing industry in the northeastern Caribbean (and especially the Virgin Islands) is further hampered by the problem of ciguatera fish poisoning. Ciguatoxin builds up over a period of time in the muscle and viscera of fish representing a broad range of species, feeding habits, size, and geographical location in the tropics. Often two fish of the same size and species caught in the same pot will produce debilitating illness in all people who eat one fish--while those who eat the second experience no harmful effects at all. Individuals of all commercially important bottom fish in the northeastern Caribbean have been reported as occasional or common carriers of ciguatoxin (Halstead, 1970). Though toxic fish are uncommon, many restaurants and even local housewives are unwilling to run the small risk of contracting the severe nervous system disorders precipitated by unintended consumption of a ciguatera-carrying fish. Despite many years of investigation in the Virgin Islands and Hawaii (the problem is more serious around some Pacific Islands), it is impossible to tell (except through feeding and bioassay tests that are sometimes inaccurate) whether or not a fish is toxic. Indeed, the chemical nature of the toxin and its source at the beginning of the food chain have not even been clearly defined. Robert W. Brody at Caribbean Research Institute is working on the toxicology and epidemiology of ciguatera in the Virgin Islands, with Sea Grant financial support.

## Modern Fishing Methods Handicapped

Modern high-yield fishing methods cannot be used in the Virgin Islands. Purse seining is useless because schools of pelagic fish are small, scattered, and not confined by thermal boundaries. Trawling of any sort is impractical because the fish populations are

COMMERCIAL FISHERIES REVIEW  
Reprint No. 924



dispersed and the good bottom habitats are huge jagged coral formations, steep irregular slopes, or mounds and canyons of rocks and coral. Longlining is susceptible to severe tangling amidst the rocks and coral, and pillaging by sharks, unless the gear is designed for large, aggressive species.

Fishing in the northeastern Caribbean is done almost exclusively from 16-22 ft. open boats with outboard motors. Most fish are caught by handlining or pot fishing. Power haulers and depth finders are seldom used. Marketing systems, shore support facilities, and cooperative activities are virtually nonexistent. Swingle, Dammann, and Yntema (1970) report that 400 individuals in the U.S. Virgin Islands earn at least part of their livelihood from fishing. Most fishermen hold down at least one other job. The market potential would allow a great deal more income from fishing if it were possible to locate greater stocks of nonciguatoxic fish and to equip fishermen for catching them more efficiently.

#### RECENT DEEP WATER FISHERY RESEARCH

Exploratory fishing accomplished through the Caribbean Research Institute (CRI) on St. Thomas and the UNDP/FAO Caribbean Fishery Development Project (CFDP) on Barbados in 1970 and 1971 indicates that commercially exploitable populations of snapper and grouper exist along the shelf margins of the northeastern Caribbean islands. The CRI work was done around the periphery of the northern Virgin Islands shelf and St. Croix (see map), primarily with multiple hook-line rigs on mechanical reels. The most successful CFDP explorations were realized on the northern edges of Saba, Anguilla, and Barbuda banks, using Z-type Antillean fish pots. Efforts around the rest of the islands of the Greater and Lesser Antilles generally yielded poor catches.

#### Fishing In Dropoffs

The resident shelf-edge snapper and grouper populations are concentrated around the slopes and cliffs of the dropoffs in 30 to 200 fathoms (see graph). The methods used for fishing in this situation (pots, long lines, and mechanical reel hook-line) have severe limitations. Rough seas, rapid drifting, and the infeasibility of anchoring make all three

types of gear very difficult to set within the narrow limits of the steep shelf slopes. Hookline fishing is fairly efficient if the wind is right either for drifting parallel to the shelf margin or for anchoring up on the top of the dropoff. The latter method can waste much time if none of the scattered schools happens to be near the boat. Pot fishing is the most productive in areas where the slope is less than 60 degrees. Well-baited pots that remain stationary on the slope will commonly catch 50 lbs. of fish or more per 6-12 hour set. Longlining can also be productive in sets of short duration on the gentler slopes, if the boat has a good crew and power hauler. Unfortunately, there are very few locations around the northeastern Caribbean island shelf margins that are not too steep for set gear fishing. Only about one-third of the total shelf slope area around the Virgin Islands is conducive to long-line or pot fishing.

#### 1314 Fish Tested

The principal deepwater shelf slope species in this region (silk, blackfin, voraz, black, and vermilion snappers, and misty groupers) are considerably less prone to be ciguatoxic than their relatives that inhabit the shallow shelf waters. Of 1314 deepwater snappers and groupers tested by the Virgin Islands project through controlled human consumption, only four were toxic. All four were large, old fish (3 were misty groupers over 25 lbs.). They were caught (see map) where the shallow-water species are known to have a high incidence of ciguatera (Brownell and Rainey, 1971). The CFDP has marketed tens of thousands of silk and vermilion snapper from the Caribbean with no reported incidents of poisoning. The other species under consideration have always been eaten extensively throughout most of the region. This has resulted in only very occasional cases of ciguatera. Because of their exceptional taste, fine texture, culinary versatility, and eye appeal, the deepwater snappers and groupers command premium prices on the sparsely supplied local markets and the hotel-restaurant circuit.

#### DEEP WATER COMMERCIAL FISHES

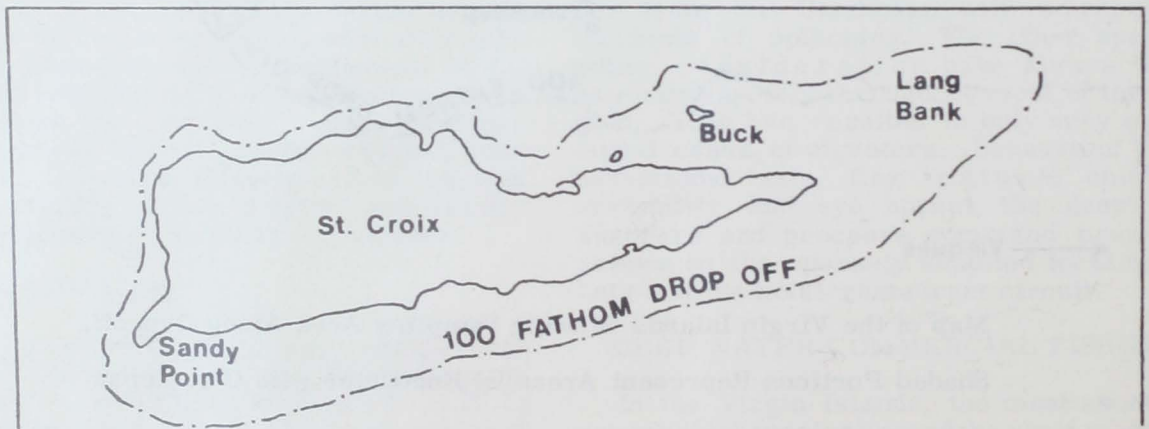
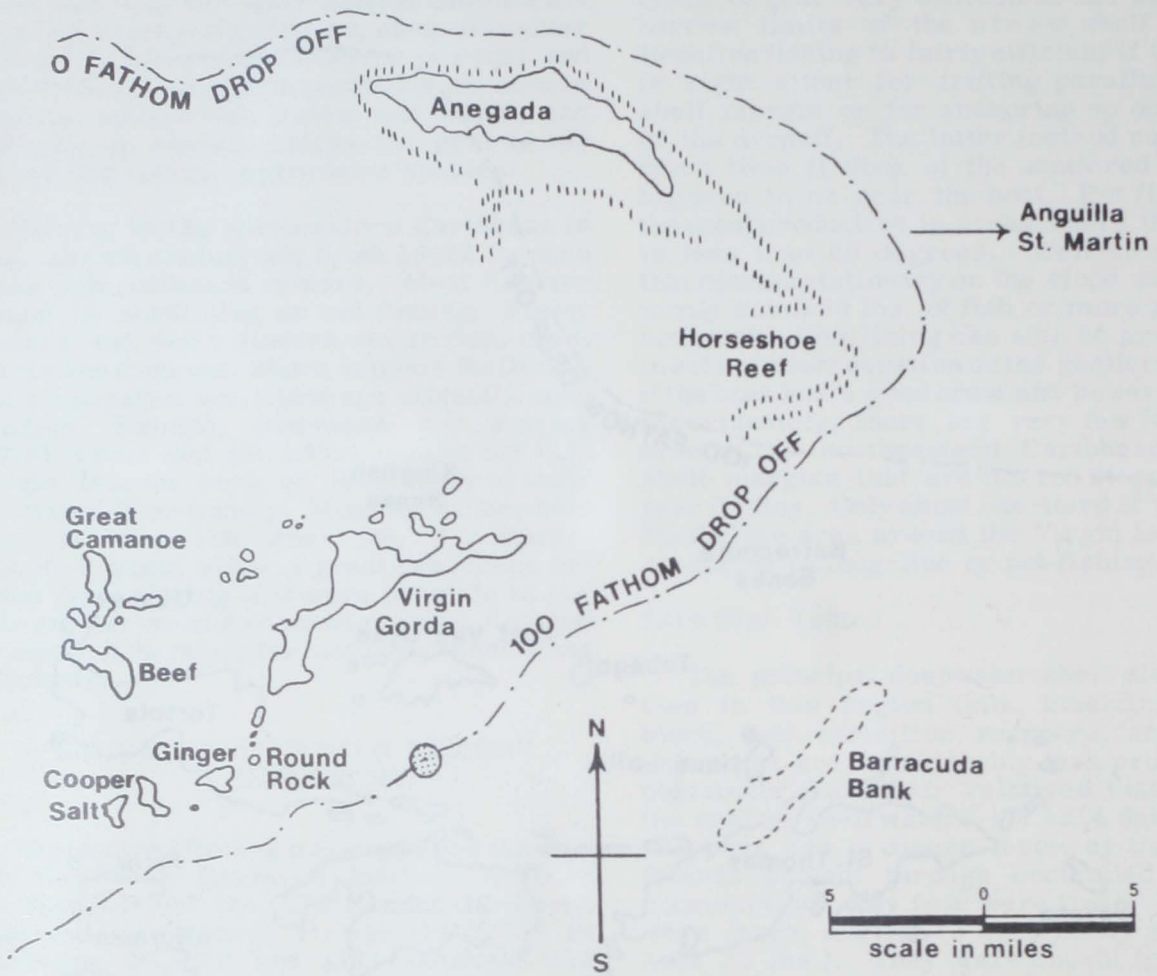
In the Virgin Islands, the most abundant commercial species around the shelf margins is the silk snapper (*Lutjanus vivanus*); this ranges from 40 to 175 fathoms (see graph). Blackfin snappers (*Lutjanus buccanella*) are abundant in a shallower domain (30 to 125



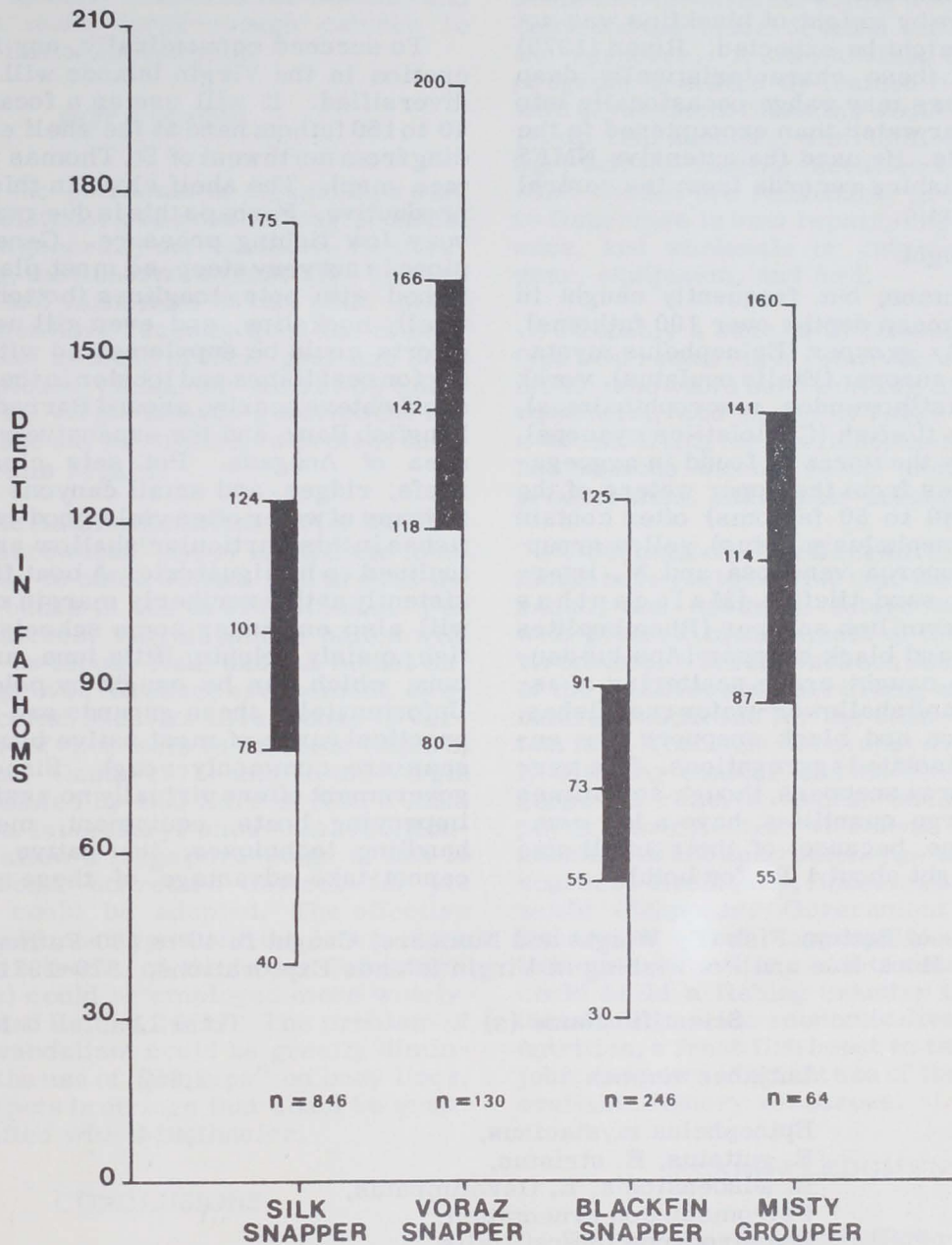
Map of the Virgin Islands Showing Sampling Area Along Dropoff.

Shaded Portions Represent Areas of Encounter with Ciguatera.





St. CROIX  
(40 miles due south of St. Thomas)



Depth Distributions of Four Virgin Islands Deep Water Fishes. Lines Represent Total Range, Shaded Bars Indicate One Standard Deviation on Either Side of the Mean. The 64 Misty Groupers Include 16 Caught on CFDP Cruises in the Northeastern Caribbean in 1970.

(From Brownell and Rainey, 1970)



fathoms). Since most exploratory fishing in this project was done in 60 or more fathoms, the percentage by weight of blackfins was not as great as might be expected. Rivas (1970) showed that these characteristically deep water snappers may range occasionally into even shallower water than encountered in the Virgin Islands. He used the extensive NMFS exploratory fishing records from the central western Atlantic.

#### The Fish Caught

Less common, but frequently caught in deep water (mean depths over 100 fathoms), are the misty grouper (*Epinephelus mystacinus*), queen snapper (*Etelis oculatus*), voraz snapper (*Pristipomoides macrophthalmus*), and blackline tilefish (*Caulolatilus cyanops*). Of these, only the voraz is found in aggregations. Catches from the upper waters of the shelf edge (40 to 60 fathoms) often contain red hind (*Epinephelus guttatus*), yellow groupers (*Mycteroperca venenosa* and *M. interstitialis*), sand tilefish (*Malacanthus plumieri*), vermilion snapper (*Rhomboplites aurorubens*) and black snapper (*Apsilus dentatus*). Also caught are a scattering of assorted jacks and shallower-water reef fishes. The vermilion and black snappers are encountered in isolated aggregations. The vermilion and voraz snappers, though sometimes caught in large quantities, have a low commercial value because of their small size (average weight about 1 lb. for both).

#### PROBLEMS AND PROMISE OF FISHERY DEVELOPMENT

To succeed economically, any fishing operation in the Virgin Islands will have to be diversified. It will use as a focal point the 40 to 150 fathom band at the shelf edge extending from northwest of St. Thomas to Anegada (see map). The shelf slope in this region is productive. Perhaps this is due mainly to the very low fishing pressure. Generally, this slope is not very steep, so most places can be fished with pots, longlines (bottom and vertical), hook-line, and even gill nets. These efforts could be supplemented with pot fishing for reef fishes and lobster in the shallower shelf waters nearby, around Barracouta Bank, Kingfish Bank, and the expansive reefs in the area of Anegada. Pot sets close to patch reefs, ridges, and small canyons in 10 to 30 fathoms of water often yield good catches; the fishes in this particular shallow area are not inclined to be ciguatoxic. A boat fishing consistently at this northerly margin of the shelf will also encounter some schools of pelagic fish, mainly dolphin, little tuna, and blackfin tuna, which can be caught by pole and line. Unfortunately, these grounds are beyond the practical range of most native boats, and the seas are commonly rough. Since the local government offers virtually no assistance for improving boats, equipment, methods, and handling techniques, the native fishermen cannot take advantage of these grounds'

Species of Bottom Fish (By Weight and Numbers) Caught in 40 to 180 Fathoms by Hook-line and Pot Fishing in Virgin Islands Explorations, 1970-1971

Species	Scientific Name (s)	Total Lbs.	No. of Fish
Silk snapper	<i>Lutjanus vivanus</i>	2,352	846
Groupers (9 species)	<i>Epinephelus mystacinus</i> , <i>E. guttatus</i> , <i>E. striatus</i> , <i>E. adscensionis</i> , <i>E. flavolimbatus</i> , <i>Petrometopon cruentatum</i> , <i>Mycteroperca interstitialis</i> , <i>M. venenosa</i> , <i>Cephalopholis fulva</i>	1,014	69
Blackfin snapper	<i>Lutjanus buccanella</i>	595	246
Other snappers (7 species)	<i>Lutjanus jocu</i> , <i>L. analis</i> , <i>L. purpureus</i> , <i>Rhomboplites</i> <i>aurorubens</i> , <i>Pristipomoides</i> <i>macrophthalmus</i> , <i>Apsilus dentatus</i> , <i>Etelis oculatus</i>	377	195
Other species (5 genera)	<i>Caulolatilus</i> , <i>Seriola</i> , <i>Caranx</i> , <i>Malacanthus</i> , <i>Haemulon</i>	365	36



potential. At the same time, considerably larger boats with more sophisticated gear would tear up their nets (and the bottom) and would not make large-enough catches to justify the initial investment.

### POT FISHING

Beyond the problems of ciguatera, rough seas, long distances to good fishing grounds, and bottoms generally not conducive to effective fishing, the fishermen must also contend with theft and vandalism of fish pots. Many pot fishermen have recently gone out of business because so much of their gear has been stolen, picked clean, or destroyed by thieves. The Virgin Islands government refuses to make any provisions to protect fishermen "in this regard."

The basic flat Antillean fish pot (of the "S", "Z", or "arrowhead" type) is still the most effective way to catch bottom fish around the Caribbean banks in one to 200 fathoms. For the best catches, they should be baited with fresh oily or bloody fish, and the funnel entrances improved to reduce escapement. Scuba studies of fish behavior in response to various types of pot sets in Jamaica (Munro, Reeson, and Gaut, 1971) and in the Virgin Islands (assisted by Lou Barr of NMFS Auke Bay, Alaska laboratory) show that traditional funnels allow a large percentage of fish to escape. Some nonreturn devices for pot apertures could be adapted. The effective pear-shaped funnel types with the inner edges turned down (some of the better fishermen build them) could be employed more widely (Brownell and Rainey, 1971). The problem of theft and vandalism could be greatly diminished with the use of "pop-ups" on buoy lines, or running pots in strings that could be grappled and lifted with a pot hauler.

### CONCLUSIONS

Though the delightful Caribbean climate makes fishing in the Virgin Islands region a pleasant activity, the catch per-unit-effort is extremely low, especially in the long run. For fishermen to make a decent living, and local markets to offer an adequate supply of fresh fish, fishermen and government must make an organized effort to establish and carry out a program of fishery development.

If there is proper management, a small fleet of fast 22-25-ft. fiberglass displacement hull boats with mechanical haulers could increase catch and meet local demand without depleting the resource. A standardized boat-building program operated by trained fishermen and with government financing would be necessary. Basic fish handling, distribution, cold storage, and ice-making facilities are essential. Also needed are reasonably priced services to fishermen in boat repair, engine maintenance, and wholesale or duty-free supply of gear, equipment, and fuel.

Probably a 30 to 40 ft. lobster or shrimp-type boat requiring a relatively small investment--and with a hard working crew, efficient equipment, and plenty of range--could yield a decent living for two fishermen. This could not be done without better marketing, gear procurement, and repair arrangements.

Unfortunately Caribbean island governments have yet to realize that their economic, social, and aesthetic future depends upon well-planned management of the marine environment. There must soon occur a reversal of the trend toward sacrificing all human and natural resources for the sake of developing tourism. The short-term approach of severely altering coastal marine environments to construct resorts, and to channel all manpower into tourist services will result in the unbalanced and destructive use of certain resources. Eventually, fishermen and farmers would disappear. Government investment, fishermen effort, appropriate legislation, fisheries extension, and training programs could build a fishing industry in the islands that would provide economic diversity, better nutrition, a fresh fish boost to tourism, more jobs, and more efficient use of the limited but available fishery resources.

### ACKNOWLEDGMENTS

FY 1971 Virgin Islands fisheries research was supported by the National Marine Fisheries Service under Public Law 88-309 (Project No. 2-121-R), and the Bureau of Sport Fisheries and Wildlife under the Dingell-Johnson program (Project No. F-6). Required matching funds were provided by the V.I. Government. The graph and map were prepared by Barry A. Smith.

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