Puerto Rican Small Scale Fleet Costs and Earnings Study

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Executive Summary

This paper describes the main findings of a socio-economic survey of the small-scale commercial fleet in the Commonwealth of Puerto Rico. The survey inquired about household demographics, fishing practices, capital investment in fishing vessels, gear and equipment, variable and fixed costs, and earnings. Three hundred and sixty three fishermen were interviewed out of an estimated population of 1,152 using a stratified random sample.

The study revealed that the majority of the interviewees were middle-aged men, with moderate levels of formal education and high levels of fishing dependence. The typical fisherman was 52 years old and had 30 years of fishing experience. Fishermen reported that he derived about 65% of their household income from fishing activities and the remaining came from non-fishing activities (11%) and government assistance (21%). Most of them fished on a full-time basis.

The majority of the fishermen (70%) owned a single fishing boat and few of them (5%) owned 2 or more boats. The average boat was about 20 feet in length, had an outboard engine (61 hp), and had a fiberglass hull. Handlines, SCUBA, fish traps, bottom lines, and gillnets were the most commonly used gears.

Bottom lines and SCUBA were the most expensive gears to operate. On average, bottom line fishermen and SCUBA divers spent about $85 and $66 per trip running their boats, respectively. Gillnets had the lowest variable costs per trip ($36). Fuel accounted for the largest share of the variable cost categories. The percentage of fuel expenses to total variable costs ranged between 60% (SCUBA) and 68% (fish traps and gillnets). Bait cost were the second most important expenditure category after fuel costs. The percentage of bait expenditures to total variable cost ranged between 0% (SCUBA) and 19% (bottom lines).

The study found that the typical Puerto Rico fisherman spent about $1,938 on annual fixed costs. Office expenses (mainly transportation and communication), and boat and engine maintenance were the main expense categories accounting for 46% and 37% of the total annual fixed expenses, respectively.

Our findings indicate that SCUBA is the most profitable fishing gear in Puerto Rico. SCUBA diving profitability is driven by targeting high valued species such as spiny lobster and conch, and by having moderate fuel and maintenance expenses.

Contents

Introduction

The Magnuson-Stevens Act (MSA), the Regulatory Flexibility Act (RFA), the National Environmental Protection Act (NEPA), and Executive Order (EO) 12866 require federal agencies to conduct socio-economic analyses when proposing regulatory actions. This requires a number of different types of economic analyses including the impact on entities directly regulated and those indirectly affected. To satisfy these legislative mandates, the National Marine Fisheries Service (NMFS) collected costs and earnings information about the Puerto Rican small scale commercial fleet.

This report provides a summary of the socioeconomic data collected during this effort. The data obtained will assist in establishing socio-economic baselines, assessing the financial and economic performance of the industry as well as developing economic models to evaluate management proposals.

Methods

The sampling frame consisted of 1,152 fishermen identified through the 2008 Puerto Rican commercial fishermen census, the trip ticket and commercial fishermen license databases. These databases provided fishermen's names and contact information. The sampling design consisted of a regional stratified random sample of 352 fishermen (i.e., North, South, West and East). The weighing of the sample was proportional to the total number of fishermen present in each region. Table 1 shows that 70 fishermen were sampled in the East region, 68 were surveyed in the North region, 102 in the South region, and 123 in the West region. Eleven surveys were collected opportunistically, totaling 363 completed surveys.

The survey instrument had both open and closed ended questions, which inquired about household demographics, fishing practices, capital investment in fishing vessels, gear and equipment, variable and fixed costs, and earnings. The surveys were in-person and voluntary.

To meet the requirements of the sampling protocol, interviewers contacted selected fishermen from a randomized list, which contained names, addresses, and phone numbers (if available). Surveyors were also instructed to select a replacement if a fisherman: a) refused to participate, b) were not available due to illness, death, or travel, and c) could not be contacted after eight separate attempts. When the number of willing participants prevented contractors from meeting a stratum goal, interviewers completed additional interviews in another region.

The overall response rate was 62%. Most of the non-responses were due to the inability to reach fishermen in the villas pesqueras. Geographically, the East region had the highest non-response rate (48%) and West region the lowest one (30%). The field work took place between June and October of 2009.

Results and Discussion

In all, 363 commercial active fishermen were interviewed along the Commonwealth of Puerto Rico (Figure 1). This section presents summary statistics for different themes covered in a survey, including: demographic profile, vessel, gear and equipment description, fishing practices, and costs and earnings.

To facilitate comparisons across gears, we report descriptive statistics for the five most commonly used gears. It is important to note that a fisherman can fish with multiple gears.

Demographic Profile

Most respondents were seasoned, middle-aged fishermen who fished on a full time basis. Fishermen's ages ranged from 17 to 86 years, with an average of 52 years (Table 2a). On average, younger fishermen used SCUBA (46 years) whereas older fishermen used bottom lines (57 years). The fishing experience of a typical fisherman ranged from 0.5 to

75 years, with an average of 30 years (Table 2a). Fish trap and gillnet fishermen were the most experienced fishermen averaging in excess of 35 years of fishing experience.

Most of the interviewees had modest levels of formal education. About 81% of the respondents did not complete high school. Only 5.5% reported having a college degree (Table 2b). The U.S. census data for 2000 reported that 60% of Puerto Rican adults had a high school degree and 18% had a college degree (Ladd and Rivera-Batiz, 2006). This information suggests that, on average, commercial fishermen have a lower educational attainment levels than a typical Puerto Rican adult, which may limit their employability outside the fisheries sector.

Eighty-two percent of the fishermen surveyed were captains who either owned a boat or fished on another individual's boat (Table 2b). Most of the fishermen interviewed (72%) owned their boat and a smaller percentage of them (14%) had another type of arrangement; which generally meant that the fisherman primarily fishes in a boat owned by another individual (Table 2b). In Puerto Rico, it is common to see family and friends fishing together, sharing one boat at a time.

Sixty-seven percent of the respondents self-reported that they fished on a full-time basis (Table 2b), which is 35% higher than the levels reported in 2002 (Matos-Caraballo *et al.*, 2008; Matos-Caraballo, 2009). The sharp rise in the proportion of fishermen operating on a full-time basis likely captures the drop in construction employment opportunities and may also be an unintended consequence of Regulation No. 6768, which required the submission of tax records to obtain a commercial fishing license.[1] Puerto Rico's Department of Agriculture grants full-time fishermen a 90% tax exemption on their fishing income. Part-time fishermen do not receive a tax exemption. Another contributing factor is the poor condition of the local economy which has been undergoing a deep recession since the latter part of 2006. In 2009, the average unemployment rate reached 13.4% (up by 2.5% relative to previous year).

[1] Full-time fishermen are required to use their state tax income returns to document that 50% or more of their income is derived from fishing whereas part-time fishermen need to show that fishing contributes between 20 and 49% of their income. The regulation also provides for a third type of license, the so-call

Most of the fishermen had small household sizes. The number of dependents (including the fisherman) ranged between 0 and 11, with an average of 3.3 (Table 2a). Griffith *et al*. (2007) ethnographic work on Puerto Rican fishing communities found similar average household sizes. Though, there are no comparable figures for U.S. Virgin Islands fishermen Agar *et al*. (2008) found that the average number of dependents for fish trap fishermen ranged from 2.8 in St. Thomas and St. John to 3.4 in St. Croix.

Seventy percent of the fishermen stated that they were dependent on fishing to support their families. The average Puerto Rican fisherman stated that he derived about 65% of their household income from fishing activities and the remaining came from non-fishing activities (11%) and government assistance (21%; Table 2b).[2] Seventy-eight percent of the fishermen declined to share information on their participation on non-fishing activities. Eight percent said that they worked on construction and another 2% stated they worked on 'odd' jobs (or "chiripas" as they known locally). Griffith *et al*. (2007) estimated that fishing activities contribute between 40% and 45% to the average fisherman's household income. Table 2b shows that SCUBA divers have the highest dependence on fishing activities (77%). Handliners have the highest dependency on non-fishing activities (15.1%), and gillnetters have the highest level of dependency on government programs (28.1%).

Description of fishing vessel, gear and fishing equipment

Vessel description

Seventy percent of the fishermen owned a single boat and only few of them (5%) owned 2 or more boats. The typical boat was 20 feet in length and the hull was 15 years old.

The majority of the vessels had fiberglass hulls (65.7%) and outboard engines (97.2%). Table 3b shows that the cost of a brand new hull ranges from $500 to $80,000 and the

[2] Similar levels of fishing dependence have been reported for the commercial fishing fleet in the U.S. Virgin Islands. According to Kojis (2004), fishermen from St. Thomas and St. John derived about 74% of their household income from fishing and fishermen from St. Croix derived about 60%.

cost of a used hull ranges from $250 to $40,000. The average longevity of the hull was about 28 years.

The average propulsion rate was 61 horsepower (hp) with a range between 5 and 270 hp. On average, SCUBA divers used larger engines (69 hp) whereas gillnetters used smaller ones (53 hp). The price of a new engine ranged from $800 to $ 30,000, while the price of a used motor ranged from $200 to $8,000. Fishermen who used bottom lines had the most expensive engines ($5,588), whereas gillnetters had the least expensive ones ($ 4,054; Table 3b).

Fishing equipment description

Table 3b shows the average cost of fishing equipment. The average cost of brand new (non-electronic) fishing equipment (i.e., winches, hoists, ropes, and coolers) was $525 (ranging from $6 to $3,200) whereas the replacement cost of their used fishing equipment was $474. The average life of this type of equipment was almost 10 years (Table 3b).

Fishermen reported that the cost of a brand new GPS ranged from $105 to $2,500 (average $488), while the replacement cost of their existing GPS ranged from $40 to $1,800 (average $246). The average longevity of the GPS was almost 5 years. The reported price of a new depth finder varied from $200 to $2,500 (average $589), while a used one ranged between $100 and $2,500 (average $462). The average longevity of a depth finder was 7 years.

Table 3b shows that the cost of a brand new fish finder ranged between $120 and $2,300 (average $589) and the price for a used one ranged from $80 to $1,000 (average $347). On average, a fish finder lasted for 6 years. The reported cost of a new radio ranged between $12.5 and $950 (average $250), and the price for a used one varied from $30 to $400 (average $130). On average the longevity of a radio was almost 6 years (Table 3b). The cost of a new EPIRB ranged from $230 to $2,000 ($1,183), while the cost a used one ranged from $ 350 to $ 1,800 (average $1,075). The average longevity of the EPIRB was 15 years. The cost of a new cell phone ranged between $20 and $500 ($146 average),

whereas the price of a used one ranged from $50 to $200 (average $113). On average, cell phone lasted about 3 years (Table 3b).

Fishing gear description

Ninety three percent of the fishermen interviewed owned their fishing gears, 3.3% co-owned them, and 4.9% used rented gear. Only SCUBA fishermen stated that they rented gear. The majority of the fish trap captains said that they fished with pots because of they could work elsewhere while their pots continued fishing, particularly when seas were rough. Fifty percent of the gillnet captains said they used this gear because of its selective nature. About 30% of the handline captains responded that they use this gear because it was efficient. Eighty percent of the bottom line and 24% of the SCUBA captains responded they used their respective gears because they enjoyed fishing with them.

Hand Line

The number of handlines held per fisherman ranged between 2 and 60 units, with an average of 12 units. However, when they went fishing, they only fished with 4 lines. The typical handline was 880 feet long (range 12-4,800) and had 2 hooks (range 1-15 hooks). Fishermen estimated that their used lines were worth, on average, $191 and that it would cost them about $325 to replace with new ones (Table 4).

Table 4 shows that handline fishermen spend, on average, $143 on annual maintenance, including materials and labor (maintenance cost ranged from $0 to $660). They typically spend 35 hours per year on gear maintenance chores. Approximately 80% of them said they built their own, building on average 12 units (Table 4).

Bottom Line

The typical bottom line fisherman had 6 bottom lines (range 1-30), but only fished with 3 lines at the time (range 1-30). The average line was 1,194 feet long (60-4,500 feet) and

had 10 hooks per line (range 1-30 hooks). Fishermen estimated that replacing the gear anew would cost them about $555.

Annual maintenance costs averaged $534 (range $9 - $5,400). Bottom line fishermen spent about 120 hours per year on maintenance activities (Table 4) Ninety-eight percent of the bottom line fishermen constructed their own lines.

Gill Net

The average gillnet fisherman held 3 nets (range 1-25) but only fished with 2 nets at the time (range 1-8). The average size of a gillnet is 323 feet in length (range 21-3,600) and 11 feet in width (range 3-165 feet). Mesh sizes varied from 1.3 to 5.5 inches, averaging 2.9 inches. Fishermen estimated that their gillnets were worth $1,618 but it would cost them about $3,660 to replace them anew (Table 4).

Maintenance cost varied from $ 3.50 to $ 2,500, averaging $ 358. Gillnetters spent the most time on gear maintenance; averaging 177 hours per year (range 1- 1,050, Table 4). Over 65% of the gillnetters build their own nets.

SCUBA

The average SCUBA diver owned about 7 tanks (range 1-22) but only fished with 4 of them (range 1-16). Divers estimated that all their SCUBA gear was worth about $677 (range $0-$2,400) but it would cost them about $1,392 (range $225-$4,375) to replace them new. As noted earlier, SCUBA divers were the only fishermen who stated that they rented gear: 73.3% rented tanks and 26.7% rented other diving equipment.

On average, divers spent $21 on tank rentals $45 on other diving equipment rentals. Maintenance costs averaged $191 per year (range $8- $625). SCUBA divers spent about 74 hours annually on maintenance chores (Table 4).

Fish Traps

The average number of fish traps held by fisherman was about 29 traps (range 3-240), however only 26 of them were fished (range 1-240). Fishermen estimated that their pots were worth $2,378 ($375-$6,000) but replacing them new would cost them about $3,346 ($375-$3,000). The average annual maintenance cost is about $1,072 (range $20-$4,500).

The relatively high cost of maintenance was due to the high number of traps lost and/or stolen. On average, fish pot fishermen spend 133 hours per year on gear maintenance activities (range 4 to 728, Table 4). Over 90% of the fish trap fishermen build their own traps.

Annual Fixed Costs

The survey also inquired about annual fixed costs. Table 5 summarizes the main expenditures under this category drawing on the information provided by the captains.
The typical Puerto Rico fisherman spent about $1,938 on annual fixed costs.

Office expenses (mainly transportation and communication), and boat and engine maintenance were highest expense categories accounting for 46% and 37% of the total expenses, respectively. Loan payments on the vessel and engine and permit payments account for 9.6% and 3.6% of the annual total expenditures, respectively. Though, the average loan payment appears to be low, in reality, they can be fairly high because a small percentage of fishermen had them. About 2 percent of interviewees had vessel loans which costs them about $3,196 annually to service. Three percent of the fishermen mentioned having an engine loan which cost them $2,273 per year to service. SCUBA fishermen had the largest boat and engine service payments and bottom line service had the lowest service payments (Table 5).

On average, the typical commercial fisherman spends almost $70 per year in permits and licenses. Most of the fishermen interviewed (57%) possessed a territorial license. Of

these territorial licenses, 95% of them were full-time licenses 1.4% were part-time licenses and 3.8% were apprentice or beginner licenses. These annual licenses sell for $10.

About 41% of the fishermen held a lobster permit, 31 % possessed a queen conch permit, and 12.4% held an incidental (by-catch) fishery permit. Very few of them possessed land crab (6.7%) or sirajo (less than 1%) permits. The average cost for each individual permit (e.g., lobster, conch, land crab, sirajo and incidental fishery) was about $15 per year. Only 12% of the fishermen held high migratory species (HMS) permit which costs about $20.

Less than 1% of the fishermen interviewed had boat insurance, but those who did, spent approximately $1,633 per year. Similarly, less than 1% of the interviewees had public liability insurance which costs about $65 per year. Most of the fishermen kept their boats docked at the fish cooperatives (43.5%) or kept them home (27.5%).

Variable Costs and Earnings

Bottom lines and SCUBA have the largest operating expenses per trip. On average, bottom line fishermen and SCUBA divers spend about $85 and $66 per trip, respectively. Gillnets have the lowest average variable costs per trip ($36; Table 6a).

Fuel accounts for the largest share of the variable expenses. Table 6a shows that bottom line fishermen spend about $57 on fuel per trip whereas gillnetters spend about $24 on fuel expenses. The ratio of fuel expenses to total variable costs ranges between 60% (SCUBA) and 68% (fish traps and gillnets).

Bait costs are the second most important expense. Bottom line fishermen spend the most averaging $16 per trip whereas SCUBA divers spend nothing on bait (Table 6a). Almost 97% of the SCUBA divers did not use bait and the few who did caught their own (Table

6b). The percentage of bait expenditures to total variables costs ranged between 0% (SCUBA) and 19% (bottom lines).

Food and ice are relatively minor components of the operating expenses. Fishermen who use bottom lines spend about $12 on food and $4 on ice per trip. In contrast, SCUBA divers spend $8 on food and less than $1 on ice per trip. About 71% of the SCUBA divers do not use ice (Table 6b). SCUBA divers spent on average $19 per trip on air refills for their tanks (Table 6a).

SCUBA divers generated the most revenues per trip averaging $357 and bottom line fishermen the least averaging $139 per trip. SCUBA divers tend to catch species with high market values such as spiny lobster and conch. When we compared our revenue and landings results to those in the Puerto Rico trip ticket database, we found that our revenue estimates were over 50% higher for SCUBA, 45% higher for gillnets and 40% higher for handlines. Our fish trap revenue estimates were 18.2% higher than those reported in the trip ticket, but 9% lower for bottom line.

We also found that our gillnet landings estimates were 21.5% higher than those reported in the trip ticket database. Similarly, our handline (SCUBA) landing estimates were more than 40% (37%) higher than those observed in the trip ticket database. On the other hand, our bottom line and fish trap landing estimates were 33% and 16% (respectively) lower than those reported in the trip ticket database.

Most fishing boats were manned by a captain and one (Table 6b). Most of the captains and crew receive a share of the revenue generated during the trip.

Table 7 shows that, on average, SCUBA and gillnets are the most lucrative gears, generating about $137 and $80 (respectively) per trip in profits. On the other hand, the average bottom line operation was found to be operating in the red. Caution must be exercised when using these figures given the striking differences between this report's landings and revenue figures and those found in the trip ticket program.

Fishing practices

Over 70% of the interviewed fishermen took single gear trips and below 30% of them would take multiple gear trips.

SCUBA divers took the most fishing trips averaging 184 per year and trap fishermen the least, averaging 99 trips per year; however, traps continue fishing while their owners work on land. The average duration of a SCUBA and fish trap trip is about 6 hours. The months between October and December tend to be the most active for SCUBA divers and the months between October and January are the most active for trap fishermen. Fishermen who fish with bottom lines take fewer trips (123 trips per year) but their duration is considerably longer. The average duration of a bottom line trip is 21 hours.
The monthly frequency of fishing trips is closely linked to local abundance, regulations and weather conditions.

About 20% of the fishermen stated keeping part of their catch for personal use and 17% stated giving part of their catch as a gift to friends and family. On average, the fishermen kept 7.5 lbs. of their catch for personal use and gave away 6.8 lbs. as a gift. When fishermen were asked which species they favored for personal consumption, most of them responded yellowtail snapper.

Conclusions

The study provides a detailed account of the socioeconomic characteristics and performance of small-scale commercial fishing fleet in Puerto Rico. This study shows that most of the fishermen interviewed were middle-age, with moderate levels of formal education and high levels of fishing dependence, which limited their ability to secure employment outside the fishery. The majority of the fishermen interviewed had considerably fishing experience and fished on full time basis.

The study also revealed that the fleet was small in size and had moderate levels of mechanization. The average boat was about 20 feet in length, had an outboard engine (61 hp), and had a fiberglass hull. Handlines, SCUBA, fish traps, bottom lines, and gillnets were the most commonly used gears.

Bottom lines and SCUBA were the most expensive gears to operate. On average, bottom line fishermen and SCUBA divers spent about $85 and $66 per trip running their boats, respectively. Gillnets had the lowest variable costs per trip ($36). Fuel accounted for the largest share of the variable cost categories. The percentage of fuel expenses to total variable costs ranged between 60% (SCUBA) and 68% (fish traps and gillnets). Bait cost were the second most important expenditure category after fuel costs. The percentage of bait expenditures to total variable cost ranged between 0% (SCUBA) and 19% (bottom lines).

Finally, the study suggested that SCUBA is the most profitable fishing gear in Puerto Rico. SCUBA diving profitability is driven by targeting high valued species such as spiny lobster and conch, and by having moderate fuel and maintenance expenses.

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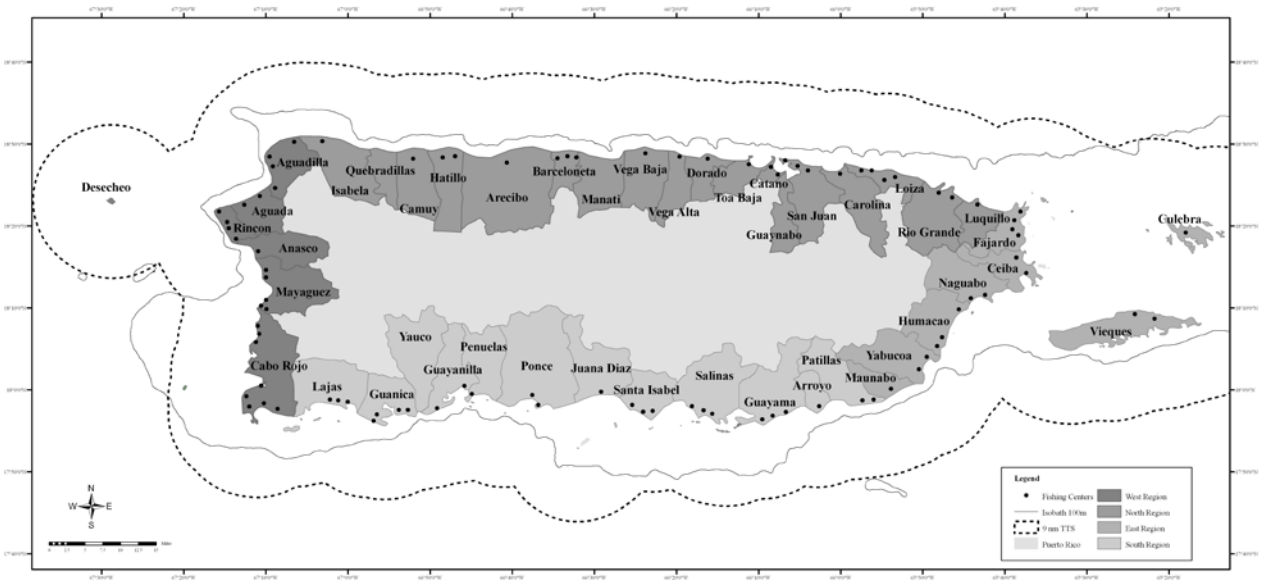

Figure 1: Distribution of fishing centers in the Commonwealth of Puerto Rico.

Table 1: Sampling design.

Region	***Population***	***Target number of surveys***	***Number of surveys completed***	***Total non-response***	***Number of contacts***
North	228	69	70	53	123
East	216	67	68	64	132
South	321	98	102	51	153
West	387	118	123	52	175
Total	**1152**	**352**	**363**	**220**	**583**

Table 2a: Demographic profiles.

	Hand line	***Bottom line***	***Gill net***	***SCUBA***	***Fish traps***	***Total All gears***
Number of fishermen	143	75	59	75	74	363
Average age (years)	53.2 (15.2) n= 127	57.4 (12.4) n= 66	56.7 (15.1) n= 53	46.3 (12.4) n= 69	56.5 (10.9) n= 68	52.3 (14.7) n = 325
Average fishing experience (years)	30.7 (16.9) n= 141	30.8 (2.4) n= 74	35.6 (16.5) n= 58	27.1 (12.4) n= 74	35.7 (14.2) n= 74	30.2 (16.5) n = 360
Average number of dependents (including self)	3.3 (1.8) n= 116	2.9 (1.4) n= 52	3.3 (1.8) n=38	3.4 (1.8) n= 79	3.0 (1.7) n= 59	3.3 (1.8) n= 326

*(Sample standard deviation); n= sample size.

Table 2b: Demographic profiles by main gear type.

	Hand line	***Bottom line***	***Gill net***	***SCUBA***	***Fish traps***	***Total All gears***
Age distribution (%)						
<=30 years	7.7	1.3	1.7	9.3	0	7.8
31-40 years	14.0	10.7	16.9	24.0	8.1	14.3
41-50 years	14.0	12.0	10.2	24.0	16.2	17.6
51-60 years	18.9	24.0	16.9	22.7	37.8	19.8
61-70 years	23.1	26.7	30.5	9.3	20.3	20.7
>=71 years	11.2	13.3	13.6	2.7	9.5	9.4
	n= 127	n= 66	n=53	n= 69	n= 68	n=325
Fishing experience (%)						
1-5 years	4.9	12.0	0	1.3	2.7	6.1
6-10 years	7.7	4.0	6.8	5.3	0	8.0
11-20 years	27.3	13.3	13.6	32.0	13.5	20.7
21-30 years	14.0	18.7	23.7	32.0	25.7	21.5
31-40 years	15.4	21.3	13.6	10.7	18.9	15.2
40+ years	30.1	29.3	40.7	17.3	39.2	27.8
	n= 141	n=74	n=58	n= 74	n=74	n= 360
Educational attainment (%)						
Less than high school	34.3	38.7	49.1	34.7	44.6	37.7
Some high school	42.7	44.0	35.6	45.3	40.5	43.2
Some college or professional training	4.9	4.0	5.1	5.3	6.8	5.8
College or more	7.7	4.0	3.4	6.3	4.0	5.5
	n= 128	n= 68	n=55	n= 69	n= 71	n= 236
Full-time vs Part-time fishermen						
Self-reported full-time fishermen (%)	60.1	57.4	61.0	78.7	81.1	67.2
Self-reported part-time fishermen (%)	37.8	41.3	35.6	21.3	18.9	31.3
	n=140	n=74	n=57	n=75	n= 74	n= 357
Household income (%)						
Household income derived from fishing	58.7	56.6	55.5	77.1	68.9	65.4
Household income derived from non-fishing activities	15.1	9.1	14.6	7.2	10.6	10.5
Household income derived from government	24.2	26.9	28.2	13.0	15.2	20.9
	n=140	n=74	n=57	n= 69	n=74	n= 357

Owner operator (%)						
Owner	77.6	88.0	84.7	66.7	82.4	71.6
Co-owner	4.9	1.3	0	6.7	0	2.5
Renter	0.7	0	0	2.7	0	1.6
Other arrangement	9.1	6.7	8.5	13.3	9.5	15.4
Does not own a vessel	7.7	4.0	6.8	10.7	8.1	8.8
	n= 142	n=72	n=59	n= 73	n=74	n= 361
Fishermen type (%)						
Owner/captain	80.4	89.3	79.7	68.0	85.1	73.5
Captain on someone's boat	9.8	6.7	8.5	12.0	8.1	8.5
Mate	4.9	2.7	6.8	6.7	5.4	10.5
Other	2.8	1.3	1.7	12.0	1.3	6.1
	n=142	n=74	n=58	n= 69	n= 74	n= 362

Table 3a: Vessel characteristics.

	Hand line	***Bottom line***	***Gill Net***	***SCUBA***	***Fish traps***	***Total All gears***
Vessel hull type (percentage)						
Fiberglass	69.9	72.7	43.5	88.0	55.7	65.7
Aluminum	0	0	0	0	0	0
Wood	30.1	27.3	56.5	12.0	44.3	34.3
Steel	0	0	0	0	0	0
	n= 113	n= 66	n= 46	n= 50	n= 61	n= 254
Motor 1 type (percentage)						
Inboard	3.6	3.1	25.0	0	4.9	2.8
Outboard	96.4	96.9	75.0	100	95.1	97.2
	n= 110	n= 64	n= 45	n= 50	n= 61	n= 250
Motor 2 type (percentage)						
Inboard	5.6	13.3	0	0	5.6	6.1
Outboard	94.4	86.7	100	100	94.4	93.9
	n= 18	n=15	n= 11	n= 13	n= 18	n= 49

Table 3b: Vessel characteristics and fishing equipment cost.

	Hand line	***Bottom line*****	***Gill Net***	***SCUBA***	***Fish traps***	***Total All gears*****
Vessel length (feet)	19.5 (3.5) n= 113	19.9 (4.4) n= 65	19.0 (3.2) n= 46	20.1 (2.4) n= 49	20.7 (5.2) n= 61	19.7 (3.9) n= 252
Hull Age (years)	15.2 (11.5) n= 111	17.4 (12.2) n= 63	13.5 (10.4) n= 44	10.4 (7.7) n= 48	14.9 (12.6) n= 59	14.6 (11.3) n= 243
New hull replacement cost ($)	10,249 (11366.9) n= 106	9,964.2 (6935.0) n= 60	8,104.8 (9,879.4) n= 42	9,737.5 (5,637.4) n= 48	10,144.5 (12,347.4) n= 55	9,603.0 (10,521.7) n= 236
Used hull replacement cost ($)	5073.2 (6571.4) n= 99	4062.0 (3057.6) n= 58	2577.4 (2226.6) n= 41	4,350.0 (3,375.5) n= 47	4,225.0 (5,918.7) n= 52	4,391.3 (5,410.4) n= 225
Hull longevity (years)	29.4 (21.4) n= 101	29.4 (12.1) n= 58	28.7 (15.7) n= 43	28.8 (10.3) n= 48	29.1 (12.1) n= 58	28.2 (17.7) n= 232
Motor 1 (hp)	57.7 (35.8) n= 110	67.4 (41.1) n= 65	52.7 (35.1) n= 44	68.6 (34.5) n= 50	58.9 (46.1) n= 60	60.8 (38.4) n= 249
New motor 1 cost ($)	4,790.2 (2,823.9) n= 111	5,588.3 (3,903.9) n= 64	4,054.0 (2,193.9) n= 44	5,040.5 (2,920.6) n= 50	5,112.5 (4,678.1) n= 60	4,869.0 (3,173.6) n= 248
Current motor 1 cost ($)	2,112.5 (1,564.5) n= 106	1,875.8 (1,151.1) n= 59	1,898.3 (1,569.7) n= 43	1,993.3 (1,199.8) n= 45	1,768.9 (1,192.6) n= 53	1,954.1 (1,379.3) n= 227
Motor 1 longevity (year)	17.5 (7.5) n= 1	10.1 (5.6) n= 64	10.5 (7.1) n= 45	7.7 (5.6) n= 47	10.7 (8.0) n= 60	9.5 (6.7) n= 247
Motor 2 (hp)	51.3 (27.8) n= 18	73.9 (66.3) n= 14	58.0 (50.9) n= 11	66.0 (32.4) n= 13	54.7 (57.9) n= 18	61.7 (44.8) n= 48
New motor 2 cost ($)	4,293.6 (2,221.2) n= 18	7,010.7 (7,110.6) n= 14	3,600.0 (2,449.0) n= 11	4,357.7 (2,459.9) n= 13	4,646.9 (6,475.0) n= 18	4,873.3 (4,370.3) n= 47
Current motor 2 cost ($)	1,988.2 (1,627.2) n= 17	2,232.1 (1,510.6) n= 14	1,440.9 (1,160.6) n= 11	1,663.6 (923.6) n= 11	1,766.7 (1,278.1) n= 18	1,907.4 (1,409.9) n= 44

Motor 2 longevity (year)	9.8 (7.7) n= 18	11.4 (7.0) n= 14	8.9 (3.7) n= 11	7.6 (3.5) n= 12	10.3 (7.6) n= 17	9.9 (6.4) n= 47
New equipment cost (winch, hoist, ropes, and coolers) ($)	495.5 (486.1) n= 100	491.7 (399.4) n= 62	409.8 (364.6) n= 39	502.5 (543.7) n= 41	630.8 (521.9) n= 55	525.2 (538.4) n= 221
Used equipment cost (winch, hoist, ropes, and coolers) ($)	498.5 (475.1) n= 26	234.4 (181.4) n= 9	432.5 (338.0) n= 6	367.4 (405.1) n= 10	660.7 (639.3) n= 14	474.0 (501.5) n= 49
Equipment (winch, hoist, ropes, and coolers) longevity (yeas)	4.7 (4.6) n= 113	4.7 (4.8) n= 54	4.7 (3.7) n= 38	4.6 (3.9) n= 38	4.6 (3.9) n= 54	4.7 (4.3) n= 211
New GPS cost ($)	557.4 (482.9) n= 34	599.5 (563.9) n= 24	456.5 (229.7) n= 10	335.1 (220.1) n= 23	341.2 (197.6) n= 17	488.3 (410.0) n= 83
New depth finder cost ($)	729.6 (623.5) n= 19	735.2 (489.9) n= 17	675.0 (322.7) n= 4	844.4 (614.6) n= 9	628.6 (179.9) n= 7	840.3 (528.2) n= 45
New fish finder cost ($)	496.2 (395.8) n= 18	641.7 (409.9) n= 18	460.0 (265.5) n= 5	267.0 (126.6) n= 4	711.1 (406.0) n= 9	589.0 (495.4) n= 32
New radio cost ($)	275.8 (186.1) n= 24	261.7 (119.9) n= 28	191.8 (88.0) n= 10	288.1 (112.6) n= 8	201.6 (109.1) n= 17	249.6 (146.9) n= 60
New EPIRB cost ($)	1186.0 (739.9) n= 5	1325.0 (671.8) n= 2	1200.0 (0) n= 1	1425.0 (813.2) n= 2	1500.0 (424.3) n= 2	1183.0 (588.1) n= 10
New cellular cost ($)	131.3 (105.8) n= 26	193.5 (139.7) n= 11	118.6 (73.6) n= 8	186.2 (131.5) n= 11	176.9 (93.3) n= 11	145.9 (102.1) n= 50
Used GPS cost ($)	365.4 (473.2) n= 12	275.0 (225.4) n= 6	172.5 (135.5) n= 4	155.6 (110.7) n= 7	212.1 (178.7) n= 7	245.5 (321.8) n= 31
Used depth finder cost ($)	600.0 (936.1) n= 6	193.8 (96.6) n= 4	150.0 (0) n= 1	150.0 (0.0) n= 1	0.0 (0.0) n= 0	462.0 (657.6) n= 12
Used fish finder cost ($)	323.4 (310.9) n= 8	263.0 (180.5) n= 5	0.0 (0.0) n= 0	0.0 (0.0) n= 0	550.0 (353.5) n= 2	347.3 (325.7) n= 10
Used radio cost ($)	124.6 (137.4) n= 6	187.5 (143.6) n= 4	0.0 (0.0) n= 0	77.5 (0.0) n= 1	208.3 (177.4) n= 3	130.3 (110.6) n= 9

Used EPIRB cost ($)	1075.0 (1025.3) n= 2	1800.0 (0.0) n= 1	0.0 (0.0) n= 0	0.0 (0.0) n= 48	1800.0 (0.0) n= 1	1075.0 (1025.3) n= 2
Used cellular cost ($)	110.3 (54.4) n= 10	200.0 (0.0) n= 1	80.0 (0.0) n= 1	145.0 (77.8) n= 2	127.5 (55.0) n= 4	113.4 (52.4) n= 15
GPS longevity (years)	5.4 (2.9) n= 33	5.7 (3.3) n= 23	6.4 (4.2) n= 11	4.0 (3.1) n= 24	3.8 (1.8) n= 14	4.9 (3.2) n= 81
Depth finder longevity (years)	6.7 (3.9) n= 18	6.2 (3.3) n= 18	6.1 (4.0) n= 4	4.5 (3.1) n= 8	11.9 (11.0) n= 7	7.0 (5.6) n= 44
Fish finder longevity (years)	5.9 (3.6) n= 20	5.6 (4.2) n= 17	8.0 (4.6) n= 5	4.5 (5.1) n= 5	6.2 (3.8) n= 8	6.0 (4.0) n= 35
Radio longevity (years)	5.9 (5.6) n= 24	6.4 (5.7) n= 26	7.4 (3.8) n= 11	4.2 (4.1) n= 7	6.4 (4.1) n= 16	5.9 (4.6) n= 57
EPIRB longevity (years)	17.5 (10.6) n= 2	20.0 (0) n= 1	1.0 (0) n= 1	22.5 (3.5) n= 2	1.0 (0.0) n= 16	15.0 (9.8) n= 6
Cellular longevity (years)	3.1 (1.8) n= 35	3.7 (3.3) n= 16	4.0 (3.7) n= 10	2.6 (3.2) n= 16	2.3 (1.9) n= 13	2.9 (2.3) n= 67

*(Sample standard deviation); n= sample size.

** For bottom line database, one outlier was taken out of the data as it was doubling the values.

Table 4: Description of the main gears used.

	Hand line	***Bottom line***	***Gill net***	***SCUBA***	***Fish traps***
Gear Description (average)					
Total Number	11.9 (10.2) n= 115	6.1 (6.2) n= 67	4.0 (4.2) n= 47	6.5 (5.0) n= 51	28.7 (35.4) n= 63
Number of gears used to go fishing (units)	3.9 (3.6) n= 115	3.3 (4.5) N= 67	2.2 (1.5) n= 47	3.5 (2.5) n= 51	25.5 (35.0) n= 63
Gear value if sold today ($)	191.3 (285.6) n= 19	1,035.0 (1,219.7) n= 4	1,618.7 (1,894.0) n= 8	676.6 (596.0) n= 41	2,378.3 (1,976.3) n= 9
New gear value ($)	325.4 (354.4) n= 112	554.6 (779.2) n= 67	3659.8 (5019.3) n= 46	1,391.7 (1020.8) n= 42	3,346.0 (4,653.2) n= 63
Gear age (year)	4.0 (4.2) n= 62	3.1 (4.3) n= 23	6.9 (7.0) n= 27	10.3 (7.3) n= 36	2.1 (2.8) n= 23
Gear longevity (year)	3.1 (3.7) n= 103	3.0 (5.5) n= 56	9.3 (15.5) n= 46	18.9 (15.2) n= 39	1.9 (2.8) n= 62
Annual repair costs ($)	143.4 (223.7) n= 9	533.7 (1,130.1) n= 24	358.0 (502.2) n= 39	190.8 (61.3) n= 32	1072.2 (1,140.4) n= 33
Time dedicated to gear maintenance (hours)	35.3 (47.3) n= 7	120.2 (157.8) n= 12	176.5 (264.8) n= 14	74.0 (61.3) n= 3	132.6 (205.7) n =22

*(Sample standard deviation); n= sample size.

Table 5: Annual fixed costs.

	Hand line	***Bottom line *****	***Gill Net***	***SCUBA***	***Fish traps***	***Total All gears*****
Average operational annual costs($)						
Permits (Boat, trailer, HMS, Conch, Land crab, Sirajo, Lobster, Incidental fishery permits and Territorial license)	63.5 (49.6) n= 115	75.0 (47.9) n= 66	69.2 (50.0) n= 47	75.8 (53.1) n= 51	79.0 (59.6) n= 63	69.8 (56.5) n= 266
Fees (Fishing cooperative fees, Mooring buoys fees) ($)	34.4 (58.5) n= 115	40.7 (44.9) n= 66	26.1 (40.4) n= 47	18.6 (39.2) n= 51	28.5 (45.6) n= 63	31.0 (70.2) n= 266
Insurance (boat insurance and public liability insurance) ($)	26.6 (279.7) n= 115	46.2 (372.1) n= 65	0 (0) n= 47	3.3 (16.9) n= 51	48.4 (381.0) n= 63	19.2 (214.7) n= 265
Boat loans payments ($)	93.0 (629.8) n= 115	59.0 (345.6) n= 66	0 (0) n= 47	181.4 (779.8) n= 51	35.4 (281.2) n= 62	84.2 (562.3) n= 266
Motor loans payments ($)	86.3 (481.0) n= 115	33.8 (274.7) n= 66	197.4 (717.8) n= 47	329.9 (922.6) n= 51	35.4 (281.2) n= 63	102.6 (511.2) n= 266
Gear loans payments ($)	0 (0) n= 115	0 (0) n= 66	0 (0) n= 47	0 (0) n= 51	15.2 (120.9) n= 63	3.6 (58.9) n= 266
Boat and motor maintenance and repair (materials and expenses included) ($)	686.7 (704.6) n= 115	695.6 (750.7) n= 66	601.7 (679.0) n= 47	803.0 (667.4) n= 50	990.2 (973.1) n= 62	723.3 (751.2) n= 266
Office expenses (including car, telephone, professional services and other office expenses)	598.5 (674.4) n= 115	999.3 (1191.4) n= 66	611.5 (760.7) n= 47	1583.1 (5015.9) n= 51	841.4 (1085.3) n= 63	893.2 (2364.1) n= 266
Taxes and other expenses ($)	3.47 (26.3) n=115	6.4 (34.6) n= 66	7.9 (37.4) n= 47	35.7 (204.8) n= 51	2.3 (15.4) n= 63	14.0 (114.4) n= 266
Total Annual fixed costs($)	1592.7 (1518.1) n= 115	1955.3 (1922.3) n= 66	1513.7 (1412.7) n= 47	3015.0 (5099.2) n= 51	2059.5 (1895.2) n= 63	1938.2 (2717.2) n= 266

*(Sample standard deviation); n= sample size.

** For bottom line database, one outlier was taken out of the data as it was doubling the values.

Table 6a: Variable cost and revenue.

	Hand line	***Bottom line*****	***Gill net***	***SCUBA***	***Fish traps***
Trip Costs (average)					
Fuel/oil cost ($)	37.0 (22.9) n= 94	57.2 (36.3) n= 54	24.5 (14.4) n= 35	39.6 (21.2) n= 55	35.4 (18.7) n= 55
Ice cost ($)	3.7 (4.6) n= 100	4.0 (5.3) n= 57	1.5 (2.5) n= 33	0.8 (2.2) N= 56	2.8 (4.3) n= 55
Bait cost ($)	6.7 (9.2) n= 100	16.1 (14.3) n= 57	0.4 (2.5) n= 35	0 (0) n= 56	4.3 (10.9) n= 56
Food cost ($)	10.4 (8.3) n= 97	12.1 (6.5) n= 55	9.7 (5.7) n= 35	8.0 (6.5) n= 55	10.1 (7.8) n= 54
Air tank cost ($)	0 (0.5) n= 98	0 (0) n= 56	0.0 (0.0) n= 34	18.9 (10.6) n= 55	0.4 (2.7) n= 54
Other cost ($)	0 (0) n= 98	0 (0) n= 56	0 (0) n= 35	0 (0) n= 59	0 (0) n= 54
Total trip cost ($)	55.4 (32.0) n= 100	85.3 (50.6) n= 57	36.1 (17.8) n= 35	66.1 (32.9) n= 56	52.0 (29.2) n= 56
Average landings (lbs/ per trip)	57.9 (39.2) n= 95	44.3 (30.1) n= 57	76.0 (59.9) n= 35	68.1 (59.0) n= 51	52.4 (40.3) n= 53
Average number of crew	0.9 (0.5) n= 97	0.9 (0.8) n= 55	1.2 (0.8) n= 35	1.2 (0.6) n= 54	1.0 (0.5) n= 54
Average Crew Payment	45% after deducting variable costs	46.5% after deducting variable costs	41% after deducting variable costs	38.5% after deducting variable costs	41.5% after deducting variable costs
Average gross revenue ($/per trip)	180.2 (103.9) n= 74	139.2 (91.5) n= 45	218.8 (194.8) n= 27	356.9 (284.9) n= 37	224.3 (188.0) n= 43
Average crew payment ($/per trip)	81.1	67.7	89.7	137.4	93.1

*(Sample standard deviation); n= sample size.

** For bottom line database, one outlier was taken out of the data as it was doubling the values.

Table 6b: Ice and bait usage.

	Hand line	***Bottom line***	***Gill Net***	***SCUBA***	***Fish traps***
Trip gear type (%)					
Multiple gear trip	33.0	31.5	37.1	3.9	27.8
Single gear trip	67.0	68.5	62.9	96.1	72.2
	n= 91	n= 54	n= 35	n= 51	n= 54
Ice usage (%)					
Do not use ice	21.2	24.1	40.0	71.4	39.3
Purchase ice	38.4	37.9	31.4	12.5	32.1
Make own ice	26.3	22.4	25.7	14.3	17.9
Purchase and make own ice	14.0	15.5	2.6	1.8	10.7
	n= 99	n= 58	n= 35	n= 56	n= 56
Bait usage (%)					
Do not use bait	6.0	5.2	82.9	96.4	57.1
Purchase own bait	23.0	36.2	2.9	0.0	10.7
Catch own bait	44.0	17.2	14.3	3.6	25.0
Purchase and catch own baut	27.0	41.4	0.0	0.0	7.1
	n= 100	n= 58	n= 35	n= 56	n= 56

Table 7: Estimated profit per fishing trip.

	Hand line	***Bottom line***	***Gill net***	***SCUBA***	***Fish traps***
Total trip cost ($)	55.4 (32.0) n= 100	85.3 (50.6) n= 57	36.1 (17.8) n= 35	66.1 (32.9) n= 56	52.0 (29.2) n= 56
Average crew payment ($/per trip)	81.1	67.7	89.7	137.4	93.1
Annual fixed Costs($)	1592.7 (1518.1) n= 115	2614.9 (5727.5) n= 67	1513.7 (1412.7) n= 47	3015 (5099.2) n= 51	2059.5 (1895.2) n= 63
Average number of trips per year	127.1 (79.7) n= 119	122.8 (66.6) n= 67	113.6 (74.1) n= 50	183.6 (87.3) n= 61	98.9 (59.7) n= 67
Fixed cost per trip($)	12.5	21.3	13.3	16.4	20.8
Average gross revenue ($/per trip)	180.2 (103.9) n= 74	139.2 (91.5) n= 45	218.8 (194.8) n= 27	356.9 (284.9) n= 37	224.3 (188.0) n= 43
Profit	**31.2**	**(35.1)**	**79.7**	**137.0**	**58.4**

*(Sample standard deviation); n= sample size.

Table 8: Fishing practices.

	Hand line	***Bottom line***	***Gill net***	***SCUBA***	***Fish traps***
Number of trips per year	127.1 (79.7) n= 119	122.8 (66.6) n= 67	113.6 (74.1) n= 50	183.6 (87.3) n= 61	98.9 (59.7) n= 67
Months with highest number of trips	April & May 11.1 (6.8) n= 119	July & June 11.4 (5.9) n= 67	October, November and December 9.7 (6.2) n= 50	October 15.6 (7.5) n= 61	October through January 8.4 (5.0) n= 67
Duration of fishing trip (hours)	8.2 (2.9) n= 118	20.9 (87.6) n= 66	7.7 (7.3) n= 50	6.2 (2.1) n= 61	5.7 (2.9) n= 67
Soak time (hours)	6.9 (2.6) n= 110	8.4 (5.1) n= 59	5.9 (3.9) n= 47	3.9 (3.1) n= 36	86.0 (58.5) n= 60
Major target species (percentage)	Yellowtail snapper (22.1%)	Silk snapper (31.3%)	Red snapper (10.6%)	Lobster (30.9)	Lobster (20.9%)
Target species average number of trips per year	119.6 (69.3) n= 96	98.7 (60.4) n= 67	116.8 (79.7) n= 20	187.6 (82.9) n= 86	92.8 (51.3) n= 43

*(Sample standard deviation); n= sample size.