

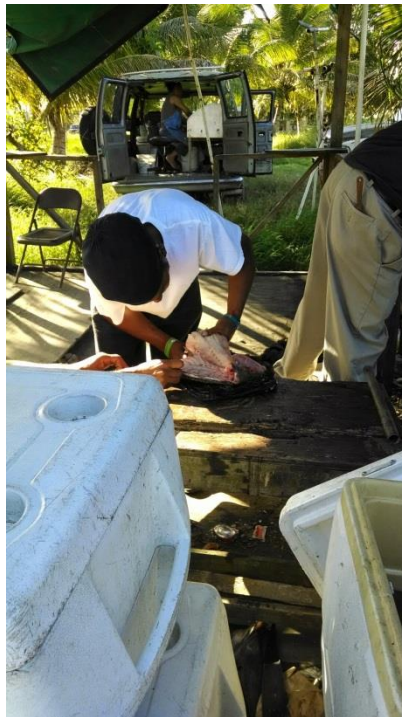


NOAA Technical Memorandum NMFS-SEFSC-718

ECONOMIC SURVEY RESULTS FOR UNITED STATES
VIRGIN ISLANDS COMMERCIAL FISHERIES

By

CHLOE S. FLEMING, ASHLEIGH ARMENTROUT AND SCOTT CROSSON



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southeast Fisheries Science Center
75 Virginia Beach Drive
Miami, Florida 33149

December 2017



NOAA Technical Memorandum NMFS-SEFSC-718

ECONOMIC SURVEY RESULTS FOR UNITED STATES
VIRGIN ISLANDS COMMERCIAL FISHERIES

BY

CHLOE S. FLEMING, ASHLEIGH ARMENTROUT AND SCOTT CROSSON
National Marine Fisheries Service
Southeast Fisheries Science Center
75 Virginia Beach Drive
Miami, Florida 33149

U.S. DEPARTMENT OF COMMERCE
Wilbur Ross, Secretary

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
Timothy Gallaudet, Under Secretary for Oceans and Atmosphere (Acting)

NATIONAL MARINE FISHERIES SERVICE
Chris Oliver, Assistant Administrator for Fisheries

December 2017

This Technical Memorandum series is used for documentation and timely communication of preliminary results, interim reports, or similar special-purpose information. Although the memoranda are not subject to complete formal review, editorial control, or detailed editing, they are expected to reflect sound professional work.

NOTICE

The National Marine Fisheries Service (NMFS) does not approve, recommend or endorse any proprietary product of material mentioned in this publication. No reference shall be made to NMFS or to this publication furnished by NMFS, in any advertising or sales promotion which would imply that NMFS approves, recommends, or endorses any proprietary product or proprietary material mentioned herein which has as its purpose any intent to cause directly or indirectly the advertised product to be used or purchased because of this NMFS publication.

This report should be cited as follows:

Fleming, C. S., A. Armentrout, and S. Crosson. 2017. Economic survey results for United States Virgin Islands commercial fisheries. NOAA Technical Memorandum NMFS-SEFSC-718. 33 p.
doi:10.7289/V5/TM-SEFSC-718

This report will appear on the SEFSC website at URL: <http://www.sefsc.noaa.gov/>

Cover photos by Scott Crosson: a diver filets up his catch on St Croix (left), and fishermen unloading spiny lobsters on St Thomas (right).

Copies may be obtained by writing:

Scott Crosson
NOAA Fisheries
75 Virginia Beach Drive
Miami, Florida 33149
Scott.Crosson@noaa.gov

ECONOMIC SURVEY RESULTS FOR UNITED STATES VIRGIN ISLANDS COMMERCIAL FISHERIES

Abstract

In 2014, an economic survey of commercial fishermen in the U.S. Virgin Islands (USVI) was conducted in tandem with the Marine Outreach and Education – Virgin Islands Style (MOES) fishermen workshops to expand data collection. Fishing is traditionally a profound aspect of life and culture in the USVI. This study discusses 1) fishermen background, 2) fixed costs, including vessels, dive gear, and fish and lobster trap ownership, and 3) variable costs, including fuel, bait, air, food and crew costs for St. Thomas and St. John (STT/STJ) fishermen, St. Croix (STX) fishermen, and USVI fishermen as a whole. After merging survey results with landings data records, we estimated respondent and fleet trip profitability.

We find that net revenues and estimated annual profits were slightly higher for STX fishers than for STT/STJ fishers. The STT respondent profit rate was 20%. After weighting for non-respondents, the annual profit rate was reduced to 15%. In comparison, the STX respondent profits rate was 33%, but after adjusting for non-respondents, the annual profit rate settled at 17%. We show that USVI fishermen are receptive to filling out economic surveys so long as they are a part of the regular and required Department of Planning and Natural Resources process.

Table of Contents

1. Introduction	1
2. Background	1
3. Methods.....	5
4. Survey Results Overall.....	6
4.1 Respondent Fishermen Background.....	6
4.2 Respondent Fishermen Fixed Costs	8
4.2.1 Fishermen Vessels.....	8
4.2.2 Fishermen Diving Gear.....	8
4.2.3 Fishermen Trap Ownership.....	11
4.2.4 Fishermen “Other” Fixed Costs.....	13
4.3 Respondent Fishermen Variable Costs	13
5. Respondent and Fleet Trip Profitability	15
5.1 STT/STJ Respondent and Fleet Trip Profitability.....	15
5.2 STX Respondent and Fleet Trip Profitability	18
6. Discussion and Conclusions	20
7. References	22
Appendix 1: Survey Form.....	25

List of Tables

Table 1. Fishermen Background.....	7
Table 2. Vessel Ownership.....	9
Table 3. Dive Gear Ownership.....	10
Table 4. Fish Trap Ownership.....	11
Table 5. Lobster Trap Ownership.....	12
Table 6. Other Fixed Costs.....	13
Table 7. Variable Costs.....	14
Table 8. STT/STJ Fleet Case Summaries and Annual Profit Estimates.....	17
Table 9. STX Fleet Case Summaries and Annual Profit Estimates.....	19

1. Introduction

In 2014, we conducted an economic survey of U.S. Virgin Islands (USVI) commercial fishermen. As required by the 2006 revision of the Magnuson-Stevens Act, each of the eight Fisheries Management Councils are required to set Annual Catch Limits for all federally managed fisheries in conjunction with the recommendations of their Scientific and Statistical Committees (Crosson 2013). This process requires reliable biological and economic data, and as a result, the Social Science Research Group at the Southeast Fisheries Science Center has focused on expanding data collection in the currently data-poor U.S. Caribbean. We saw an opportunity to integrate the data collection into the territory's 2014 commercial fisheries workshops: Marine Outreach and Education – Virgin Islands Style (MOES). Commercial fishermen were required to attend the workshops as part of the fisheries registration process, so collecting economic data at this stage seemed more efficient and effective than traditional field or telephone surveys. That was indeed the case, and special thanks are given to NOAA contractor Lia Ortiz and the staff from the USVI Division of Fish and Wildlife for aiding us in this process. Without their support, this process would have been impossible. We also hoped to put the USVI commercial fisheries community at ease with the regular collection of economic cost data, and with the goal of perhaps integrating it into the landings data records. In this sense, the survey was intended as a pilot study for both gathering baseline data and conducting community outreach.

This document is structured as follows: Section 2 provides background; Section 3 describes the methods and response rates; Section 4 gives the overall results, including respondent fishermen background, vessels, gear, fixed costs, and variable costs for all fishermen; Section 5 estimates 2013 landings and annual profitability; and Section 6 provides discussion and conclusions.

2. Background

The USVI of St. Thomas (STT), St. Croix (STX), and St. John (STJ) are located within the northeastern Caribbean Sea. This U.S. territory has an exclusive economic zone (EEZ) of over 33,000 square kilometers, with an inshore fishing area of 1,536 square kilometers. The territory's waters hold 0.2% of the world's coral reefs, as well as sixteen marine protected areas (Pew Charitable Trusts, 2015). Since Columbus reported seeing these islands in 1493, Spain,

France, Holland, England, Denmark, and the United States have each claimed this area at different times. In the 17th century, the Danes began to colonize the USVI with the hopes of cultivating sugar cane; however, when Denmark abolished slavery in 1848, the sugar industry subsided, and a century-long period known as the “subsistence era” ensued. From fear of German capture during World War I, the United States bought the USVI and about 50 smaller islands from Denmark, and has controlled the territory ever since (National Geographic, 2015).

The USVI has a total population of 106,405 (USC, 2011). STT and STX hold approximately 48% each of the total population, while STJ has roughly 4% of the region’s population (Fleming, Tonioli and Agar, 2014). These three islands have a reported non-farm employment of approximately 39,000, with the most employment in the government and trade, transportation, and utilities sectors (BLS, 2014). Gross domestic product in 2013 was an estimated \$3.8 billion (BEA, 2014).

Although there are similarities, each USVI island is distinct in its geography, culture, and economy. STT is composed of hill ridges with relatively no flat areas (VInow, 2015c), and because of this, has very little agricultural activity (VInow, 2015b). This island has an idyllic natural harbor, and in 1815 became a duty free port, specializing as a trade center and distributing point for the West Indies. This trading center and natural harbor later developed into an ideal destination for cruise ships and tourism, catering to high-end tourism, specifically (VInow, 2015b).

In comparison, STX has a rocky terrain on the eastern end of the island, but has rolling pasturelands and flat farming land with fertile soil throughout most of the central and western parts (VInow, 2015c). STX’s history is nested in agricultural activities, as it produced and exported sugar, rum, cotton, molasses, and hard woods through the use of slavery. After many slave revolts and the subsequent abolishment of slavery, STX’s agricultural focus declined (VInow, 2015a). In 1966, Hess Oil Virgin Islands Corporation began construction on the Hovensa oil refinery (Virgin Islands Daily News, 2013). This oil refinery grew to be one of the world’s ten largest crude oil refineries, and became a substantial economic sector on STX; however, in February 2012, Hovensa closed, and it now serves as a storage terminal (Fleming, Tonioli and Agar, 2014). The existence of Hovensa provided such a massive economic impact that STX did not have to rely on tourism for many decades. With its closure, its revenue stream has largely halted and most of its jobs have ended, resulting in Crucians attempting to generate

income through the island's weaker tourism sector (Plaskett, 2013). Today, agriculture and tourism are the island's two main industries (VInow, 2015a).

STJ has the smallest population of the three islands, and was once home to plantation life. Following the abolishment of slavery, residents maintained small scale subsistence farming and fishing (VInow, 2017a). STJ is now home to the Virgin Islands National Park, which protects over half of the 12,500 acre island. As a result, the island caters to ecotourism and camping, in addition to high-end tourism. Since STJ does not have its own airport, tourists and residents alike must take a ferry to and from STT (VInow, 2017b).

Fishing has historically been a profound aspect of life and culture in the USVI. A dependence on the territory's natural resources, including fisheries resources, has been demonstrated throughout the islands' history, and although the level of dependence has changed over time, USVI culture remains deeply connected to the sea, its fisheries resources, and the livelihoods created from these resources (Ortiz, 2014). Most commercial fishermen carry out all aspects of fishing themselves, including fish catch, gear and vessel repairs, and product marketing (Kojis and Quinn, 2011).

Although the islands of the USVI are often grouped together, their fisheries are almost as distinct as the islands themselves. Many studies group STT and STJ together for comparison purposes (Impact Assessment, Inc., 2007; Kojis, 2004; Kojis and Quinn, 2006; Kojis and Quinn, 2011), due to the small population of STJ and its geographic location (they occupy the same oceanic platform, and access to STJ is via ferry from STT). In this study, we follow this practice by grouping these islands together.

Valdés-Pizzini *et al.* (2010) suggested that fishing for economic purposes in STX has historically played a smaller role in comparison to the plantation economy and manufacturing and tourism industries on the island because it supported only a small percentage of local employment. Although fishing's economic contribution is smaller than other industries in STX, the study found that fishing is ultimately at the core of Crucian identity and culture, and has provided sustenance to the island's inhabitants of a diverse ethnic background. Additionally, fishing in STX supports the island's tourism industry since it provides fresh fish to restaurants and marketplaces (Valdés-Pizzini *et al.*, 2010).

Valdés-Pizzini *et al.* also found that many Crucian fishermen did not exclusively fish as their main source of income. Kojis and Quinn (2011) found that only 41% of Crucian fishers

spent more than 36 hours per week on fishing related activities, that approximately 25% of Crucian fishers spent between 15-36 hours per week, and that 28% of fishers spent less than 15 hours per week on fishing related activities. This varied slightly in comparison to STT and STJ, where only 30% of fishermen reported spending more than 36 hours per week on fishing-related activities, roughly 25% spent between 15-36 hours per week and 30% spent less than 15 hours per week. Lastly, there are not place-based fishing communities on STX; instead, the whole island can be classified as a fishing community due to social capital constructs and network relations among fishers (Valdés-Pizzini *et al.*, 2010).

Similar to STX, Stoffle *et al.* (2011) suggested that the complex social relations and history of economic development on STT has impacted and helped create a fishery that is deeply entwined in the social fabric and identity of the local community. However, on STT fishing plays a more important economic role. Both the commercial and recreational fisheries help support a strong tourism industry by providing not only fishing charters, but also fresh fish to restaurants and fish markets. The fishermen of STT also play an important role in the island's politics through the St. Thomas Fishermen's Association. In addition to community benefits and involvement from these fishers, Stoffle *et al.* found that more than 80% of STT fishers serviced their vessels and engines locally, more than 60% bought their fishing and navigational gear locally, and more than 90% bought their bait locally. Stoffle *et al.*'s findings suggest that the entire island of STT can also be defined as a fishing community (2011).

In terms of specific fisheries, Kojis and Quinn found that between 2003 and 2004 the majority of USVI landings were reef fish, followed next by coastal pelagics, lobster, deepwater snapper, conch, and deep pelagics (2006). From 2007-2008, STX fishermen caught the majority of parrotfish by freediving, SCUBA, gillnets, and traps. The gillnet and trammel net ban in 2008 increased the use of freediving methods, and snappers were caught primarily by line fishing. In comparison, STT and STJ fishermen landed the overwhelming majority of parrotfish with traps, and caught snappers with a combination of line fishing, traps, and seine nets (McCarthy, 2011). Agar *et al.* (2008) further demonstrated a dependence on trap fishing, and found that the STT/STJ fleet was larger and more capital-intensive than the STX fleet.

3. Methods

In July 2014, Marine Outreach and Education USVI Style (MOES) organized the Commercial Fisher Workshop and Registration on STT and STX. The goals of these workshops were to 1) develop and implement effective and efficient USVI commercial fishermen catch report training, 2) develop and implement an effective and efficient fishing license registration protocol for the USVI Department of Planning and Natural Resources (DPNR) Division of Fish and Wildlife (DFW) and Division of Environmental Enforcement, 3) improve fishing community awareness of current fisheries issues, rules, and regulations, and 4) improve fishermen compliance with fisheries regulations (NOAA CRCP, 2014). It was during these workshops that we administered economic surveys. STX's registrations were held at the DPNR office on July 7th, 8th, and 9th while the STT/STJ districts were held at the DPNR conference rooms at Cyril E. King Airport on July 14th, 15th, and 16th. We brought survey forms in both English and Spanish, the latter being edited and revised by Dr. Juan Agar, as well as an "About This Survey" page given to each fisherman in their registration packets, again available in both English and Spanish.

STX had 3 groups registered per day. DPNR staff gave a presentation on how to properly fill out commercial catch report forms and the importance of reporting accurately. Following this, the Coast Guard spoke to the fishermen about a mandatory safety inspection on October 15, 2015. A representative from the Caribbean Oceanographic and Restoration Education Foundation (CORE) gave background information on lionfish and gave a short, 6-question survey about fishermen perception on lionfish and the nascent market for it. Lastly, we presented our survey. Crosson informed the fishermen that we wanted to gather data on what it costs a fisherman to run his/her business. Crosson explained that collecting this economic data would help scientists and government officials understand how economic conditions and regulations (i.e. marine protected areas and seasonal closings) would affect the commercial fishing industry. The CORE representative assisted in bridging the language gap for Spanish speaking fishermen. We also offered to fill out the survey forms via individual interviews if a fisherman did not want to fill out a survey on his own. Because we were the last to present, we had the advantage of being less restricted by time, as fishermen had to wait to be individually called for license renewals with DPNR staff. There was a total of 190 fishers engaged in the MOES July 2014 workshops from both districts, representing 66% of the total fishers on DFW's August 2014

rosters. Of the 93 fishers from STX, 68 fishers took the survey in-person. Roughly a dozen fishers from both districts took surveys and return envelopes with them to fill out at a later point.

The STT/STJ district sessions were held in the DPNR conference rooms on the second floor of the airport on the Western side of STT. Four sessions were held per day. Staff from the DPNR reviewed the requirements for commercial catch reports, and the Coast Guard presentation on the upcoming safety inspections followed. Crosson then gave his presentation. Many were again very open to taking our survey and sharing their cost information. No one needed a Spanish version during these registration days, but we still offered to sit down and help people fill out their surveys (although there was a steep decline in the number of individuals who opted for this method). Of the entire 3-day registration period, 62 people filled out surveys in-person. For STT/STJ fishers, 90 were present of the 97 who had officially signed up.

The survey form (see Appendix 1) asked a series of questions regarding fixed costs and variable trip expenses, as well as basic demographic information (i.e. age and other occupations). The front page began with background information on each individual, and next asked about business investments and capital, number of vessels owned and their current market value, numbers of tanks owned for diving and their value, and number of traps owned and their total value. The survey continued by inquiring about variable/per-trip costs such as oil and gas, ice, food, and crew pay. This was considered the most critical information because these costs cannot be avoided when making a fishing trip, are variable and constantly changing, and strongly influence when and where a fisherman will be able to fish. The last page asked for annual/fixed costs, such as mooring or dockage, lawyers or other accounting fees, and fishing related loan payments.

4. Survey Results Overall

4.1 Respondent Fishermen Background

Table 1 shows that approximately two thirds of all respondent fishermen reported themselves as full-time fishermen, while the remaining one third considered themselves part-time fishermen. Of the respondent fishermen actively engaged in fishing activities, their mean percentage of household income from fishing activity was 65.4% and their median percentage of household income was 80%. For respondent fishermen who listed other income sources, it was reported that the top other sources were handyman work and non-labor activities (see Table 1 for a more detailed breakdown). The mean and median ages of all respondent fishermen were 53.5

and 54, respectively, ranging from 21 to 83. The mean years of fishing experience was 30.8, but the experience ranged from 2 to 83 years. Approximately one third reported themselves as first generation fishermen.

Table 1. Fishermen Background

Fishermen Background				
		All USVI	STT/STJ	STX
Fishermen Status	N	128	63	65
	Part-time	41 (32.0%)	25 (39.7%)	16 (24.6%)
	Full-time	87 (68.0%)	38 (60.3%)	49 (75.4%)
% of Household Income from Fishing	N	115	55	60
	Mean % Household Income from Fishing	65.4	59.1	71.2
	Median % Household Income from Fishing	80	50	100
Other Income Sources	N	40	25	15
	Handyman Work	23.8%	6	4
	Non-labor Income	23.8%	4	6
	Farming/Landscaping	9.5%	2	2
	Government	14.3%	3	3
	Sales	14.3%	6	0
	Maritime Non-fishing Work	9.5%	4	0
	Other	4.8%	2	0
Age	N	129	63	66
	Mean	53.5	50.4	56.4
	Median	54	53	55
	Min	21	23	21
	Max	83	74	83
Years Fishing Experience	N	119	55	64
	Mean	30.8	29.9	31.5
	Median	30	30	30
	Min	2	2	5
	Max	83	71	83
First Generation	N	128	64	64
	Yes	39 (30.5%)	10 (18.5%)	29 (44.6%)
	No	89 (69.5%)	54 (84.4%)	35 (54.7%)

Table 1 also shows respondent fishermen background information for STT/STJ and STX fishermen, independently. STX fishermen reported a higher mean percentage of household

income from fishing than did STT/STJ fishermen, and also claimed a larger proportion of first generation fishing. Age and years of fishing experience were similar between the two populations, as were top sources of other income, with the exception that STT/STJ fishermen included sales and maritime non-fishing work as top income sources and STX did not.

4.2 Respondent Fishermen Fixed Costs

4.2.1 Fishermen Vessels

Table 2 shows that the majority of all respondent fishermen reported owning and operating their own vessels. The majority of owner operators reported owning 1 vessel. The mean vessel length reported was 22.8 ft., but vessels ranged from 6 ft. to 43 ft. The mean and median current values of these vessels differed considerably, with a mean value of \$25,786, and a median value of \$15,000. The minimum and maximum recorded values also greatly differed: between \$900 and \$250,000. Mean and median reported 2013 maintenance costs for these vessels were considerably different, as the mean was \$5,172, and the median was \$2,500. Similar to the range of vessel value, the minimum and maximum reported maintenance costs ranged from \$75 to \$50,000. For non-owner operators, a slight majority described themselves as owner but not operator, approximately 46% described themselves as the captain of someone else's boat, less than one third considered themselves crew, and the remaining portion reported that their boat was not in service.

Table 2 also indicates fishermen vessel data for STT/STJ and STX fishermen, independently. The mean vessel value and maintenance costs were higher for STT/STJ fishermen than for STX fishermen, but median STX values and costs were similar to those reported for the STT/STJ population. Other metrics were roughly comparable between the two populations.

4.2.2 Fishermen Diving Gear

Table 3 shows that slightly more than two thirds of all respondent fishermen reported owning SCUBA gear. Similarly, approximately 82% reported owning free dive gear. Fishermen who owned SCUBA gear (35) reported its mean and median values at \$5,027.86 and \$4,000, respectively, with values ranging from \$150 to \$18,000.00. Yearly maintenance costs for this gear had mean and median values of \$328.75 and \$140, respectively, but a maximum value of \$2,000. Fishermen who owned free dive gear reported its mean and median values at \$702.17

and \$500.00, respectively, with values ranging from \$70 to \$4,000. Yearly maintenance costs for this free dive equipment had similar mean and median values (just under \$100 and \$55, respectively), and a smaller overall range than for SCUBA gear maintenance.

Table 2. Vessel Ownership

		Vessel Ownership		
		All USVI	STT/STJ	STX
Own and Operate	N	130	64	66
	Yes	117 (90%)	58 (90.6%)	59 (89.4%)
	No	13 (10%)	6 (9.4%)	7 (10.6%)
If “no”...	N	13	6	7
	Crew	4	2	2
	Captain Someone Else’s Boat	6	3	3
	Owner Not Operator	7	4	3
	Boat Not in Service	1	1	0
Number of Vessels Owned	N	127	63	64
	0	5 (3.9%)	3 (4.8%)	2 (3.1%)
	1	91 (71.7%)	47 (74.6%)	44 (68.8%)
	2	27 (21.3%)	11 (17.5%)	16 (25%)
	3	4 (3.2%)	2 (3.2%)	2 (3.1%)
Vessel Length	N	153	76	77
	Mean	22.8	22.8	22.8
	Median	22	21	22
	Min	6	6	13
	Max	43	43	42
	≤ 19 ft.	51	31	20
	20-35 ft. ≥ 36 ft.	94 8	40 5	54 3
Current Market Value	N	135	63	72
	Mean	\$25,786	\$28,828	\$23,476
	Median	\$15,000	\$15,000	\$15,000
	Min	\$900	\$62	\$1,000
	Max	\$250,000	\$250,000	\$250,000
Maintenance Costs	N	117	59	58
	Mean	\$5,172	\$6,134	\$4,520
	Median	\$2,500	\$2,500	\$2,000
	Min	\$75	\$58	\$75
	Max	\$50,000	\$50,000	\$34,000

Table 3 also shows diving gear data for STT/STJ and STX fishermen, independently. A higher proportion of STT/STJ fishermen reported owning SCUBA equipment than did STX fishermen, but more STX fishermen reported owning free dive equipment than did STT/STJ fishermen. Gear value and maintenance costs were similar between the two populations for each SCUBA and free dive, although the overall range of values and costs for each category was higher for STX fishermen than for STT/STJ fishermen.

Table 3. Dive Gear Ownership

Dive Gear Ownership				
		All USVI	STT/STJ	STX
Own SCUBA Gear	N	136	66	70
	Yes	100 (73.5%)	60 (90.9%)	40 (57.1%)
	No	36 (26.5%)	6 (9.1%)	30 (42.9%)
Own Free Dive Gear	N	136	66	70
	Yes	111 (81.6%)	50 (75.8%)	61 (87.1%)
	No	25 (18.4%)	16 (24.2%)	9 (12.9%)
SCUBA Gear Value	N	35	6	29
	Mean	\$5,027.86	\$5,000	\$5,033.62
	Median	\$4,000	\$4,000	\$4,000
	Min	\$150	\$1,000	\$150
	Max	\$18,000	\$10,000	\$18,000
SCUBA Gear Maintenance Cost	N	36	6	30
	Mean	\$328.75	\$350	\$324.50
	Median	\$140	\$250	\$140
	Min	\$0	\$0	\$0
	Max	\$2,000	\$1,000	\$2,000
Free Dive Gear Value	N	23	14	9
	Mean	\$702.17	\$646.43	\$788.89
	Median	\$500	\$500	\$300
	Min	\$70	\$70	\$100
	Max	\$4,000	\$2,000	\$4,000
Free Dive Gear Maintenance Cost	N	22	14	8
	Mean	\$99.55	\$86.43	\$122.50
	Median	\$55	\$55	\$50
	Min	\$0	\$0	\$0
	Max	\$400	\$300	\$400

4.2.3 Fishermen Trap Ownership

Tables 4 and 5 provide details on reported fish and lobster trap ownership and costs. Approximately one third of all respondent fishermen reported owning fish traps. Of the fishermen who reported owning fish traps, the mean and median number of traps each individual owned in 2013 was 109.3 and 67, respectively, with a large range of 4 to 547 fish traps. The mean and median cost per fish trap was approximately \$250, but ranged from \$40 to \$500, and fishermen reported these traps to last a mean of 4.7 years.

Table 4. Fish Trap Ownership

Fish Trap Ownership				
		All USVI	STT/STJ	STX
Fish Trap Ownership	N	136	66	70
	Yes	39 (28.7%)	24 (36.4%)	15 (21.4%)
	No	97 (71.3%)	42 (63.6%)	55 (78.6%)
Number Traps Owned in 2013	N	38	24	14
	Mean	109.3	151.3	37.4
	Median	67	131	17
	Min	4	20	4
	Max	527	527	160
Number Traps Lost in 2013	N	35	23	12
	Mean	28.8	36.8	13.3
	Median	20	25	10
	Min	0	0	0
	Max	227	227	40
Number Traps Purchased/ Made in 2013	N	34	23	11
	Mean	33.9	34.5	32.6
	Median	25	25	25
	Min	0	0	0
	Max	227	227	130
Cost per Trap	N	35	23	12
	Mean	\$247.91	\$268.35	\$208.75
	Median	\$250	\$250	\$200
	Min	\$40	\$97	\$40
	Max	\$500	\$500	\$500
Lifespan of Trap	N	32	24	8
	Mean in Years	4.7	5.5	2.0

Table 5. Lobster Trap Ownership

		Lobster Trap Ownership		
		All USVI	STT/STJ	STX
Lobster Trap Ownership	N	136	66	70
	Yes	19 (14.0%)	16 (24.2%)	3 (4.3%)
	No	117 (86.0%)	50 (75.8%)	67 (95.7%)
Number Traps Owned in 2013	N	19	16	3
	Mean	188.9	220.6	20
	Median	107	160	-
	Min	10	10	-
	Max	600	600	-
Number Traps Lost in 2013	N	17	15	3
	Mean	12.5	14.2	0
	Median	2	6	-
	Min	0	0	-
	Max	60	60	-
Number Traps Purchased/ Made in 2013	N	15	14	3
	Mean	23.2	24.9	0
	Median	0	1.5	-
	Min	0	0	-
	Max	100	100	-
Cost per Trap	N	15	15	0
	Mean	\$177.46	\$177.47	-
	Median	\$175	\$175	-
	Min	\$57	\$57	-
	Max	\$300	\$300	-
Lifespan of Trap	N	12	12	0
	Mean in Years	7.4	7.4	-

Lobster trap ownership varied even more greatly than for fish traps, with one individual reporting 10 lobster traps and another reporting 600. The cost per lobster trap was lower than for fish traps, with similar mean and median values of approximately \$175, and the range was almost as wide as for fish trap costs. The mean lifespan of these traps was greater than that of fish traps at 7.4 years.

Tables 4 and 5 also indicate trap ownership date for STT/STJ and STX fishermen, independently. A higher proportion of STT/STJ fishermen owned both fish and lobster traps compared with STX fishermen. Such a small number of STX fishermen reported owning lobster traps that comparisons between STX fish and lobster trap ownership cannot be made, nor can comparisons between STX lobster trap ownership and STX fish trap ownership.

4.2.4 Fishermen “Other” Fixed Costs

Table 6 indicates that when asked if they had “other” fixed costs, a slight majority of all respondent fishermen said no. More STT/STJ fishermen reported “other” fixed costs than STX fishermen. Mooring and dockage fees were considerably higher for STT/STJ fishermen than for STX fishermen, as were costs for office supplies, but STX fishermen spent more on licensing and business loans than did STT/STJ fishermen.

Table 6. Other Fixed Costs

		Other Fixed Costs		
		All USVI	STT/STJ	STX
Other Fixed Costs	N	136	66	70
	Yes	63 (46.3%)	38 (57.6%)	25 (35.7%)
	No	73 (53.7%)	28 (42.4%)	45 (64.3%)
Mooring/ Dockage Fees	N	25	20	5
	Mean	\$3,561.72	\$3,725.25	\$2,905.60
	Median	\$2,500	\$2,640	\$1,000
License Costs	N	32	15	17
	Mean	\$304.09	\$201.27	\$394.82
	Median	\$95	\$50	\$100
Office Supplies	N	34	24	9
	Mean	\$1,963.56	\$2,358.88	\$794.22
	Median	\$980	\$980	\$600
Professional Services	N	11	11	0
	Mean	\$505.91	\$505.91	-
	Median	\$325	\$325	-
Business Loans	N	9	5	4
	Mean	\$11,677.78	\$9,620	\$14,250
	Median	\$6,000	\$6,000	\$8,000

4.3 Respondent Fishermen Variable Costs

Table 7 shows that almost 90% of all respondent fishermen reported they had variable expenses. The most popular recorded variable costs included boat fuel, ice, food, and truck fuel. For all respondent fishermen, the mean cost per trip was \$256.09, while the median cost per trip was \$194. For all respondent fishermen who reported variable costs, the mean cost per trip was adjusted to \$292.43, and the median cost per trip was adjusted to \$240. Those who reported variable costs averaged an increased mean and median cost per trip.

Table 7. Variable Costs

Variable Costs				
		All USVI	STT/STJ	STX
Variable Costs	N	136	66	70
	Yes	119 (87.5%)	57 (86.4%)	62 (88.6%)
	No	17 (12.5%)	9 (13.6%)	8 (11.4%)
Boat Fuel	N	119	57	62
	Mean	\$121.44	\$135.32	\$108.68
	Median	\$100	\$125	\$80
Gallons Used Per Trip	N	79	47	32
	Mean	29.7	29	30.8
	Median	24	25	20
Truck Fuel	N	86	34	52
	Mean	\$33.19	\$33.82	\$32.77
	Median	\$25	\$20	\$30
Ice	N	101	52	50
	Mean	\$29.80	\$38.73	\$20.93
	Median	\$20	\$25	\$15
Bait	N	69	41	28
	Mean	\$54.52	\$70.90	\$30.54
	Median	\$30	\$45	\$20
Food	N	97	45	52
	Mean	\$22.07	\$24.50	\$19.98
	Median	\$20	\$20	\$20
Air	N	27	4	23
	Mean	\$36.30	\$28.75	\$37.61
	Median	\$30	\$27.50	\$30
Crew	N	41	13	28
	Mean	\$149.02	\$201.92	\$124.460
	Median	\$100	\$150	\$80
	Mean number of Crew	1.5	1.3	1.7
Other Variable Expenses	N	16	11	5
	Mean	\$220	\$64.09	\$163
	Median	\$80	\$50	\$80
Total Per Trip Cost for All Respondents	Total Mean	\$256.09	\$277.74	\$235.68
	Total Median	\$194	\$225	\$167
Total Per Trip Cost for Respondents Reporting Variable Costs	Total Mean	\$292.43	\$337.35	\$248.94
	Total Median	\$240	\$229	\$194

Table 7 also shows variable costs data for STT/STJ and STX fishermen, independently. Approximately the same proportion of fishermen reported having variable costs for each population. Boat fuel, ice, bait, and crew costs were higher for STT/STJ fishermen than for STX fishermen, while STX fishermen reported higher costs associated with air and “other” variable costs. The total cost per trip (mean and median) was higher for STT/STJ fishermen than for STX fishermen, as was total cost per trip for those who reported variable costs.

5. Respondent and Fleet Trip Profitability

Respondent trip profits were estimated by merging their questionnaire answers with every logged trip within their commercial catch report (CCR). For missing cases when calculating total fleet profits, a hot deck imputation method was used (Lew *et al.* 2015): We filled in the data for fishermen with landings who were not in the respondent pool by substituting the cost data from a respondent from the same island who predominantly used the same gear and had the nearest annual fishing revenue.

Annual profits were calculated for actual respondents, non-respondents through hot deck imputation, and the two categories combined. To calculate annual profits, fixed costs were subtracted from previously calculated profits. Fixed costs included annual fixed expenses from the last page of the questionnaire, and included costs such as office expenses and dockage fees (see section 4.2).

5.1 STT/STJ Respondent and Fleet Trip Profitability

Table 8 shows that with 41 STT/STJ respondents, the mean sum of value landed was an estimated \$24,540.49, the median sum was \$9,971.60, and the sum of these sums was \$1,006,160. The mean and median sums of total variable costs were estimates of \$12,193.90 and \$4,290.00, respectively, and the sum of these sums was \$499,950.00. The mean sum of net revenue for STT/STJ respondents was estimated at \$12,346.59, the median sum was \$2,287.60, and the sum of these sums was \$506,210.15. The mean and median sums of net revenue minus crew shares was estimated to be \$6,967.21 and \$1,653.40, respectively, and the sum of sums was \$285,655.63. With 28 STT/STJ respondents reporting their fixed costs, the mean sum of these costs was an estimated \$6,306.29, the median sum was \$2,802.50, and the sum of these sums

was \$176,576.00. This resulted in annual profits of an estimated mean of \$7,234.95, a median of \$1,799.80, and a sum of \$202,578.55.

Table 8. STT/STJ Fleet Case Summaries and Annual Profit Estimates

STT/STJ								
		Value Landed Sum	Total Variable Costs Sum	Net Revenue Sum	Net Revenue minus Crew Shares Sum	Fixed Costs Sum	Annual Profits	Annual Profit Rates
Actual Respondents	N	41	41	41	41	28	28	
	Mean	24540.5	12193.9	12346.6	6967.2	6306.3	7234.9	
	Median	9971.6	4290.0	2287.6	1653.4	2802.5	1799.8	
	Sum	1006160.2	499950.0	506210.2	285655.6	176576.0	202578.6	20%
Hot Deck Imputed Fishermen	N	23	23	23	23	17	17	
	Mean	21690.7	12472.2	9218.6	6253.8	10447.2	1245.4	
	Median	9260.0	4900.0	4138.4	2242.3	3001.0	-1466.0	
	Sum	498886.8	286860.0	212026.8	143838.2	177602.0	21172.5	
Total Combined	N	64	64	64	64	45	45	
	Mean	23516.4	12293.9	11222.5	6710.8	7870.6	4972.2	
	Median	9759.6	4315.0	2636.3	2155.8	3000.0	1762.0	
	Sum	1505047.0	786810.0	718237.0	429493.8	354178.0	223751.1	15%

Table 8 also shows net revenue and annual profits for the remaining 23 STT/STJ fishermen after hot deck imputed estimates had been made. These values were then added to the 41 respondent STT/STJ fishermen to adjust total estimated net revenue and annual profits. The adjustments accounted for by the inclusion of hot deck imputed fishermen resulted in an increase of all metrics, but a decrease in annual profit rates from 20% (actual respondents) to 15% (adjusted rate). Sums for value landed, total variable costs, net revenue, and net revenue minus crew shares increased by about one third, while fixed costs increased by about 50% and annual profits by only about 10%.

5.2 STX Respondent and Fleet Trip Profitability

Table 9 shows that with 38 STX respondents, the mean estimated sum of value landed was \$38,306.50, the median sum was \$10,511.99, and the sum of these sums was \$1,455,647.14. The mean and median sums of total variable costs were estimated at \$14,493.05 and \$4,665.00, respectively, and the sum of these sums was \$550,736.00. The estimated mean sum of net revenue for STX respondents was \$23,813.45, the median sum was \$2,931.70, and the sum of these sums was \$904,911.14. The estimated mean and median sums of net revenue minus crew shares was \$15,705.27 and \$1,844.88, respectively, and the sum of sums was \$596,800.20. With 13 STX respondents reporting their fixed costs, the estimated mean sum of these costs was \$2,285.23, the median sum was \$1,060.00, and the sum of these sums was \$29,708.00. This resulted in estimated annual profits of a mean of \$36,545.82, a median of \$5,855.00, and a sum of \$475,095.70.

Table 9 also shows net revenue and annual profits for the remaining 40 STX fishermen after hot deck imputed estimates had been made. These values were then added to the 38 respondent STX fishermen to adjust total estimated net revenue and annual profits. The adjustments accounted for by the inclusion of hot deck imputed fishermen resulted in an increase of all metrics, except for a decrease in the sum of annual profits and in annual profit rates from 33% (actual respondents) to 17% (adjusted rate). Sums for value landed, total variable costs, net revenue, and net revenue minus crew shares increased by about 50%, while fixed costs increased by about 65%. Annual profits decreased by approximately 1%.

Table 9. STX Fleet Case Summaries and Annual Profit Estimates

STX								
		Value Landed Sum	Total Variable Costs Sum	Net Revenue Sum	Net Revenue minus Crew Shares Sum	Fixed Costs Sum	Annual Profits	Annual Profit Rates
Actual Respondents	N	38	38	38	38	13	13	
	Mean	38306.5	14493.1	23813.5	15705.3	2285.2	36545.8	
	Median	10512.0	4665.0	2931.7	1844.9	1060.0	5855.0	
	Sum	1455647.1	550736.0	904911.1	596800.2	29708.0	475095.7	33%
Hot Deck Imputed Fishermen	N	40	40	40	40	14	14	
	Mean	32590.7	11196.8	21393.9	12546.5	3621.4	-39.8	
	Median	6524.2	2980.5	1392.0	1146.1	1570.0	-597.6	
	Sum	1303627.5	447873.1	855754.4	501860.5	50700.0	-557.8	
Total Combined	N	78	78	78	78	27	27	
	Mean	35375.3	12802.7	22572.6	14085.4	2978.1	17575.5	
	Median	7396.3	3707.0	2178.2	1749.4	1200.0	1154.0	
	Sum	2759274.7	998609.1	1760665.6	1098660.8	80408.0	474537.9	17%

6. Discussion and Conclusions

This study finds that net revenues and estimated annual profits were slightly higher for STX fishers than for STT/STJ fishers. These results both support and conflict with a 2005 study on U.S. Caribbean fish trap costs and earnings that showed higher annual financial profits in the STX trap fishery than in the STT/STJ trap fishery, but lower annual economic profits in the STX trap fishery than in the STT/STJ trap fishery (Agar *et al.*, 2005). These differences could result from changes over time, or from the fact that the 2005 Agar *et al.* study focused on profits from trap fisheries and this study encompassed all modes of fishing. We also found a significant disparity between the median and mean fishing income, with the former being much lower than the latter, which is indicative of the fact that a relatively few highliners tend to dominate the fisheries on both island groups. The low median fishing income is not sufficient to survive on the islands, and the degree to which underreporting affects these numbers is unknown. Nor do we have estimates for other household income sources in the form of outside jobs or social assistance.

This study also indicates that USVI fishermen are receptive to filling out economic surveys as long as it is a part of the regular and required DPNR process (Crosson and Hibbert, 2017). Our high response rates were largely due to our incorporation into DPNR and the MOES workshops. Our short and succinct survey style also led to our positive reception by the fishermen and increased our response rates. This study methodology was unique in its ability to adapt throughout the multiple day workshops (Crosson and Hibbert, 2017). Although the survey instrument itself was consistent throughout surveying, our introduction presentation and interpersonal connections were modified as a result of respondent verbal or non-verbal feedback. For example, we learned to generally avoid the word “economics,” and instead emphasize that we were collecting “business costs.” We also learned to explain our reasoning for collecting this information as an attempt to help scientists understand how market conditions and regulations might affect local fishermen’s businesses. Many respondents reacted favorably to this communication effort, and openly discussed their businesses with us (i.e. completed the survey instrument) (Crosson and Hibbert, 2017). Together, our survey methodology and survey instrument resulted in savings in staff time and labor costs. This demonstrates that integrating the surveys into the registration process was a much more time efficient means of gathering cost data

than trying to interview fishermen in the field or over the phone, and should be considered as an option for other fisheries with a centralized registration process.

7. References

- Agar, J. J., J. R. Waters, M. Valdés-Pizzini, M. Shivlani, T. Murray, J. E. Kirkley, and D. Suman. 2008. "U.S. Caribbean Fish Trap Fishery Socioeconomic Study." *Bulletin of Marine Science* 82(3): 315-331.
- Agar, J. J., M. Shivlani, J. R. Waters, M. Valdés-Pizzini, T. Murray, J. Kirkley and D. Suman, 2005. U.S. Caribbean Fish Trap Fishery Costs and Earnings Study. NOAA Technical Memorandum NMFS-SEFSC- 534, 127 p.
- Bureau of Economic Analysis (BEA). 2014. United States Department of Commerce. News Release: The Bureau of Economic Analysis Releases 2013 Estimates of Gross Domestic Product for the U.S. Virgin Islands. Accessed on February 25, 2015 at http://www.bea.gov/newsreleases/general/terr/2014/VIGDP_081914.pdf.
- Bureau of Labor Statistics (BLS). 2014. United States Department of Labor Establishment Data: State and Area Employment Annual Averages. Accessed on February 25, 2015 at http://www.bls.gov/sae/eetables/sae_annavg113.pdf.
- Crosson, S. 2013. The impact of empowering scientific advisory committees to constrain catch limits in US fisheries. *Science and Public Policy*. 40(2): 261-273.
- Crosson, S. and L. Hibbert. 2017. Integrating Commercial Fisheries Registration, Education, and Social Science in the U.S. Virgin Islands. *North American Journal of Fisheries Management* 37(2): 349-352.
- Fleming, C.S., F. Tonioli, and J.J. Agar. 2014. A review of principle coastal economic sectors within the southeast United States and U.S. Caribbean. NOAA Technical Memorandum NMFS-SEFSC-669. 44 p.
- Impact Assessment, Inc., 2007. Community Profiles and Socioeconomic Evaluations of Marine Conservation Districts: St. Thomas and St. John, U.S. Virgin Islands. NOAA Series on U.S. Caribbean Fishing Communities. NOAA Technical Memorandum NMFS-SEFSC-557, 123 p. Agar, J. J. and B. Stoffle (editors).
- Kojis, B.L. 2004. Census of Marine Commercial Fishers of the U.S. Virgin Islands. Caribbean Fishery Management Council.
- Kojis, B.L. and N.J. Quinn. 2006. "A census of US Virgin Islands commercial fisheries at the start of the 21st century." Proceedings of 10th International Coral Reef Symposium 1326-1334.
- Kojis, B.L. and N.J. Quinn. 2011. Census of the Marine Commercial Fishers of the U.S. Virgin Islands.

Lew, D. K., Himes-Cornell, A., & Lee, J. 2015. Weighting and Imputation for Missing Data in a Cost and Earnings Fishery Survey. *Marine Resource Economics*, 30(2), 219-230.

Marine Outreach and Education USVI Style (MOES). 2014. Improving Fishing Community Awareness and Compliance: 2014 Commercial Fisher Workshop Summary. Final Report.

McCarthy, K.J. 2011. "Reported commercial landings of parrotfish, snappers, groupers and unclassified finfish in the United States Virgin Islands, 1974-2008." National Marine Fisheries Service. Sustainable Fisheries Division Contribution SFD-2011-010. Accessed on February 26, 2015 at http://www.sefsc.noaa.gov/sedar/download/S26_DW_08%20usvi%20commercial%20landings.pdf?id=DOCUMENT.

National Geographic. 2015. Virgin Islands National Park. Accessed on March 16, 2015 at <http://travel.nationalgeographic.com/travel/national-parks/virgin-islands-national-park/>.

National Oceanic and Atmospheric Administration (NOAA) Coral Reef Conservation Program (CRCP). 2014. Marine Outreach and Education U.S. Virgin Islands Style Initiative: Strategizing for Improved Outreach, Education and Communication Pertaining to USVI Marine and Fisheries Management and Conservation, U.S. Virgin Islands. Final Report. Prepared by AECOM, Jenn Travis, and Bob Trumble. Christiansted, St. Croix.

Ortiz, L. 2014. "United States Virgin Islands (USVI) Fishery Dynamics Under Seven Flags: Transformations of Knowledge and Culture." *Fuete y Verguilla* (St. Croix Special Edition): Fishing as a Lifestyle in St. Croix 8(2): 1-43.

Plaskett, S. Esq. 2013. "Dealing with the closing of the Hovensa Refinery." St. Thomas Source. Accessed on March 17, 2015 at <http://stthomassource.com/content/commentary/open-forum/2013/07/24/dealing-closing-hovensa-refinery>.

Pew Charitable Trusts. 2015. Sea Around Us Project. Exclusive Economic Zones. Accessed on February 25, 2015 at <http://www.searoundus.org/eez/>.

Stoffle, B., J. Contillo, C.A. Grace, and D. Snodgrass. 2011. The Socio-economic importance of fishing in St. Thomas, USVI: An examination of fishing community designation. NOAA Technical Memorandum NMFS-SEFSC-623, 47 p.

United States Census 2010 (USC). 2011. U.S. Census Bureau Releases 2010 Census Population Counts for the U.S. Virgin Islands. Accessed on February 25, 2015 at <http://www.census.gov/2010census/news/releases/operations/cb11-cn180.html>.

Valdés-Pizzini, M., J. J. Agar, K. Kitner, C. García-Quijano, M. Tust, and F. Forrestal. 2010. Cruzan Fisheries: A rapid assessment of the historical, social, cultural and economic processes that shaped coastal communities' dependence and engagement in fishing in the island of St. Croix, U.S. Virgin Islands. NOAA Series on U.S. Caribbean Fishing Communities. NOAA Technical Memorandum NMFS-SEFSC-597, 144 p.

VInow. 2015a. St. Croix, Virgin Islands: Facts & History. Accessed on March 17, 2015 at <http://www.vinow.com/stcroix/history/>.

VInow. 2015b. St. Thomas, Virgin Islands: Facts & History. Accessed on March 17, 2015 at <http://www.vinow.com/stthomas/History/>.

VInow. 2015c. Virgin Islands Geography. Accessed on March 16, 2015 at http://www.vinow.com/general_usvi/geography/.

VInow. 2017a. St. John: History. Accessed on November 27, 2017 at <http://www.vinow.com/stjohn/history/>.

VInow. 2017b. St. John, Virgin Islands Travel Guide. Accessed on November 27, 2017 at <http://www.vinow.com/stjohn/>.

Virgin Islands Daily News. 2013. Hovensa Q and A. Accessed on March 17, 2015 at <http://virginislandsdailynews.com/news/hovensa-q-and-a-1.1538255>.

Appendix 1: Survey Form

Name: _____ Date: _____
 Telephone: _____ Permit #: _____
 E-mail: _____ Vessel Name: _____
 Vessel ID: _____

Please complete this brief survey. Enter “0” in categories where you had no such expenses.

1. How would you describe your participation in commercial fisheries?
 _____ Full-time _____ Part-time
2. What percentage of your household income is from commercial fishing? _____%
3. If not 100%, what non-commercial fishing activities do you engage in for income?

4. What is your age? _____
5. How many years of commercial fishing experience do you have? _____
6. Are you a first generation commercial fisherman? ____ Yes ____ No

Vessels:

7. Do you own **AND** operate a fishing vessel? ____ Yes ____ No

If No, how would you describe yourself?

____ Captain on someone else’s boat ____ Vessel owner, not operator ____ Crew
 ____ Other: _____

8. How many fishing vessels do you own? _____

Boat Number	Length (ft.)	Current Market (sale) Value of Vessel and Engines (\$)	Repair and Maintenance Costs in last 12 Months (\$)
1			
2			
3			

Diving Gear: *Do you own...*

Gear and associated fishing equipment	Today's market (sale) value of fishing gear and associated equipment (\$)	Repair and maintenance costs incurred in last 12 months
SCUBA (tanks, BC, spear, etc.)		
Free diving (fins, masks, spear, etc.)		

Traps: *Do you own...*

Type of trap	Number of traps owned at the end of the year	Number lost or retired last year	Number purchased or made last year	Cost per trap (w/ buoys, rope, etc.)	Average life span of trap not lost or retired
Fish traps					
Lobster traps					

Trip Expenses:

On a regular fishing trip how much do you spend on:

9. Fuel and oil cost: \$ _____ Gallons used per trip: _____
10. Truck fuel: \$ _____
11. Ice: \$ _____
12. Bait: \$ _____
13. Food and beverage: \$ _____
14. Air supply: \$ _____
15. Captain and crew: \$ _____ Number of crew: _____
16. Other expenses: \$ _____ What were they: _____

Last year, how much did you spend on:

	Annual (\$)
Mooring/dockage fees	
Fishing, boat, and trailer licenses	
Office expenses (rent, cellular, utilities)	
Professional services (lawyer or accountant)	
Loan Payments	