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A census of US Virgin Islands commercial fishers at the start of the 21st century

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Abstract A census of the commercial fishers of the U.S. Virgin Islands (USVI) was conducted from July 2003 to January 2004 to determine the socioeconomic aspects of the fishers and to describe equipment used in the fishery. USVI fishers had a mean age of 50.5 yrs and on average had fished almost 23 years and planned to continue to fish for the rest of their lives. The fishers do not have much education as over 50% of the fishers had not completed high school. The St. Thomas/St. John District (NVI) fishery was dominated by trap fishers catching mainly reef fish and lobsters. They fished an average 2.6 times per week during an 8 hrs trip. In contrast, St. Croix District (STX) fishers were more likely to target pelagic fish and deep water snappers. NVI fishers have been fishing longer than STX fishers. NVI fishers are slightly younger and slightly better educated than STX fishers. All fishers surveyed were male. More NVI respondents worked as full time fishers. The fishers targeted a variety of fin fish and shellfish with the most common categories being reef fish and coastal pelagic fish. A wide range of fishing gear including traps, lines, nets and scuba were used. About 50 NVI fishers used more than 7,500 fish traps, modified lobster traps, and plastic lobster traps. In STX, traps were not as commonly used. Instead fishers diversified into other gears such as multi-hook vertical setlines, gill and trammel nets, and scuba. Fishing using hand lines or less commonly, rods and reels, was done by most fishers. Fishing was usually performed in the day.

Keywords Reef fishery, Caribbean, small scale fishery, socioeconomic survey

Introduction

The marine environment in the northeast Caribbean contains extensive shallow water and deepwater (45–60m) hermatypic coral reefs with associated seagrass and mangrove communities. Fishers of the northeast Caribbean have a long history of harvesting the resources of these habitats. Until recently, fishing has been confined to nearshore environments. However, as the human populations on the islands increased and technology advanced during the 20th century, fishers have ventured offshore and adapted their fishing techniques and gears to target new and different fish stocks in deeper water habitats.

This report describes a census of the socio-economic and demographic characteristics of comercial fishers of the US Virgin Islands (USVI). The USVI lies in the northeast Caribbean (Fig. 1) and consists of three major islands, St. Thomas and St. John and St. Croix, and about 50 cays (Fig. 2). St. Thomas and St. John (the northern USVI) lie on the Puerto Rico Bank that extends from western Puerto Rico to eastern Anegada in the British Virgin Islands (Fig. 2). St. Croix (STX), the largest island in the USVI, lies 65 km south of St. John and is separated from the Puerto Rico Bank by a deep trench. Greater than 80% of the USVI insular shelf is in the northern USVI (NVI) (St. Thomas/St. John District) (Fig. 2). The NVI shelf is ~12 km wide to the south of the islands and 32 km wide to the north. The depth of water over most of the shelf is >20m, commonly 35–40 m deep. The STX shelf is shallower (< 20 m deep) and considerably smaller (~200 km^2) than the shelf of the NVI (~850 km^2). Most of the STX shelf, except for Lang Bank to the east of STX, is within the 3 nautical mile (~5 km) territorial jurisdiction. On the northwest side of STX, the shelf edge may be only a 100 m from shore.

Although surveys of the commercial fishery of the USVI go back to at least 1930 when Fiedler and Jarvis (1932) conducted a survey of the 85% of the fishers and described the fishers and fisheries of St. Thomas, St. John and St. Croix, the last comprehensive survey of the entire USVI was conducted 36 years ago (1967-68) when Swingle et al. (1970) surveyed an estimated 69% of full-time fishers and 25% of part-time fishers.

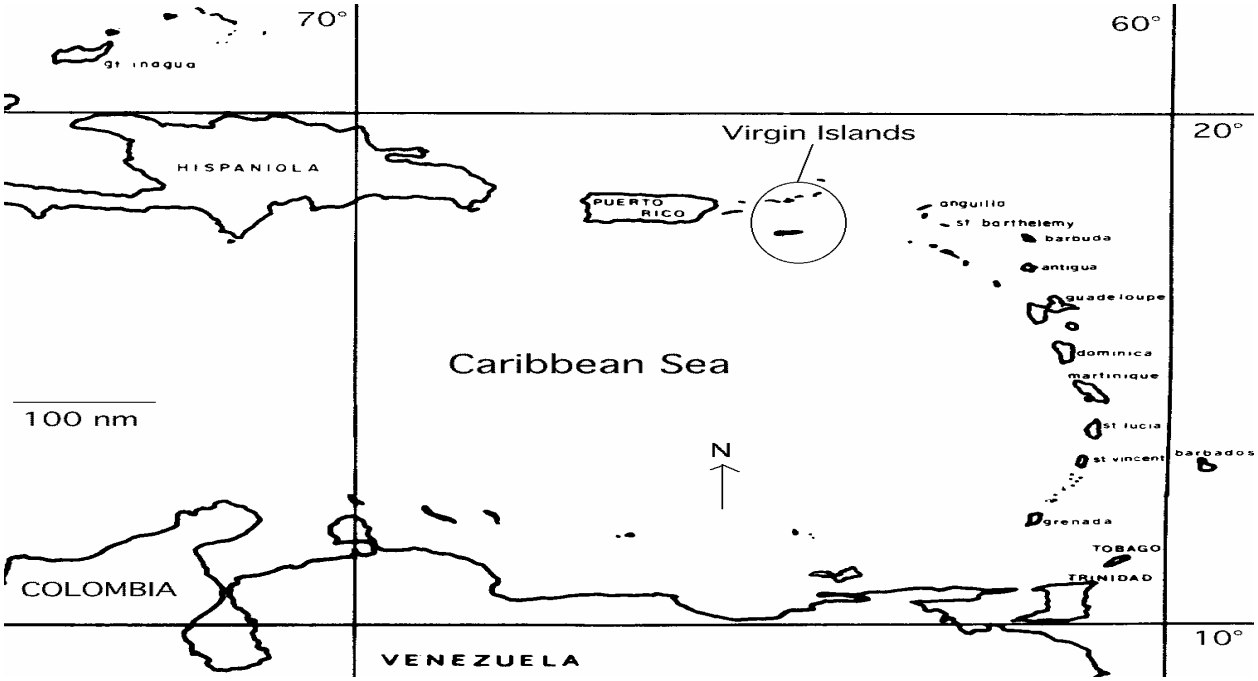

Fig. 1: Geographic location of the US Virgin Islands in the Caribbean.

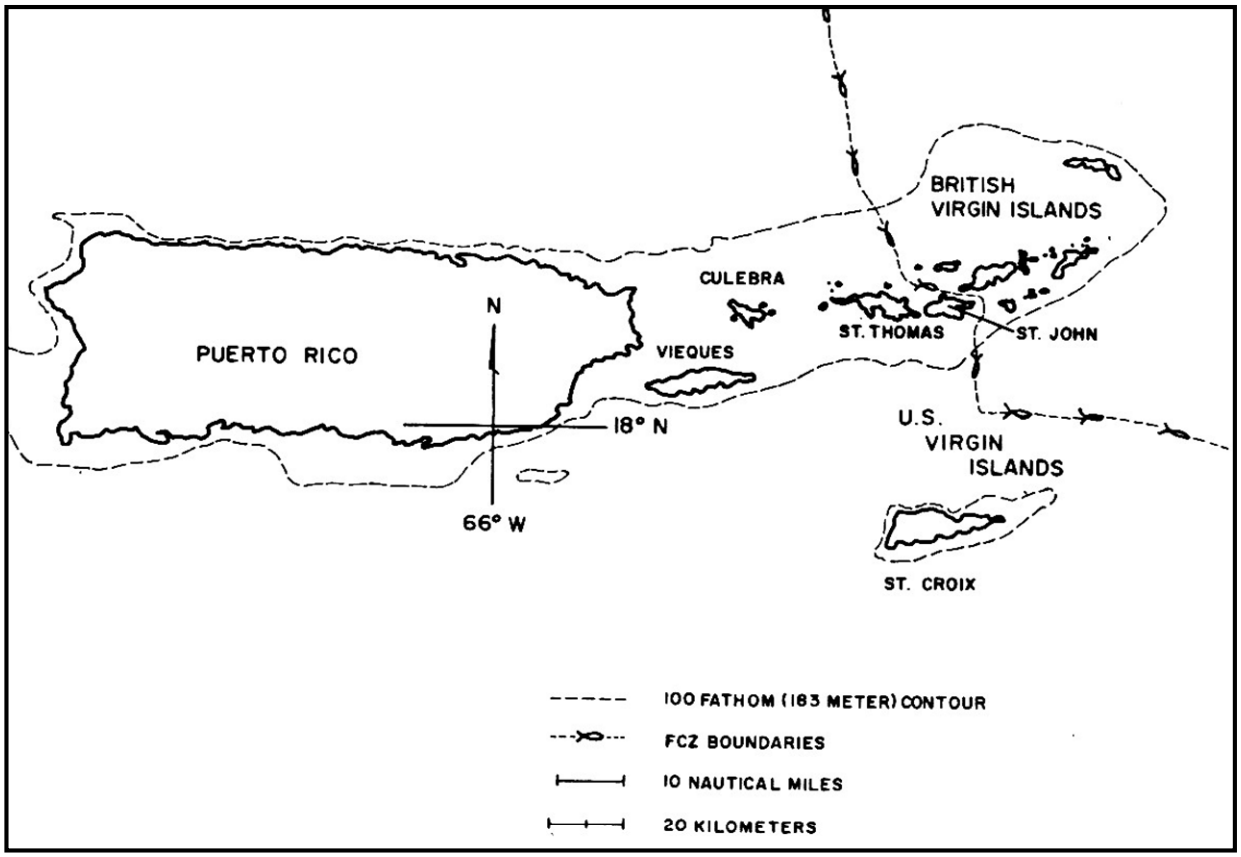

Fig. 2: Map of the US Virgin Islands in relationship to the other US territory, Puerto Rico

Current and detailed information about the socio-economic and demographic characteristics of USVI commercial fishers was needed at the start of the 21st century. This census provides information that assists in determining trends in the socioeconomic and demographic characteristics of these fishers.

Methods

A total of 323 commercial fishermen were interviewed, 116 in NVI and 217 in STX between July 2003 and January 2004. The fishers interviewed were selected from the VI Department of Planning and Natural Resources (DPNR) list of licensed commercial fishers. Based on Holt and Uwate's (2004) figures over 70% of licensed commercial fishers in NVI. All the licensed commercial fishers in STX were interviewed.

The survey instrument was modified by DPNR, Division of Fish and Wildlife (DFW) staff from the questionnaire used in the periodic census of fishermen, gear units, and fishing vessels in Puerto Rico (Matos Caraballlo and Torres Rosado 1989). Pilot interviews were conducted with several commercial fishers and slight modifications were made to the questionnaire. A training program was conducted for interviewers. Completed questionnaires were reviewed and further information or clarification was requested from the interviewers if required. Respondents were contacted in each district to verify that the surveys had been conducted.

Results

NVI port agents conducted successful interviews with 114 of the 160 licensed fishers. Two licensed fishers refused to be interviewed in NVI. Attempts to contact the remaining 46 NVI were unsuccessful. A total of 223 questionnaires were completed in STX, which represents all the licensed commercial fishers.

Collectively the fishers identified themselves as "black or West Indian" (38.5%), Hispanic (33.1%) or French (16.7%). However, there were major differences in the "ethnicity" of fishers in the NVI and STX. Most fishers in the NVI were descendents of French immigrants (55.2%-both African and European descent) or "black" (32.5% or 38.6% including those who responded black French). Most commercial fishers in STX were either Hispanic (48.4%) or black (38.5%). Almost all of the licensed fishers were men.

There was no significant difference in the age of fishers in either district (two-tailed t-test = 1.96, p = 0.06, df = 326) (Fig. 3). The oldest licensed commercial fisher was 85 years old and resided on St. Thomas. The modal age class in NVI was 41-50 yrs (Fig. 3), while in STX the modal age class was 51-60 yrs.

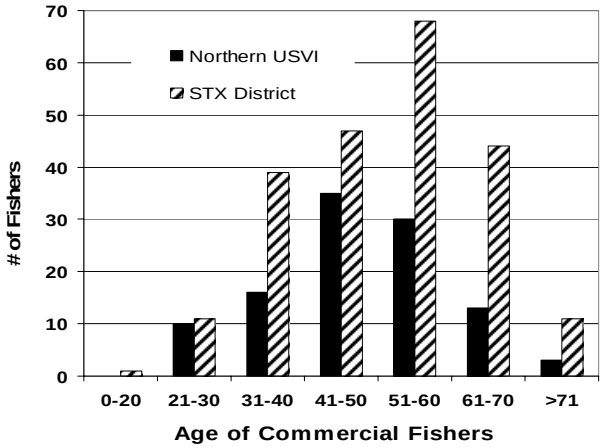

Fig. 3 Age distribution of commercial fishers

Licensed fishers fished an average of about 22.8 years, ranging from 0 to 67 years. A two-sample t-test (equal variances) revealed that there was a significant difference in the number of years respondents had fished in the two districts (t = 2.03, df = 328, p = 0.04). Almost 50% of NVI fishers had fished for 16 to 30 years while only just over 40% of STX fishers had fished for this period. There was also a distinct difference in the length of time fishers expected to fish in NVI compared with STX. Of NVI fishers, 74% expected to continue to fish for the rest of their lives compared with only 41% of STX fishers.

NVI fishers had a significantly higher education level than fishers in STX (Wilcoxon Rank Sum Test–U Statistic = 4.07, N = 318, two-tailed $p < 0.001$). Most fishers (58.7%) had not completed high school with a higher percentage of fishers completing high school in the NVI (51.9%) compared to STX (36%).

Multi-species reef fish was the most common category of fish harvested by fishers in both districts (82.3%) (Table 1). Deepwater snapper was the next most common category (42.3%) fished by STX fishers, but was seldom fished on NVI (4.5%). Deepwater pelagic fish were also more commonly targeted in STX (33.0%) than in NVI (9.8%) where coastal pelagic fish were targeted by a higher percentage of fishers (Table 1). Lobsters were an equally important target species in both districts. Conch were a more important fishery in STX (84 fishers - 39%) than in NVI (10 fishers -8.9%). In contrast, whelk, an intertidal mollusk, was fished by more fishers in NVI (14.3%) than in STX (4.7%). Most fishers targeted fish in at least 2 to 4 different categories. Only 30.4% of the NVI fishers and 19.1% in STX targeted fisheries products in only one category. While traps were still an important fishing gear, they were less important in STX than in the NVI.

Categories of fish	NVI N[1]	NVI %	STX N	STX %	USVI N	USVI %
Reef fish	87	77.7%	182	84.7%	269	82.3%
Coastal pelagic	60	53.6%	80	37.2%	140	42.8%
Deep pelagic	11	9.8%	71	33.0%	82	25.1%
Deepwater snapper	5	4.5%	91	42.3%	96	29.4%
Bait fish	33	29.5%	31	14.4%	64	19.6%
Conch	10	8.9%	84	39.1%	94	28.7%
Whelk	16	14.3%	10	4.7%	26	8.0%
Lobster	40	35.7%	87	40.5%	127	38.8%
Total # responses	262		636		898	
Total # respondents	112	234.0%[2]	215	295.9%	327	274.7%

[1]N = total number responses to this question
[2] Percent is >100% because fishers fished >1 category.

Table 1 Distribution of fishers targeting fin and shell fish categories

The most common equipment onboard NVI fishing vessels was a winch, reflecting the importance of trap fishing. The most common equipment on STX vessels was an electric reel, reflecting the importance of deepwater snapper fishing in this district.

NVI fishers went on fewer but longer trips than STX fishers. STX fishers had an average of 3.3 trips per week compared with an average of only 2.6 trips per week for NVI fishers. Mean trip duration was 1.5 hrs longer in the NVI than in STX. When not fishing, fishers were usually involved in selling their catch, repairing their gear and/or maintaining their vessel. Fishing was generally a day operation with ~ 80 % of fishing trips < 9 hrs. The median time spent fishing was 6.5 hrs. Only two fishers, both in the NVI, reported conducting overnight fishing trips.

Almost all fishers went out with one helper and occasionally with a second helper. This was especially true in STX where 89% of fishers fished with at least one helper. Over twice as many NVI fishers fished alone (17%) or with other commercial fishers (29.2%) compared with STX (7.1% and 10.4%, respectively).

In the NVI, 77.3% of fishers considered themselves full time compared with only 61% of STX fishers (Table 2). Also, a higher proportion of the income of commercial fishers in the NVI was derived from fishing (74%) than in STX (64.5%) with approximately 75% of NVI fishers compared to 50% of STX fishers relying on fishing for more than half their income. Part time fishers who rely on <25% of their income from fishing are more common in STX (33%) than in the NVI (13%).

Discussion

Tropical marine fisheries, especially those associated with coral reefs, are often artisanal and / or small-scale with fishers targeting many different species using a variety of gear. Landing sites and sales points may be scattered throughout the coastal areas. All of this makes it difficult and relatively expensive to obtain accurate fisheries statistics. However, fisheries statistics are required for science based management. Since fisheries management is mainly management of fishers, it is imperative to have an adequate understanding of the socioeconomic characteristics of the people involved in the fishery and information on trends over time in these characteristics.

Since 1930, when the first comprehensive survey of fishers was undertaken by Fiedler and Jarvis (1930), the numbers of fishers has remained fairly constant while the population of the islands has quintupled. In 1930, the population of the USVI was 22,012 people and fishing provided a livelihood to about 2% of the population (Table 2). In 1968, the population had more than doubled to 55,000 people, but the number of fishers remained nearly the same. However, as a percentage of the total population, the number of fishers declined nearly 60% (Table 2). In 2003, the number of licensed commercial fishers again remained stable despite a further doubling of the USVI population. Again, the number of fishers as a percentage of the population declined 60% (Table 2).

Year	Full / Part time FT	FT %	PT	PT %	# Fishers	USVI Population	commercial fishers
1930[1]	n/a		n/a		405	22,012	1.8%
1968[2]	120	30%	280	70%	400	55,000	0.73%
'03-4[3]	215	67%	108	33%	383	108,612[4]	0.3%

[1] Fiedler and Jarvis 1932
[2] Swingle et al. 1970
[3] This survey

Table 2 Comparison of the number of commercial fishers between 1930 and 2003

In the NVI the commercial fishing industry was dominated by people of French descent (55% of fishers both African and European descent). The French ethnic community has a long fishing tradition in the USVI that goes back to 1867 when descendants of French colonists came to St. Thomas and established a community in Honduras (now known as Frenchtown) (Fielder and Jarvis 1932) and on the

north side of St. Thomas in the vicinity of Hull Bay (Downs and Petterson, 1997). The French community has long been recognized as knowledgeable about the fisheries resources of the NVI insular shelf (Morrill 1967). In STX, there is no ethnic group that has as strong a fishing identity as that of the French community on St. Thomas. Most fishers on STX identified themselves as Hispanic (48%) or "black" (42%). Many of the Hispanic fishers on STX are descendants of Puerto Ricans from Vieques who immigrated to the island in the 1930's.

In 1968, the average fisher in the USVI was almost 45 years old and had been fishing for 19 years (Swingle et al. 1970). There was concern that commercial fishing was attracting fewer of the younger generation because of the increase in better paying jobs in tourism and government (Swingle et al. 1970). In 2003, the average fisher's age was 5.5 years older than in 1968 (Swingle et al. 1970). The increasing age of commercial fishers and their declining numbers as a percentage of the population, indicates that commercial fishing continued to attract fewer of the younger generation. Although, the low number of recent entrants into the fishery (< 5 yrs) was, in part, a function of the moratorium on the issuance of new commercial fishing licenses that had been in effect since August 24, 2001, relatively few fishers stated that they started fishing even within the last 10 years.

Over half of STX fishers had completed only elementary school or junior high school compared to 20% of NVI fishers. The higher level of education reported by NVI fishers may be a function, at least in part, of the somewhat younger age of the fishers in this district. There is no comparable information on the education level of fishers from the two previous censuses (Fielder and Jarvis 1932; Swingle et al. 1970).

Commercial fishers have disagreed among themselves regarding whether part-time fishers should be allowed to be licensed as commercial fishers (USVI Government 1987). Part-time fishers usually have other employment and only fish on weekends or when they have free time from full time employment. However, in order for a fisher to sell the fish that they catch and/or use such traditional gears as traps and nets, they were required to be a licensed commercial fisher (Title 12 of the VI Code).

In 1968, 30% of fishers engaged in commercial fishing activities were full time fishers and 70% were part time (Swingle et al. 1970). In 2003, the percentage of full time fishers had more than doubled (Table 2). A typical fisher in 2003 fished three times a week with 1 -2 helpers for about 7 hrs each trip. Although the number of fishers has declined as a percentage of the population in 2003 compared to 1968, the number of fishers has remained stable. Given that the number of full time fishers has doubled since 1968, it is likely that fishing effort has concomitantly increased.

Trends in Fishing Gear and Fish Targeted

Artisanal and small scale tropical fishers are often day fishers who adapt their fishing techniques and gears to the habitat that is in close proximity to their island. Historically trap fishing was the primary fishing gear of the USVI. This gear targeted reef fish and traps were originally set close to shore where fishers could row or sail and pull their traps by hand. However, as technology improved, fishers bought outboard engines to access habitat further from shore. In conjunction with the improvement in technology, the population of the islands increased and the economic conditions improved, increasing the market for fish. As a result, fishers deployed more traps, purchased winches to haul the ever larger number of traps and diversified into new types of gear to harvest newly accessible offshore resources.

In 2003, most fishers still targeted reef fish (82%), but targeted other species as well. As reef fish have declined inshore (Rogers and Beets 2001; Garrison et al 2004), fishers have increasingly targeted deeper water resources. In the NVI this has primarily meant setting traps further off shore. However, on STX, a large portion of fishers target deepwater pelagic fish (33% of fishers) and deepwater snapper (42%). The popularity of these two fish categories in STX is a function of the limited shelf area and the proximity of deepwater to the island (Fig. 2). It is also a function of the increased frequency of hurricanes and the susceptibility of traps to hurricane damage, especially on the shallow St. Croix insular shelf. In 1989, Hurricane Hugo, a category 4 storm, wiped out the traps fishery on St. Croix. Many fishers did not replace their traps and instead switched to other gears.

Multi-species and multi-gear fisheries are common throughout the Caribbean (Munro and Smith 1983; Sary 2001). This was true in the USVI in 1987 (Tobias 1987) and continued to be true in 2003. Not only did fishers target a variety of fish species, they also targeted a wide range of habitats requiring different types of gear. In the following paragraphs we will describe some of the more common techniques and discuss the changes in their use.

Fish Traps

Fish traps (locally called "pots") have been the most widely used gear since the 1930's (Fielder and Jarvis 1932). Austin (1988) provided three reasons for their popularity:

1) Traps are the most effective small boat gear in the strong trade winds that buffet the USVI because

they can be left to fish for days and then hauled in the morning when it is often reasonably calm.

2) Other fishing techniques can be used to augment catches while the traps fish.

3) Traps effectively catch a wide diversity of reef fish that are not harvestable by other means.

Trap design has changed little but the materials used to construct traps have changed. In the 1930's, arrowhead traps made from mats of split vines woven into 2.5–5.0cm hexagonal mesh and braced with a framework of wood were common (Fiedler and Jarvis 1932). Because it lasted longer, STX fishers favored making traps from 0.3cm diameter marine cable, which fishers found discarded.

In 1968, arrowhead traps were still the most widely used gear and the principal method of harvesting food (Swingle et al. 1970). The traps were using new materials such as plastic coated or galvanized welded mesh chicken wire. Occasionally, the frame was made of reinforced steel instead of wood and a zinc anode added to prevent electrolysis. Mesh size ranged from 1.8 to 5.0 cm. Traps were still individually buoyed. The importance of traps to the fishers persisted until at least 1981, when > 80% of the fishermen use only traps (Olsen and LaPlace 1981).

Trap design in 2003 was much more diverse than in 1967. The traditional arrowhead traps were still popular but many fishers now commonly built square or rectangular traps and sometimes Z or S shaped traps. Most traps were built of reinforced steel and covered with plastic or galvanized mesh, though some fishers, especially on STX still used wood to construct the trap frame. According to Title 12, VIRR, the minimum mesh size was 1.5" (3.75 cm) hexagonal in STX and 2" (5 cm) square in NVI. Traps were required to have two escape panels in federal waters; so many traps were built to meet federal requirements, especially in NVI where trap fishing on the shelf outside the 3 nautical mile territorial limit was common. While individual traps were buoyed in STX, NVI fishers usually set their traps in a "string" with no buoy (D. Greaux pers. com.). The traps were connected by floating line and triangulation or, more commonly in 2003, GPS was used to relocate the traps. By setting the traps blind, the fishers minimized trap loss due to entanglement with vessel propellers, especially the propellers of large freighters and cruise ships that plied the waters around the USVI in large numbers (D. Berry, pers com.). It also made trap theft more difficult (D. Greaux and C. Berry, pers. com.).

In 1930, 85% of fishers were interviewed compared to only 38.3 % of fishers in 1968 (Table 3). In 2003, 83% of lobster and fish trap fishers in NVI were interviewed. On STX, all licensed commercial fishers were inter-viewed, but only 57 of 69 fishers (82.6%) who stated that they owned traps on the questionnaire reported on the number of traps owned. Assuming that fishers were randomly interviewed in the 1930, 1968, and 2003 surveys, an expanded estimate of the total numbers of traps in the fishery was calculated based on the percentage of fishers interviewed. There was over a 500% increase in the number of traps used by about the same number of fishers between 1930 and 2003 (Table 4). This indicates that although fisher numbers have remained stable, fishing effort has substantially increased.

Year	% fishers interviewed	# traps	Total # traps[1]
1930[2]	85%	1600	1,882
1968[3]	38.3%	838	3,296
2003[4]	82.8%	8642	10,409

[1] Total # traps = number of traps reported divided by % of fishers interviewed. This is an estimated value.
[2] Fiedler and Jarvis 1932
[3] Swingle et al. 1970
[4] This study

Table 3 Temporal changes in the number of fish and lobster traps used

Year	Total # Fishers	Fishers Sampled #	Fishers Sampled %	Fish pots	Lobster Pots	Beach seines	Cast nets	Vertical Set lines[1]	Hand lines[2]	Troll lines[3]
1930[4]	405		85%	1,600	0	40	113	25	204	68
1968[5]	400	153	38.3%	838	425	n/a	n/a	n/a	n/a	n/a
2003[6]	383[7]	339	88.5%	3,886	4,756	18	147	68	192[2]	118

[1] Fiedler and Jarvis called these trawl lines - description identical to vertical set lines in this study
[2] Number of hand lines used by anchor fishers
[3] Troll lines refer to a type of fishing. Troll fishers may use rods and reels or hand lines
[4] Fiedler and Jarvis, 1932
[5] Swingle et al., 1970, Table 1, p. 115
[6] This study
[7] Total number of licensed fishers during this study

Table 4 Distribution of fishing by gear type in 1930, 1968, and 2003

Nets

Tangle nets were used in the 1930's to catch turtles and woven from cotton seine twine (Fiedler and Jarvis 1932). The primary nets in use in 1967 were beach seines used to harvest bait, little tuna (*Ethynnus alletteratus*), or jacks (Swingle et al. 1970). No purse seines or gill nets were in use in 1967 (Swingle et al., 1970). However, small modified tangle nets were still used to catch sea turtles. Harvest of turtles was banned with the Indigenous and Endangered Species Act in the USVI (VI Code, Title 12). After 1987, fish nets had become a common component of the fishery (USVI Government 1987). In 2003, nets in NVI were not commonly owned by fishers, except for cast nets (Table 4). Trammel net and gill net ownership in STX was greater than NVI. Gill and trammel net use, often in conjunction with scuba, increased after Hurricane Hugo which destroyed fishers' traps. The number of gill and trammel nets in use in STX, combined with their effectiveness in catching fish was causing concern among STX fishers and the local government was considering the St. Croix Fisheries Advisory Committee's recommendation to ban these nets altogether.

Vertical set lines

In 1930, Fiedler and Jarvis (1932) recorded 25 "trawl" lines with a total of 735 hooks. Hooks were tied about 0.6m apart. "Trawl" lines appear to have been constructed and used as vertical setlines are today, though some "trawl" lines were deployed with floats on either end and were used in a similar fashion to surface long lines. This gear was fished in depths of 20 – 100m (Fiedler and Jarvis, 1932). In 1967, this type of gear was not mentioned although it was mentioned that fishermen fish in deep water (600-1200 ft) (180 – 360 m) while anchored (Swingle et al. 1970). Fishers called this "banking" and fished anchored at the edge of the shelf.

Much of the shelf edge is a steep cliff. In 2003, vertical set lines were commonly used, especially by STX fishers, to catch deepwater snapper and grouper along the insular shelf edge (Table 4).

Scuba and Other Gear

Scuba gear did not exist in 1930 and was not reported in 1967 (Swingle et al. 1970), although skin divers were mentioned in the harvest of conch and lobsters. In 2003, scuba was an important component of the fishery, especially in STX. Fishers used scuba gear to harvest conch by hand, lobster with a snare or by hand, to spear fish and to drive fish into trammel and gill nets. A new technique used in NVI using a PVC pipe and salted cowhide to attract lobsters generally required that divers use scuba gear to retrieve the PVC pipe and harvest the lobsters (Gomez pers. com.).

Hand lines and cast nets have remained a staple gear throughout the years. In 2003, most fishers used these gears at least occasionally. Most fishers used hand lines consisting of inexpensive plastic reels. However a few fishers, especially those targeting pelagic fish, used rods and reels. Cast nets were commonly used to catch bait to use for other fishing methods or for sale (Table 4).

Marketing and Sales

Most people idealize the USVI fisher and imagine them at sea engaged in fish capture. The reality is that most commercial fishers not only catch fish but they construct and repair their gear, repair their boats, and market their fish. They spend an average of 8 hrs per week selling fish, 3.2 hrs per week fixing his boat, and 4.1 hrs per week fixing his gear – totaling 15.3 hrs compared with an average of 21 hrs actually fishing.

In 1968, fishers sold their catch directly to the consumer with a few selling directly to commercial outlets (Swingle et al. 1970). In 2003, fishers sold their catch to a wide variety of customers including restaurants and customers at their landing site. In NVI, fishers also commonly sold fish along the road and at formal and informal fish markets. In STX, fishers commonly brought their fish home for personal use or sale.

In 1930, it was estimated that the catch could be increased by as much as 50% (Fiedler and Jarvis 1932). In 1967-68, while the number of fishers remained essentially the same as in 1930, the catch had increased (Swingle et al. 1970). They interpreted this to mean stocks were not in danger of being over fished and bottom fishing could be increased. Although Swingle et al. (1970) noted that the effects of pollution on fisheries nursery habitats were evident.

Conclusion

This study contributes to the basic demographic information of an artisanal / small scale tropical marine fishery that has been traditionally based on the harvest of coral reef resources. This type of information is essential to provide a scientific basis for managing this type of fishery. It provides information that can be part of a suite of data that can be shared among fishery managers, fishers, and other marine resource users when management plans and regulations are being developed.

One of the many challenges in management of artisanal / small scale fisheries is gaining sufficient trust of fishers to allow successful co-management between government agencies and fishers. If trust can be gained, then the traditional knowledge of fishers, as exemplified by the oral traditions of the French ethnic

fishers of St. Thomas (Morrill 1967), can be combined with the scientific information (such as this study) of fisheries managers to create adaptive and sustainable fisheries management strategies. Fisheries managers will need to be able to summarize scientific information and introduce management concepts clearly and simply. This is necessary, because, as exists in the USVI (this study), the majority of fishers have a low level of formal education that often ceased several decades ago. Fishers, in turn, will need patience and understanding to communicate their knowledge of fisheries resources to managers. Both groups will need to listen closely in order to successfully incorporate this knowledge into sustainable fisheries management strategies.

In the USA, NOAA Fisheries is increasingly emphasizing cooperative scientific research with fishers. The purpose of these cooperative research programs is to ensure sustainable fisheries management by utilizing the expertise of fishers on the water to ensure the accuracy of the data and by building fishers confidence in the scientific basis of fisheries management. These cooperative research programs will, hopefully, improve fisheries management and increase fishers support of fisheries management measures.

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