

# **Survey of Resident Participation in Recreational Fisheries Activities in the US Virgin Islands**

IVAN MATEO

*USVI Division of Fish and Wildlife*

*Rainbow Plaza 45 Marshall Fsted.*

*St. Croix, USVI 00841*

## **ABSTRACT**

The USVI Division of Fish and Wildlife (DFW) through its recreational fisheries assessment program is currently using various methods to gather information from all aspects of the recreational fishery. One of the sampling methods that the Division is currently evaluating is the use of telephone surveys to gather information from recreational anglers. A household telephone survey was conducted from December 1998 to July 1999. The USVI phone directory was divided in two strata: (1) St. Croix and (2) St. Thomas/St. John. Attempts were made to contact household units on each stratum listed in the US Virgin Islands telephone directory on a monthly basis. The response rate in St. Croix stratum was 75 % whereas the response rate in St. Thomas/St. John was 55 %. Of all household units contacted, 11 % of households in St. Croix and 13.5 % of St. Thomas/St. John stratum had at least one recreational angler. A number of 3,294 recreational anglers were estimated from St. Croix and 7,705 recreational anglers for St. Thomas/St. John stratum. Based on this survey, St. Croix recreational fishermen landed an estimated number of 35,225 pounds annually with a fishing effort of 11,844 hours. St. Thomas/St. John recreational fishermen landed an estimated number of 137,412 pounds annually with a fishing effort of 42,820 hours. The results of this survey indicate that during this study, 9.2 % of the residents of the US Virgin Islands (approximately 11,000 individuals) fished recreationally.

**KEY WORDS:** Recreational fisheries, angler survey, USVI

## **Estudio de la Participación en las Actividades Pesqueras Recreacionales de los Residentes de las Islas Vírgenes Estadounidenses**

La pesca recreativa de agua salada en las islas vírgenes estadounidenses es muy popular y puede ser categorizada en tres tipos. (1) pesca deportiva en aguas profundas (2) pesca de bote en aguas someras (3) pesca de orilla (muelle, marinas, playa). Un número estimado de 10,800 pescadores (casi 10.8% de los residentes) pescaron recreacionalmente a mediados de la década de los ochenta. (Jennings, 1992). Las áreas de pesca al norte de las islas vírgenes estadounidenses son muy reconocidas por la pesca de la aguja. La pesca de la aguja contribuye aproximadamente 5.5 millones de dólares a la economía local (Adams, 1995)

La División de Pesca y Vida Silvestre del Gobierno de las Islas Vírgenes Estadounidenses dentro de su programa de evaluación de pesca recreativa condujo

un censo de residentes envueltos en actividades de pesca recreativa durante Diciembre 1998 hasta Julio del 1999. Se utilizo el muestreo de numeros telefonicos residenciales como metodologia. Los resultados del censo indican que en 1999, 9.2% de los residentes en las Islas Virgenes Estadounidenses (Aproximadamente, 11,000 individuos) pescaron recreativamente. Un punto interesante fue que la tasa de participacion de residentes envueltos en actividades de pesca recreativa no ha cambiado mucho durante los ultimos 13 anos. Las proporciones de pescadores de bote, orilla, y de bote/orilla en St Croix y St. Thomas/St. John para 1999 fueron bastante parecidas a las encontradas en 1986 por Jennings (1992).

Otros resultados del censo indican que la metodologia de muestrear numeros telefonicos residenciales unicamente no es un metodo suficiente para evaluar una pesqueria que consiste de muchas especies como la pesca recreacional de de Islas Virgenes Estadounidenses debido a problemas como la exactitud y exageracion en los reportes de captura y la identificacion especies. Otras metodologias como el muestreo de rampas, marinas (point access) deben ser consideradas como alternativas prar obtener informacion exacta y precisa de captura. El manejo efectivo de la pesca recreativa en las islas virgenes estadounidenses requiere una fuente de datos continuos que puedan describir todos los aspectos de la pesqueria. Es muy importante que en cualquier clase de pesca se este muestreando la coleccion de datos sea consistente y estadisticamente valida para que pueda permitir comparaciones directas de anos previos.

**PALABRAS CLAVES:** Pesca recreativa, censo de residentes, las Islas Virgenes

## INTRODUCTION

Saltwater recreational fishery in the United States Virgin Islands (USVI) is very popular and can be characterized into three types:

- i) Big game fishing (offshore fishing),
- ii) Boat fishing (inshore fishing) and
- iii) Shoreline fishing (pier, dock, beach, etc.).

An estimated number of 10,800 anglers (almost 10.8 % of the residents in the Virgin Islands) fished recreationally during the mid 1980s (Jennings 1992). The fishing grounds north of the USVI have been well known for its billfish fishery. It has been estimated that the St. Thomas billfish fishery contributes approximately 5.5 million of dollars to the local economy (Adams 1995).

The USVI Division of Fish and Wildlife (DFW) through its recreational fisheries assessment program is currently using various methods to gather information from all aspects of the recreational fishery, including logbooks, shoreline roving creel surveys, dockside interviews and fishing tournaments. One of the sampling methods that the DFW is currently evaluating is the use of telephone surveys to gather information from recreational anglers. Telephones surveys have been widely used to collect household demographic characteristics (Groves et al. 1988) and have also

been used in recreational fisheries (Essig and Hollida 1991, Wheatman 1991, Jennings 1992). The objective of this study is to evaluate the use of a telephone survey as a feasible methodology to collect recreational fisheries data.

## METHODS

The telephone survey was conducted from December 1998 to July 1999, following a testing period of the questionnaire. The USVI phone directory was divided in two strata: (1) St. Croix and (2) St. Thomas/St. John. Currently, there are 53,110 household units listed in the USVI phone directory; 28,772 household units in St. Thomas/St. John and 22,168 in St. Croix (personal communication with the Virgin Islands Telephone Company).

Listings in the Virgin Islands telephone directory were numbered, and survey respondents were chosen randomly. Using computer generated random numbers, pages from the phone directory were selected for each month. One hundred random numbers were selected from the total numbers on the selected page in the phone book as target respondents for that month. During the last week of each month respondents were chosen for the next month. Attempts were made to contact 50 households on each stratum listed in the USVI telephone directory on a monthly basis.

Calling periods were selected from 4:00 PM to 9:00 PM in an effort to maximize the potential to contact individuals. At least five attempts were made to each number to screen for households. When a number was dialed, the telephone was allowed to ring five times before it was classified as no answer. When a household with an angler was contacted, if the angler was not able to answer the survey at the time, four additional attempts were made. If a phone number had been disconnected or currently not working, a new number was dialed as a replacement.

Fishing effort of anglers contacted during this survey was divided into three categories: boat, shore, and boat and shore. Fishing gear among all categories were divided into rod and reel, hook and line, spear guns, and nets. Differences between fishing effort and harvest estimates among categories were analyzed by Kruskal-Wallis One-Way ANOVA after  $\log(x+1)$  and square root transformation failed to pass Kolmogorov-Lilliefors Normality Test (Sokal and Rohlf 1981).

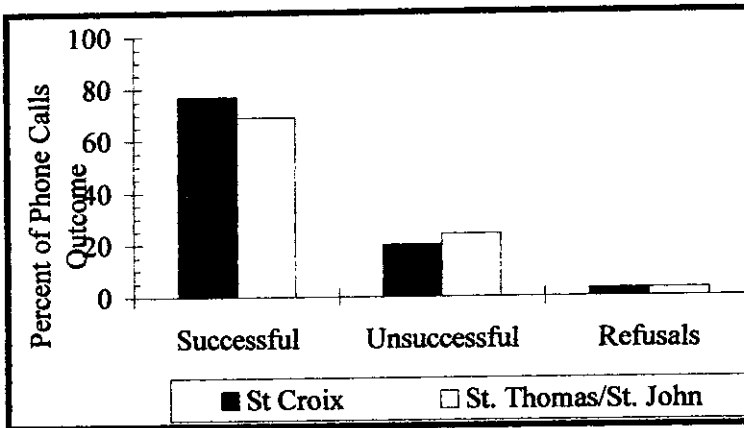
## RESULTS

A total of 1,089 phone calls were attempted on the telephone survey; 557 were made in St. Croix and 532 were made in St. Thomas/St. John. The response rate in St. Croix was 75 %, 23 % were unsuccessful calls and the refusal rate was 2 %. The response rate in St. Thomas/St. John was 55 %, 44 % were unsuccessful calls and refusal rates were 1 % (Figure 1).

Of all household units contacted, 11 % of households in St. Croix and 13.5 % of St. Thomas/St. John households had at least one recreational angler (Figure 2).

A number of 3,294 recreational anglers were estimated from St. Croix and 7,705 recreational anglers for St. Thomas/St. John.

Of the 44 anglers interviewed in St. Croix, 16 (36 %) fished in the last month. Of 40 persons interviewed in St. Thomas and St. John, 20 (50 %) had at least fished once in the latest month. Due to the small sample size of interviews where the fishing activity occurred in less than a month, an estimate of the average of hours fished, number of trips and pounds caught were used for subsequent analysis.

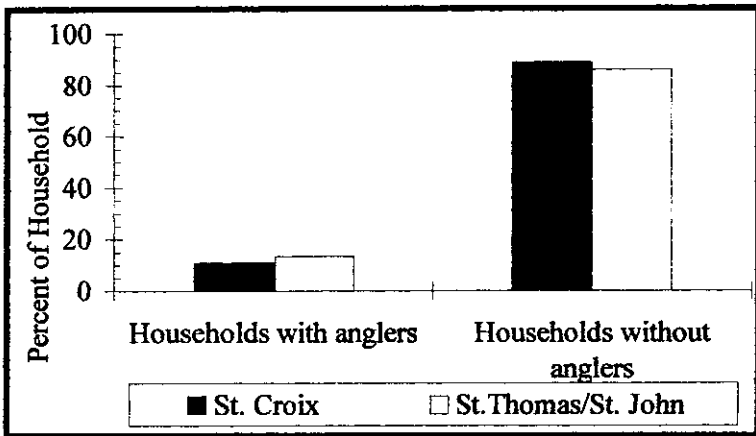


**Figure 1.** Proportion of successful unsuccessful and refusal rates for St. Croix (n = 452) and St. Thomas/St. John strata (n = 300).

Angler effort was characterized into three main components: boat, shore, and boat and shore. There were more anglers fishing from the shore (60%) than from boats (19 %) in St. Croix, while 21 % of the anglers in St. Croix fished from boats and shore. St. Thomas/St. John anglers fished more from boats (50%) than from shore (12 %) and 38 % of anglers fished from boats and from shore (Figure 3). There were no significant differences between crew size, fishing trip length and number of trips per month among categories in St. Croix and St. Thomas/St. John strata ( $p > 0.05$ ;  $df = 2$ ). However, boat fishing trip duration was significantly higher than shore in St. Thomas/St. John stratum ( $p < 0.05$ ;  $df = 2$ ). The most popular fishing activity among St. Croix and St. Thomas/St. John recreational fishermen was bottom fishing (66 %, 54 %, respectively), followed by trolling (30 %, 32 %, respectively) (Figure 4). The most common fishing gear used in by St.

Croix anglers was the handline (64 %) followed by rod and reel (23 %). The most common fishing gear used in by St. Thomas/St. John anglers was rod and reel (46 %) followed by handline (39 %) (Figure 5). St. Croix recreational anglers prefer to fish in the evening (43 %) and early morning hours (33%) (Figure 6) on a monthly basis (57 %) (Figure 7). St. Thomas/St. John recreational anglers prefer to go fishing at night hours (50 %) and afternoon hours (21 %) (Figure 6) on a weekly basis (45 %) (Figure 7).

Although there are many fishing locations around the USVI, some areas seemed to be more popular than others. Frederiksted pier (24 %) followed by Altona Lagoon (10 %) were the most common fishing spots among the St. Croix shore anglers while the boat anglers preferred the offshore waters at the east end of Buck Island (10 %) as one of their major fishing grounds (Table 1). The most popular shore fishing spot was for St. Thomas/St. John shoreline anglers was the Charlotte Amalie waterfront (23%), while boat anglers preferred to fish on the north side of St. Thomas (10 %) (Table 1).



**Figure 2.** Proportion of households with or without recreational fishermen for St. Croix (n = 400) and St. Thomas/St. John (n = 295) stratum.

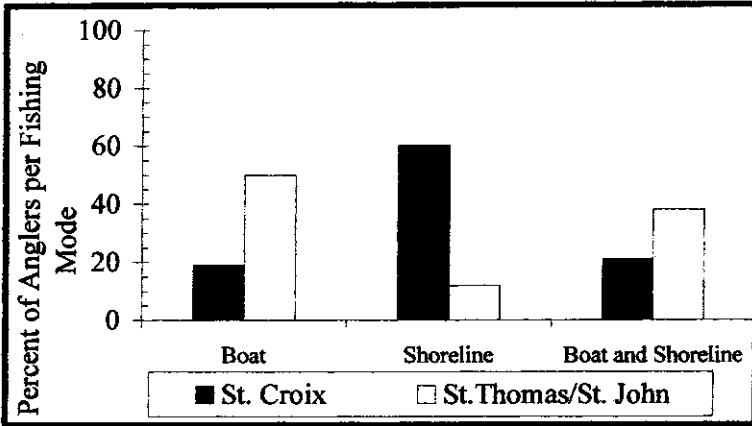


Figure 3. Proportion of anglers by fishing category for St. Croix and St. Thomas/St. John stratum

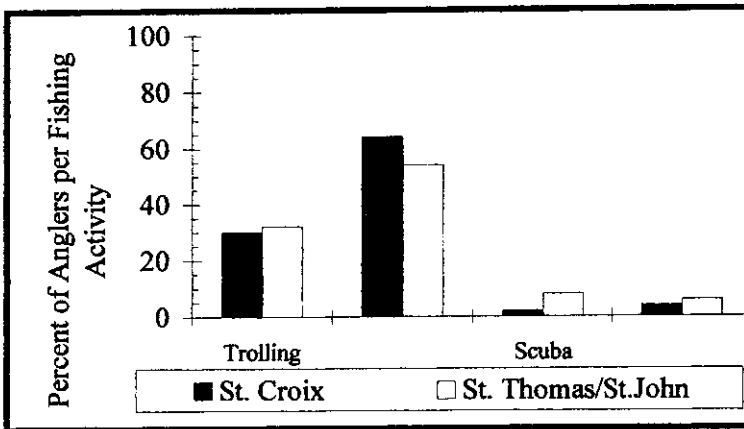


Figure 4. Proportion of anglers per fishing activity for St. Croix and St. Thomas/St. John stratum

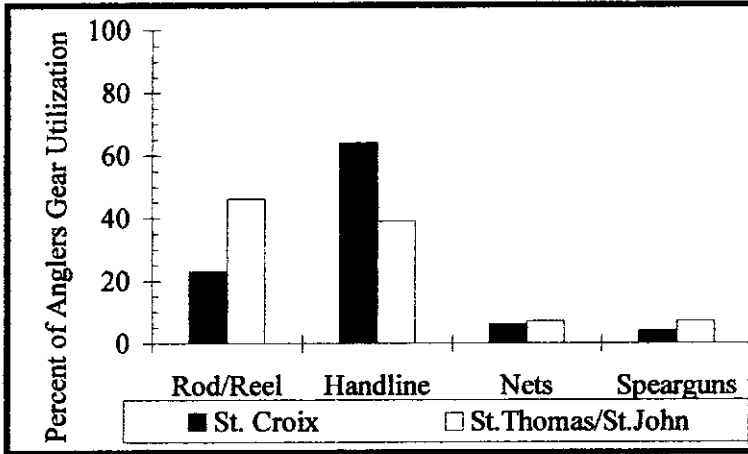


Figure 5. Proportion of fishing gear utilization by St. Croix and St. Thomas/St. John anglers

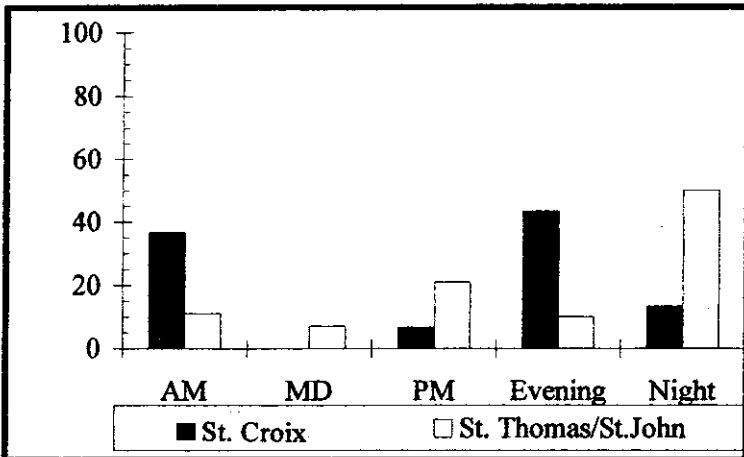
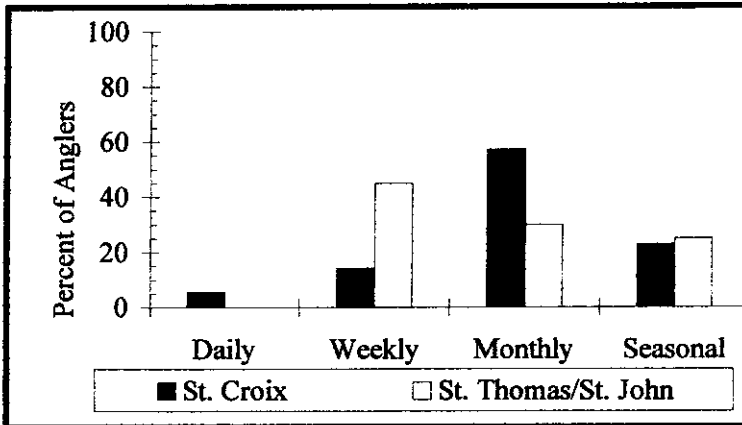


Figure 6. St. Croix and St. Thomas/St. John anglers fishing time preferences



**Figure 7.** St Croix and St. Thomas/St. John anglers seasonal preferences for fishing activities

### Angler Success

There were significant differences among mean angler success among categories in St. Croix and St. Thomas/St. John stratum ( $p < 0.05$ ,  $df = 2$ ). Anglers who fished from boats and shore had significantly higher mean number of pounds harvested than shore fishermen on both strata ( $p < 0.05$ ,  $df = 2$ ). Mean angler success by category ranged from 3.04 to 29.1 pounds in the St. Croix and 2.9 to 20 pounds in the St. Thomas/St. John (Table 2).

The reef fish species composition in the St. Croix inshore recreational fishery were dominated by members of the families Lutjanidae and Scaridae, where the yellowtail snapper *Ocyurus chrysurus* and the stoplight parrotfish *Sparisoma viride* were reported by local fishermen as the most commonly caught species. The species most commonly caught from the offshore fisheries were dolphin (*Coryphaenidae hippurus*) and wahoo (*Acanthocybium solanderi*) (Table 3). In St. Thomas/St. John, the species reported as most commonly caught species from the inshore recreational fishery catch were members of the families Lutjanidae (yellowtail snapper *Ocyurus chrysurus*) and Holocentridae (squirrelfish *Holocentrus adcionis*). The offshore fisheries species composition were dominated by tuna and dolphin (Table 3).

Based on this survey, St. Croix recreational fishermen landed an estimated number of 35,225 pounds annually with a fishing effort of 11,844 hours (Table 4). It was also estimated that St. Croix anglers made 8,823 fishing trips. St. Thomas/St.



John recreational fishermen landed an estimated number of 137,412 pounds annually with a fishing effort of 42,820 hours (Table 4) and made approximately 19,733 fishing trips.

Approximately 50% of the anglers queried were opposed for a recreational fishing license program in both St. Croix and St. Thomas/St. John stratum. It was felt that paying for recreational fishing license would reduce the enjoyment of their fishing experience. They also said that the USVI Government should not regulate recreational fisheries unless there is proof the stocks are over-fished (Figure 8).

**Table 1. Most Popular fishing sites by St. Croix and St. Thomas/St. John anglers (some anglers cited more than one sites during the interviews).**

St. Croix Stratum			St. Thomas/St. John Stratum		
Site	Number	Percent	Site	Number	Percent
Frederiksted Pier	15	24.2	Waterfront	16	23.2
Altona Lagoon	6	9.7	Northside	7	10.1
Offshore East Buck Island	6	9.7	Crown	5	7.2
West Shoreline	3	4.8	Southside	5	7.2
Christiansted Dock	3	4.8	Subbase	5	7.2
Cramer Park	3	4.8	Tropical	4	5.8
Cane Bay	3	4.8	All Over	2	2.9
Sandy Point	2	3.2	FrenchCap	2	2.9
Sprat Hall	2	3.2	National Park Service	2	2.9
Grassy Point	2	3.2	Dock		
Northeast of St. Croix	2	3.2	Saba	2	2.9
Teague Bay	2	3.2	Sorgenfri	2	2.9
Ham Bluff	2	3.2	Water Island	2	2.9
Krause Lagoon	1	1.6	Airport	1	1.4
Good Hope	1	1.6	Brass	1	1.4
Great Pond	1	1.6	BVI	1	1.4
Lang Bank	1	1.6	Lagoon	1	1.4
Coakley Bay	1	1.6	Mandahl	1	1.4
Green Cay	1	1.6	Pillsbury	1	1.4
Princess	1	1.6	Red Hook	1	1.4
Richmond Pier	1	1.6	Southside St. John	1	1.4
La Valle	1	1.6	Hans Lollick	1	1.4
Davis Bay	1	1.6	Anegada/Norman Is.	1	1.4
Molasses Dock	1	1.6	John Brewers Bay	1	1.4
			Krum Bay	1	1.4
			Long Bay	1	1.4
			Vessup	1	1.4
			Coki	1	1.4
<b>TOTAL</b>	<b>62</b>		<b>TOTAL</b>	<b>69</b>	

**Table 2. Summary of estimates of fishing effort and harvest parameters during 1999 telephone angler survey on St. Croix and St. Thomas/St. John (SE = Standard Error, N = number of samples).**

		St. Croix		Stratum	St. Thomas/St. John Stratum		
		Boat	Shore	Boat and shore	Boat	Shore	Boat and shore
<b>Party size</b>	Mean	1.50	2.50	2.40	3.15	2.75	4.40
	SE	0.22	0.28	0.25	0.33	0.22	1.43
	N	8.00	26.00	5.00	13.00	20.00	5.00
<b>Hours Fished</b>	Mean	4.33	3.50	3.20	5.85	4.22	5.60
	SE	0.57	0.31	0.81	0.48	0.23	0.93
	N	8.00	26.00	5.00	13.00	20.00	5.00
<b>Harvest (lb.)</b>	Mean	14.50	3.04	29.10	19.78	2.95	20.00
	SE	6.65	0.92	15.40	5.31	0.47	7.74
	N	8.00	26.00	5.00	13.00	20.00	5.00
<b>Trip Number</b>	Mean	2.00	2.17	4.75	2.91	2.25	2.20
	SE	0.31	0.36	2.40	0.39	0.33	0.49
	N	8.00	25.00	4.00	13.00	20.00	5.00

When St. Croix anglers were asked about what the government agencies can do to improve recreational fishing in the USVI, they had different opinions on effective recreational fishing management. Twenty percent of the respondents cite enforcement as a major drawback in improving the fishing quality in the USVI. Some respondents stated that there were insufficient personnel to put the fishing regulations into action. Others responded that a strong public educational program on marine resources was necessary to make people aware about their environment. Some respondents were concerned about pollution and sewage disposal problems and how it could potentially affect coastal habitats (Figure 9). St. Thomas/St. John anglers responded that their major concerns were enforcement issues and public access. Additional comments included that foreign longliners were overharvesting large quantities of fish in the territory, the number of recreational fishing boats should be controlled, and there should be regulations on unattended gillnets and fishpots to help reduce "ghostfishing," (Figure 10).

## DISCUSSION

Angler surveys provide fishery managers with effort and angler success data crucial to the management of fisheries stocks. They are also effective in gathering demographic and socioeconomic parameters in resource management. Several methods have been used to survey recreational fishermen: on-site methods including roving creel surveys and point access surveys, while off-site methods including mail surveys, door to door surveys and telephone surveys. However, each type of method has its characteristic sampling and non-sampling errors (Essig and Holliday, 1991). For telephone surveys, the sampling errors can be categorized as non-

coverage errors when a survey is being taken on incomplete frames. Non-sampling errors include response and non-response bias. Misreporting of the data and prestige bias are among the common errors found in response bias; whereas, refusals and non-working numbers are the most common sources of non-response bias.

**Table 3.** List of common finfish caught in St. Croix and St. Thomas/St. John (some anglers cited more than one species per interview).

Local Name	Family	Common Name	St. Croix Frequency	St. Thomas/St. John Frequency
*	Acanthuridae	Doctorfish	0	1
Olewife	Balistidae	Queen trigger fish	0	2
Gar	Belonidae	Houndfish	3	0
Flatfish*	Bothidae	Flounder	1	0
Crevalle	Carangidae	Crevalle jack	3	0
Cobbler	Carangidae	Permit	2	0
*	Carangidae	Jacks	1	7
King	Carangidae	King mackerel	0	4
Hardnose	Carangidae	Blue runner	0	3
	Coryphaenidae	Dolphin	3	2
Silverfish	Gerreidae	Slender mojarra	3	0
	Haemulidae	Grunt	6	10
Wenchman	Holocentridae	Squirrelfish	5	14
*	Lutjanidae	Snapper	14	8
*	Lutjanidae	Yellowtail snapper	5	16
Virgin Snapper	Lutjanidae	Mutton snapper	2	0
Goatee	Mullidae	Goatfish	3	0
Bluefish	Scaridae	Stoplight parrotfish	5	1
Gutto	Scaridae	Parrotfish	3	4
Pink Chump	Scaridae	Redtail parrotfish	1	0
Macka	Scaridae	Midnight parrotfish	1	0
*	Scombridae	Tuna	3	2
*	Scombridae	Wahoo	2	0
Robin	Scombridae	Round mackerel	1	0
Bonito (offshore)	Scombridae	Skipjack	1	2
*	Scombridae	Blackfin tuna	1	0
Bonito (inshore)	Scombridae	Little tunny	0	3
Butterfish	Serranidae	Coney	3	0
*	Serranidae	Grouper	1	2
Hind	Serranidae	Red hind	0	7
*	Sparidae	Porgy	0	3
Barra	Sphyraenidae	Barracuda	4	4

\* No local names for these species were found

Table 4. Summary of the Estimated Effort and Harvest Parameters for the USVI Recreational Fishery during 1999.

St Croix	Boat	Shore	Boat and shore	Total	St. Thomas/ St. John			
					Boat	Shore	Boat and shore	Total
Effort (hr)	2,711	6,919	2,214	11,844	22,522	3,901	16,396	42,820
Harvest (lb.)	9,077	6,011	20,137	35,225	76,125	2,727	58,557	137,412
Fishing trips	1,252	4,284	3,287	8,823	11,211	2,080	6,441	19,733

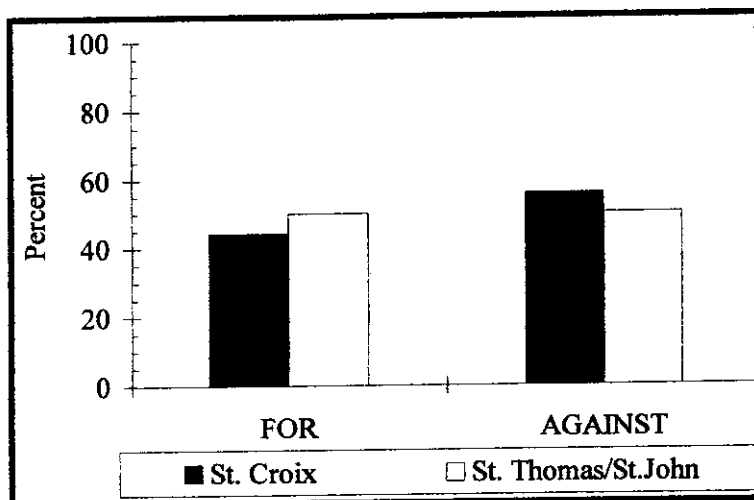


Figure 8. St. Croix and St. Thomas/St. John Anglers attitudes for recreational fishing license program implementation

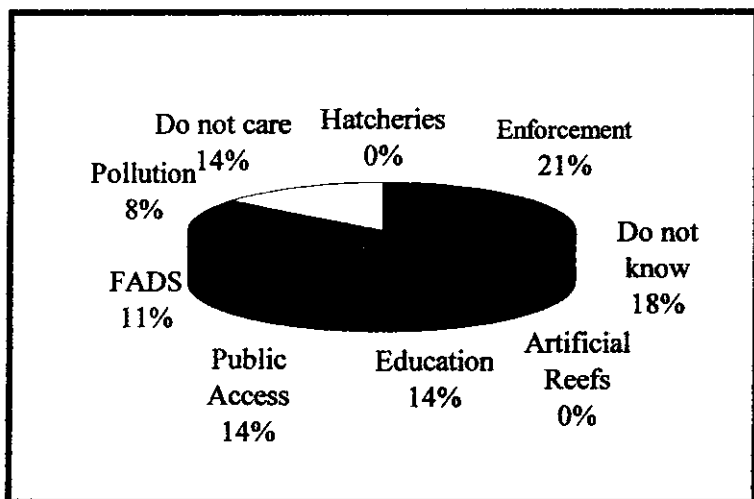
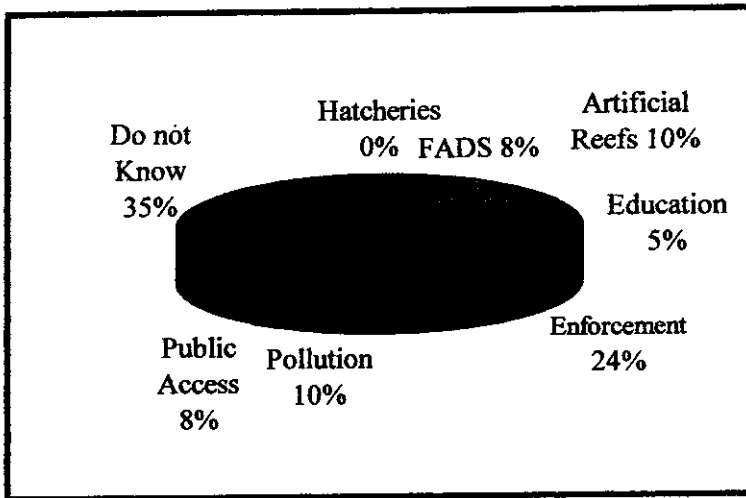


Figure 9. St. Croix anglers opinions on how the government can improve recreational fisheries in the USVI



**Figure 10.** St. Thomas/St. John anglers opinions on how the government can improve recreational fisheries in the USVI

When samples frames are known, telephone surveys, mail surveys and door to door surveys are appropriate survey techniques (Brown 1991). These techniques have been applied to fishing license holders, boat registration holders and charter boat captains. The most important step in planning this survey is to select a sample frame that can adequately represents the whole population. However, when the population, represented by sample frames, is not entirely covered, results of telephone surveys may be biased by particular exclusion of groups whose fishing patterns are different from the actual covered group. In this survey, more than 80% of the USVI household units have a telephone and only 4% of the household units with telephone are unlisted in the USVI phone directory. Therefore, the survey had a slight chance of bias of non-coverage errors.

Non-response bias can be a serious problem in any household survey due to the different answers between non-respondent and respondent. Adjustments for non-responses bias phone surveys have not well addressed in previous surveys. The telephone response rates for St. Croix (75 %) and St. Thomas/St. John (55 %) were higher in this survey than the previous telephone angler survey (less than 50 %) (Jennings 1992). Our study achieved higher response rates because many of the calls were placed on evening hours when most of the household residents were at home after their normal working hours.

Telephone surveys along with mail surveys and door to door surveys are all techniques for collecting angler reported data. They are especially helpful on

gathering information on angler effort and demographic characteristics. However, catch reports on any of these surveys should be interpreted cautiously due to the problems caused by prestige bias (when there is an exaggeration of the catch reported), misidentification of the species caught and recall bias (when the angler interviewed do not remember the details of their last fishing trip). Nevertheless, telephone surveys can be very useful for obtaining catch information about memorable species, specially offshore species such as dolphin, wahoo, tunas, marlin, etc. During the survey, anglers who fished offshore were more skillful on identifying offshore species than reef species. Most of the fishermen who fished from shore were limited to associate the fish they caught to a family level, since the inshore fishery has a high diversity of species. Many anglers surveyed used local common names to report their catch. Some difficulties could arise because local common names for Caribbean marine fishes often differ from accepted common names and can also differ between islands (Jennings 1992). This problem can raise doubts about the validity of the angler reported catch information.

Previous studies on telephone surveys have paid attention to recall bias (Fisher et al. 1991). There have been suggestions that shorter recall periods (two to four weeks) would give better estimates than extensive recalling periods (two to four months). As a result, information gathered from anglers who had shorter recall periods (less than a month) from the time they were interviewed; were entered into the DFW recreational fishery database. However, only 16 anglers from 39 interviewed in St. Croix, and 20 anglers from 38 interviewed in St. Thomas, fished in less than a month from the time they were interviewed, consequently, this data exhibited a recall bias. Furthermore, the harvest rates (PPUE = pound per unit effort) for boat fishermen phone interviews were rather lower than estimates based on boat angler logbook and intercept interviews. These results were precluded from statistical comparison due to low sample size (Table 5a, 5b).

A household survey of anglers can tell us demographic characteristics as well as attitudes toward regulation management plans. It can also give a brief estimate of angler abundance and participation on a large region but with questionable precision. A major drawback conducting this type of study is that there are not many people who like to fish recreationally and sampling a phone directory will limit the probability to find an angler who can give reported data. In addition, there is going to be a major limitation of the data especially on catch reports when people interviewed do not remember very well their fishing trip nor the species they caught. A possible recommendation to improve data quality on future telephone surveys is to develop a recreational license program so the information gathered can be strictly direct from anglers. If catch reports are desired in the survey, they have to be with shorter recall periods and species that are very easy to identify. There have been previous studies that were successful in including catch reports surveying from an angler license frame (Wheatman 1991, Wheatman and Haverland 1991). However, a major problem arises because the USVI fishery is a multi-species one, and most of these angler telephone surveys have been done in lakes and reservoirs that have a limited number of species. Another approach is to supplement information from

telephone angler surveys with on-site creel surveys. The Marine Recreational Fisheries Statistics Survey have developed over the years a telephone access design which consists of two parts: 1.) a random digit dialing telephone survey to estimate fishing effort and 2.) a point access survey to estimate catch rate. Catch and catch per unit effort are best estimated on-site where the catch can be inspected, but effort may be estimated off-site as well as on-site and an off-site effort survey may be less expensive to conduct (Essig and Holliday 1991).

**Table 5a. Fishing Effort and Harvest Estimates per Categories for St. Croix Stratum from Telephone Interviews, Roving Shoreline Creel Surveys Interviews and Non-Charter Angler Interviews. All values are Means with standard error (SE) in parenthesis, N = Number of samples, PPUE = Pounds of Fish Caught per Effort.**

		St. Croix Phone Interviews		St. Croix Stratum Creel Surveys Interviews	
		Boat	Shore	Boat	Shore
Effort (hr)	Mean	5.00	3.00	4.92	1.29
	SE	0.63	0.45	0.19	0.12
	N	5.00	6.00	58.00	31.00
Total Weight(lb.)	Mean	10.40	4.17	81.22	2.35
	SE	7.58	1.97	11.87	0.43
	N	5.00	6.00	58.00	31.00
PPUE (lb./hr)	Mean	2.41	1.87	16.92	2.04
	SE	1.91	1.03	2.49	0.43
	N	5.00	6.00	58.00	31.00

**Table 5b. Fishing Effort and Harvest Estimates per Categories for St. Thomas/St. John Stratum from Telephone Interviews, Roving Shoreline Creel Surveys Interviews and Non-Charter Angler Interviews. All values are Means with standard error (SE) in parenthesis, N = Number of samples, PPUE = Pounds of Fish Caught per Effort.**

		St. Thomas/St. John Phone Interviews		St. Thomas/St. John Creel Surveys Interviews	
		Boat	Shore	Boat	Shore
Effort (hr)	Mean	5.50	4.44	7.70	1.19
	SE	0.59	0.31	0.09	0.10
	N	8.00	10.00	293.00	52.00
Total Weight (lb.)	Mean	21.10	2.70	285.98	1.91
	SE	6.57	0.36	18.98	0.59
	N	8.00	10.00	291.00	25.00
PPUE (lb./hr)	Mean	3.75	0.71	37.08	2.00
	SE	0.92	0.13	2.39	0.64
	N	8.00	10.00	291.00	25.00



### CONCLUSION

The data suggests that recreational fishing continues to be an important outdoor activity for local residents in the USVI. The results of this survey indicate during this study, 9.2 % of the residents of the USVI (approximately 11,000 individuals) fished recreationally. One interesting finding was that the proportion of USVI resident participation in recreational fishery activities has apparently not changed during almost thirteen years. The percentages of household units with at least a fisherman in St. Croix and St. Thomas/St. John stratoms were similar to those found on the 1986 telephone survey conducted by Jennings (1992). The present survey also found that the proportions of boat, shoreline, and boat/shoreline anglers in both stratoms were very similar to those found on the previous survey.

The results from the telephone survey show that, due to the recall bias, species identification and prestige bias associated with catch reports, a telephone survey is not an efficient method to access a multi-species fishery, such as the USVI recreational fishery. Others survey methods, such as point access surveys, should be considered as an alternative to collect precise and accurate angler catch information.

Effective management of saltwater fishing in the USVI requires an ongoing source of data that can best describe all aspects of the fishery. It is very important that whatever angler groups are surveyed, the data collected should be consistent and statistically valid to allow for direct comparison to previous years.

### ACKNOWLEDGMENTS

We thank S. Caseau, R Gomez, V. Gomez Christian and D. Jackson for their logistical support provided during the telephone interviews. Special thanks goes to Dr. Cecil Jennings for his assistance during the start of the survey and for his insightful comments on the manuscript. This study was funded by U.S. Fish and Wildlife Service Federal Aid Grant; F8-9 under the Dingell-Johnson Sport Fish Restoration Act.

### LITERATURE CITED

- Adams, A. 1995. Recreational Fisheries Assessment Program Annual Performance Report F:8-5.
- Brown, T.L. 1991. Use and abuse of mail surveys in fisheries management. *American Fisheries Society Symposium* 12:225-234.
- Essig, R.J. and M.C. Holliday. 1991. Development of a recreational fishing survey :the marine recreational fishery statistics survey case study. *American Fisheries Society Symposium* 12:245-254.
- Fisher W.L., A. E., Grambusch, D.L Eisenhower., and D.R. Morganstein. 1991. Length of Recall Period and Accuracy of Estimates from the National Survey of Fishing, Hunting and Wildlife-Associated Recreation. *American Fisheries Society Symposium* 12:367-375.

- Groves, R. M., P.P. Biemer, L.E. Lyberg, J.T. Massey, W.L. Nicholls II, and J. Waksberg (eds.). 1988. Telephone Survey Methodology. Wiley, New York.
- Jennings, C.A. 1992. Survey of Non-Charter Boat Recreational Fishing in the US Virgin Islands. *Bulletin of Marine Science* 50(2):342-351.
- Sokal, R.R., and F.J. Rohlf. 1981. *Biometry*. W.H. Freeman and Company, New York, New York USA. 959 pp.
- Wheatman, A.S. 1991. Telephone Survey Preferred in Collecting Angler Data Statewide. *American Fishery Society Symposium* 12:271-280.
- Wheatman, A.S., and P. Haverland. 1991. Comparability of Data Collected by Telephone and Roving Creel Surveys. *American Fisheries Society Symposium* 12:67-73.