PACIFIC ISLANDS FISHERIES SCIENCE CENTER

Economic and Social Characteristics of Small Boat Fishing in the Commonwealth of the Northern Mariana Islands

Justin Hospital
Courtney Beavers

May 2014

Administrative Report H-14-02

About this report

Pacific Islands Fisheries Science Center Administrative Reports are issued to promptly disseminate scientific and technical information to marine resource managers, scientists, and the general public. Their contents cover a range of topics, including biological and economic research, stock assessment, trends in fisheries, and other subjects. Administrative Reports typically have not been reviewed outside the Center. As such, they are considered informal publications. The material presented in Administrative Reports may later be published in the formal scientific literature after more rigorous verification, editing, and peer review.

Other publications are free to cite Administrative Reports as they wish provided the informal nature of the contents is clearly indicated and proper credit is given to the author(s).

Administrative Reports may be cited as follows:

> Hospital, J., C. Beavers. May 2014. Economic and Social Characteristics of Small Boat Fishing in the Commonwealth of the Northern Mariana Islands. Pacific Islands Fish. Sci. Cent., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96818-5007. Pacific Islands Fish. Sci. Cent. Admin. Rep. H-14-02, 58 p.+ Appendices

---

For further information direct inquiries to

NMFS/PIFSC/DO/SIS Chief
1845 Wasp Boulevard
Building 176
Honolulu, Hawaii 96818-5007

Phone: 808-725-5386
Fax: 808-725-5332

Pacific Islands Fisheries Science Center
Administrative Report H-14-02

Economic and Social Characteristics of Small Boat Fishing in the Commonwealth of the Northern Mariana Islands

Justin Hospital
Pacific Islands Fisheries Science Center
National Marine Fisheries Service
NOAA Inouye Regional Center
1845 Wasp Boulevard, Building 176
Honolulu, Hawaii 96818

Courtney Beavers
Joint Institute for Marine and Atmospheric Research
University of Hawaii
1000 Pope Road
Honolulu, Hawaii 96822

May 2014

EXECUTIVE SUMMARY

This report presents an empirical snapshot of small boat fishing in the Commonwealth of the Northern Mariana Islands (CNMI) by using results from a cost-earnings survey of the fleet conducted in 2011. Survey booklets were completed by 112 fishermen on the islands of Saipan (80% of sample), Tinian (10%) and Rota (10%). This paper profiles the current CNMI small boat fleet and details current levels of fishing activity, behavioral aspects of fishing, market participation, average trip costs, fishing-related expenditures, investment levels, the social and cultural importance of fishing, as well as attitudes and perceptions of fishing conditions and management.

The demographics of the CNMI fleet reveal the deep tradition and cultural importance of fishing to the people of the CNMI. On average, fishermen responding to the survey were 41 years old and reported to have been boat fishing for an average of 15 years. CNMI small boat fishermen were more likely to identify themselves as Chamorro relative to the general population of the CNMI, although they reported similar nativity rates. In general, fishermen were more educated then the general population and of comparable affluence.

On average, vessels in the CNMI are approximately 18 ft long with a 98 hp engine, were built in the early 1990s, and purchased in the early 2000s. All vessels in the survey were reported to be less than 25 ft in length. Considerable evidence showed co-ownership and sharing of fishing vessels as, on average, nearly 70% of vessel owners reported that their vessel is used, at least part of the time, without the boat owner on board. On average, fishermen reported 3 people on board while fishing. About one third (31%) of the fleet reported to be a 2-person operation with a captain and one crew member, while another third (31%) typically fish with one captain and two crew members. A mere 2% of fishermen reported to always fish alone.

CNMI fishermen, on average, reported approximately 37 boat fishing trips in the past 12 months, with fishermen who sold fish reporting more fishing trips relative to those who do not sell fish. Boat fishermen in the CNMI use many gear types and target many species throughout the year. On average, fishermen reported the use of 3 different gear types/target species during the past 12 months, with pelagic trolling as the most popular gear type followed closely by deepwater bottomfish fishing, shallow-water bottomfish, and spear fishing. Survey respondents indicated that their fishing trips in the past 12 months were evenly distributed within both local (< 3 nm from shore) and offshore waters (3–200 nm). The importance of Fish Aggregating Devices (FADs) was evident as 71% of fishermen reported to have fished at a FAD during the past 12 months, and on nearly 22% of their fishing trips. A high degree of seasonal fishing effort was found for all fishing activity across most subgroups of the fleet, although fishermen on Tinian and Rota were more likely to report fishing year round.

A majority of fishermen (74%) reported selling at least a portion of fish caught in the past 12 months and, on average, these fishermen reported selling fish after approximately 47%

of their fishing trips in the past 12 months. On average, fishermen reported selling roughly 38% of their total catch. For the majority of the fleet there is considerable heterogeneity in levels of market participation, utilization and access, although the majority consider the fish they sell to contribute *very little* to their personal income, as cost recovery is a major motivation for selling a portion of catch. However, there appear to be significant market limitations for CNMI fishermen as less than half (43%) of survey respondents indicated that they can always sell all the fish that they want to sell.

During 2010 and 2011, the cost of a trolling trip averaged approximately $188 with a median cost of $179. As anticipated, fuel expenses accounted for a majority (78%) of total pelagic trip expenditures. Likewise, the average bottomfish trip cost was reported at $179 with a median of $138. Fishermen reported an average reef fish trip to cost approximately $108 (median of $94). Fuel accounted for a similar share of the cost structure across all fishing methods. In total, it is estimated that CNMI small boat fishermen responding to our survey provided direct trip-related sales impacts ranging from approximately $0.60 million (using median trip costs) to $0.72 million (using mean trip costs) to the CNMI economy.

In addition to variable trip costs, fishing requires significant annual fixed-cost expenditures. Nearly every survey respondent (88%) reported to incur at least some non-trip-related fishing expenditures during 2010. The most common expenditure categories were fishing gear (84%), oil and lube (67%), repair and maintenance (67%), safety equipment (58%), and fees (49%). As one would expect, the median annual fishing related expenditure in 2010 was significantly higher for boat owners ($3075) relative to non-boat owners ($175). In aggregate CNMI small boat fishermen responding to our survey incurred total annual fishing expenditures of approximately $0.31 million. In considering the direct economic impact to the local island economy, fishermen reported, on average, that 64% of fishing expenditures were purchased directly on island. Therefore, direct sales impacts of fishermen responding to the survey from non-trip related expenditures equate to approximately $0.20 million.

The breakdown of catch disposition in the CNMI small boat fishery reflects the social and cultural motivations towards fishing and sheds light on the complexities of classifying catch in the small boat fisheries. Fishermen who responded to our survey reported that approximately 28% of fish catch was consumed at home, while 38% was given away, with approximately 29% of fish sold. The remaining catch is either released (2%) or exchanged for goods and services (3%). This diversity of catch disposition even extends to avid fishermen who regularly sell fish as they still retain approximately 22% of their catch for home consumption and participation in traditional fish-sharing networks and customary exchange. Additionally, fish are clearly an important source of food for fishing families: 86% consider the pelagic fish they catch to be an important source of food, with higher rates for bottomfish and reef fish at 91% and 93%, respectively. These findings validate the importance of fishing in terms of building and maintaining social and community networks, perpetuating fishing traditions, and providing fish to local communities as a source of food security.

This report includes responses that shed light on current attitudes and perceptions towards recent fishing conditions, expectations for future fishing participation, effects from the establishment of the Marianas Trench Marine National Monument, attitudes towards marine preserve areas (MPAs), and impacts of U.S. military exercises in the region. The survey questionnaire provided fishermen the opportunity to expand on their responses to these questions by including open-ended comment sections. Additionally, the final page of the survey questionnaire asked for "suggestions for future management or topics needing further study." Many fishermen took the opportunities to provide direct feedback to managing agencies. A report of raw survey comments loosely organized by topic can be found in Appendix B to this report.

We find the CNMI small boat fisheries to be a complex mix of subsistence, cultural, recreational, and quasi-commercial fishermen whose fishing behaviors provide evidence of the importance of fishing to the people of the CNMI. This report provides important baseline information that can be used to inform future management alternatives and actions.

(This page is left blank intentionally.)

CONTENTS

(This page is left blank intentionally.)

INTRODUCTION

The Commonwealth of the Northern Mariana Islands (CNMI), a U.S. territory, lies in the western Pacific Ocean, just north of Guam and is made up of 14 islands located between 14° and 21° north latitude at about 145° east longitude (Fig. 1) with its population concentrated on the islands of Saipan, Tinian, and Rota. Land area in the CNMI is approximately 184 mi^2 or 477 km^2 with a marine tropical climate and a rainy season from July through October (Allen and Amesbury, 2012). People have lived in the Mariana Islands for at least 3500 years, or about 3000 years prior to European contact. A detailed description of the history of the CNMI and its characterization as a fishing community can be found in Allen and Amesbury (2012), as well as the introduction chapter of Brainard et al. (2012).

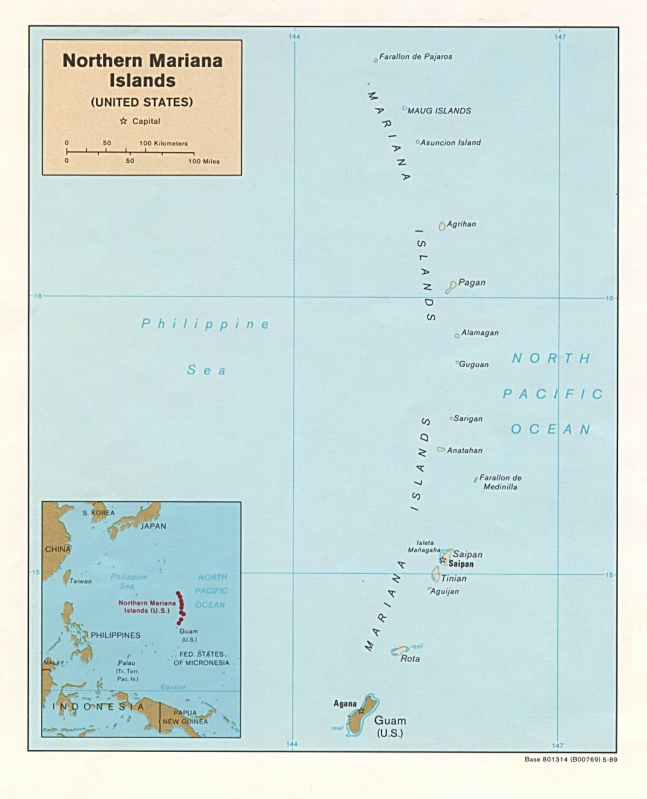

Figure 1.--The Commonwealth of the Northern Mariana Islands.[1]

This report presents an empirical snapshot of small boat fishing in the Commonwealth of the Northern Mariana Islands (Saipan, Tinian, and Rota) using results from a cost-earnings study of the fleet conducted in 2011. This paper profiles the current CNMI small boat fleet and details current levels of fishing activity, behavioral aspects of fishing, market participation, average trip costs, fishing-related expenditures, investment levels,

[1] Source: The University of Texas Library.
http://www.lib.utexas.edu/maps/islands_oceans_poles/nomarianaislands.jpg

the social and cultural importance of fishing, as well as attitudes and perceptions of fishing conditions and management. This report serves as an important update to previous research on small boat fishing in the CNMI (Miller, 2001; Kasaoka, 1989), as well as research focused on estimating the value of coral reef resources (van Beurking et al., 2006). The findings from this research provide fishery managers with insights into the economic and social context of the fishery and could help guide the design and analysis of future management actions and alternatives.

SURVEY METHODS

In January 2011, this research project was introduced to the community at two fisheries management meetings with representation from members of the fishing community: the Mariana Archipelago Ecosystem Plan Team and Marianas Advisory Panel[2]. Additionally, a less formal public meeting was held at the Saipan Community Center with fishing community members in attendance. These presentations detailed the contents of the survey and demonstrated how the information collected can be used in management of CNMI's fisheries. In the months after these meetings, a survey booklet was developed by staff at the Pacific Islands Fisheries Science Center (PIFSC) in consultation with local stakeholders, fishermen, and fishery managers. The Pacific Islands Fisheries Group (PIFG)[3] was contracted to administer the survey instrument. The majority of surveys were completed in-person by fishermen at a community meeting held on Saipan (May 2011), Tinian (August 2011), and Rota (August 2011). PIFG staff collected the remainder of the surveys completed through in-person interviews on the islands of Saipan and Rota between September and October 2011. All of these meetings were held at central locations on island. Anyone who had fished from a boat in the past 12 months was eligible and encouraged to participate in this research. Contact information for all survey respondents was collected for data quality assurances, although this information is kept strictly confidential and no individual-level responses are shown in this report.

RESPONSE RATES

A total of 112 surveys were completed with 52% of respondents reporting to own the vessel on which they fished. The spatial distribution of surveys from attendees at the multiple community meetings and voluntary participants is shown in Table 1. The distribution of survey effort is reflective of population levels across the islands. While nearly all fishermen attending the community meetings completed a survey, it is somewhat difficult to estimate the coverage of our survey respondents as there are no

[2] A similar survey effort was conducted on the island of Guam and report results can be found here: http://www.pifsc.noaa.gov/library/pubs/admin/PIFSC_Admin_Rep_12-06.pdf

[3] The Pacific Islands Fisheries Group (PIFG) is a Hawaii-based 501(c)3 nonprofit organization established in 2005 to organize and keep Pacific Island fishermen informed about current fishery issues. The PIFG supports programs that benefit Hawaii's marine resources, enhances the fishing community's awareness about current fishery issues and fosters responsible fishing and conservation practices. PIFG supports agencies responsible for monitoring, managing and conserving our island's resources (source: http://www.fishtoday.org/about-pifg).

definitive measures of small boat fishing participation across the CNMI. According to CNMI Division of Fish and Wildlife (DFW) staff, of the approximately 400 vessels registered in the CNMI, approximately 200 are active with an estimated 100 engaged in fishing activities (Allen and Amesbury, 2012; Impact Assessment, Inc, 2011). Using DFW creel survey boat log data, approximately 122 boats were observed to be actively fishing during 2010 and 2011 (WPacFIN, 2012). Further, recent research suggests estimates of approximately 15 to 20 active vessels on Tinian, although estimates for Rota are unknown (Impact Assessment, Inc., 2011). Based on the feedback from knowledgeable members of the local fishing communities, we received support that our sample is representative of the active members of the CNMI fishing community.

Table 1.--Survey population and response rates, by mode of administration.

Island	Mode of Administration (Month)	Completed Surveys	Share of Full Sample (%)
Saipan	Community Meeting (May)	84	80
	In-person Interviews (September – October)	6	
Tinian	Community Meeting (August)	11	10
Rota	Community Meeting (August)	5	10
	In-person Interviews (September – October)	6	
	Totals	112	100

RESULTS

In this report, survey responses are presented for our complete CNMI survey respondent pool as well as for relevant subgroups of the fleet. Most tables provide distinctions between the islands of Saipan, Tinian, and Rota. Care should be taken in the interpretation of results due to the relatively small sample sizes for Tinian and Rota, although we feel it is important to document results on Tinian and Rota because of the limited information available for fisheries on these islands. We also analyze results between fishermen who reported the sale of fish in the past 12 months and those reporting no sales of fish[4]. Additionally, responses are further disaggregated to consider fishery highliners, which for the purpose of this report are defined as those reporting the catch of more than 500 lbs of pelagic or bottomfish and/or more than 250 lbs of reef fish in the past 12 months[5] and who reported the sale of more than 50% of their catch in the past 12 months. We explore primary species targeting (pelagics, bottomfish, reef fish, and no primary target) based on reported levels of gear usage as a share of total fishing trips in the past 12 months. In some instances, distinctions will be made between boat owners and "crew" fishermen who do not own the vessel on which they fish.

[4] The distinction between commercial and noncommercial fishing in the western Pacific is complex and is discussed in greater detail in the *social aspects of fishing* section of this report.
[5] These quantities correspond to the highest catch category option available in the survey instrument.

Demographics

It is important to understand the socioeconomic composition of fishery participants to better understand the potential for differential economic and social impacts from regulatory measures. The majority (68%) of survey respondents ranged in age from 35 to 54 years, with an average age of 41. This age distribution is understandable given the capital requirements of owning and operating a fishing vessel in addition to the localized knowledge and experience required for successful fishing. Not surprisingly, fishermen targeting reef fish, on average, are slightly younger than others, likely due to the physical requirements of reef fishing (primarily spear fishing). The age distribution for subgroups of our survey respondents is presented in Table 2.

Table 2.--Survey Responses: "What is your age?"

Percentage of Responses [*n*]	Less than 25 Years (%)	25 - 34 Years (%)	35 - 44 Years (%)	45 - 54 Years (%)	55 - 64 Years (%)	More than 65 Years (%)
Full Sample [107]	**3.7**	**17.8**	**41.1**	**27.1**	**10.3**	**0.0**
Island						
Saipan [85]	3.5	16.5	42.4	28.2	9.4	0.0
Tinian [11]	0.0	27.3	45.5	27.3	0.0	0.0
Rota [11]	9.0	18.2	27.3	18.2	27.3	0.0
Sell Fish						
Yes [78]	2.6	14.1	41.0	29.5	12.8	0.0
Highliner [19]	0.0	5.3	42.1	42.1	10.5	0.0
Not Highliner [59]	3.4	16.9	40.7	25.4	13.6	0.0
No [29]	6.9	27.6	41.4	20.7	3.4	0.0
Primary Target						
Pelagics [37]	2.8	27.0	29.7	29.7	10.8	0.0
Bottomfish [36]	2.8	5.6	47.2	30.6	13.8	0.0
Reef Fish [15]	13.2	26.7	46.7	6.7	6.7	0.0
No primary [19]	0.0	15.8	47.4	31.6	5.3	0.0
Boat Ownership						
Yes [56]	0.0	14.3	41.1	30.4	14.3	0.0
No [51]	7.8	21.6	41.2	23.5	5.9	0.0

Nearly half of fishermen (49%) responding to our survey reported to have lived their entire life in the Marianas, likewise the 2010 CNMI Census reports that 49% of the CNMI population were originally born in the CNMI (U.S. Census Bureau, 2012). This would suggest that the fishing community mirrors nativity rates for the general population of the CNMI (Table 3).

Table 3.--Survey Responses: "How long have you lived in the Marianas?"

Percentage of Responses [*n*]	Less than 5 Years (%)	5 - 10 Years (%)	11 - 20 Years (%)	21 - 30 Years (%)	More than 30 Years (%)	Entire Life (%)
Full Sample [108]	**3.7**	**9.3**	**12.9**	**14.8**	**59.3**	**49.1**
Island						
Saipan [86]	4.7	11.6	16.3	13.9	53.5	38.8
Tinian [11]	0.0	0.0	0.0	18.2	81.8	81.8
Rota [11]	0.0	0.0	0.0	9.1	91.9	90.9
Sell Fish						
Yes [79]	3.8	12.7	11.4	12.7	59.5	51.3
Highliner [18]	11.1	27.8	5.6	5.6	50.0	42.1
Not highliner [61]	1.6	8.2	13.1	14.8	62.3	54.2
No [29]	3.5	0.0	17.2	20.7	58.6	41.4
Primary Target						
Pelagics [37]	0.0	8.1	18.9	10.8	62.2	51.4
Bottomfish [38]	0.0	13.2	10.5	13.2	63.1	52.8
Reef fish [15]	13.3	0.0	13.3	26.7	46.7	46.7
No primary [18]	11.1	11.1	5.6	16.6	55.6	36.8
Boat Ownership						
Yes [57]	3.5	7.0	8.8	12.3	68.4	50.0
No [51]	3.9	11.8	17.6	17.7	49.0	47.1

Fishermen responding to the survey reported to have been fishing from a boat for an average of 15 years, providing evidence of a deep tradition of boat fishing in the CNMI. Fishermen reporting sales of fish in the past 12 months and boat owners have been boat fishing for an average of approximately 16 and 17 years, respectively, as compared to fishermen who do not sell fish and "crew" fishermen (14 years and 12 years). The distribution of boat fishing experience for subgroups of the fleet is presented in Table 4.

Table 4.--Survey Responses: "How many years have you fished from a boat?"

Percentage of Responses [*n*]	Less than 5 Years (%)	5 - 10 Years (%)	11 - 20 Years (%)	21 - 30 Years (%)	More than 30 Years (%)
Full Sample [105]	**11.4**	**34.3**	**28.6**	**20.9**	**4.8**
Island					
Saipan [83]	13.2	37.4	25.3	21.7	2.4
Tinian [11]	9.1	9.1	54.5	9.1	18.2
Rota [11]	0.0	36.3	27.3	27.3	9.1
Sell Fish					
Yes [78]	12.8	30.8	29.5	21.8	5.1
Highliner [18]	22.2	16.7	33.3	27.8	0.0
Not highliner [60]	10.0	35.0	28.3	20.0	6.7
No [27]	7.5	44.4	25.9	18.5	3.7
Primary Target					
Pelagics [35]	11.4	34.3	31.4	20.0	2.9
Bottomfish [38]	18.4	23.7	28.9	21.1	7.9
Reef fish [15]	6.7	53.2	26.7	6.7	6.7
No primary [17]	0.0	41.2	23.5	35.3	0.0
Boat Ownership					
Yes [57]	15.8	21.1	26.3	31.6	5.2
No [48]	6.2	50.0	31.3	8.3	4.2

The 2010 CNMI Census, administered by the U.S. Census Bureau reports an estimated population of 53,883 for the CNMI, down approximately 22% from 2000 Census estimates, with equivalent declines on the islands of Saipan and Rota and slightly less decline on Tinian (U.S. Census Bureau, 2012). The bulk of population decline on Saipan can largely be attributed to guest workers associated with the closure of the garment industry and recent inconsistencies in tourism which had drastic effects on the local economy (Allen and Amesbury, 2012). Fishermen from villages across the islands of Saipan, Tinian, and Rota completed surveys, and our survey sample reflects representation from a number of villages in the CNMI (see Table 5).

Table 5.--Survey Responses: "What village do you live in?"

Island	Village	Number of Fishermen[a]	Percent of Island Sample (%)	2000 vs. 2010 Population CNMI Census[b] (%)
Saipan	As Lito	4	5	-22.7
	As Perdido	4	5	
	As Teo	4	5	
	Capital Hill (*I Denne, Tapochau*)	7	8	
	Chalan Kanoa (*I, II*)	6	7	
	Chalan Piao	2	2	
	Dandan	9	10	
	Fina Sisu	5	6	
	Garapan	11	13	
	Gualo Rai	2	2	
	Kagman (*I, III*)	9	10	
	Koblerville	1	1	
	Navy Hill	1	1	
	Oleai	1	1	
	Papago	2	2	
	Sadog Tasi	1	1	
	San Antonio	6	7	
	San Vicente	7	8	
	Susupe	2	2	
	Tanapag (*Puerto Rico*)	1	1	
	Tottoville	1	1	
Tinian	Carolinas Heights	4	36	-11.4
	San Jose	7	64	
Rota	Sinapalo	1	9	-23.0
	Sinapalo II	1	9	
	Songsong	7	64	
	Teneto	2	18	
Total		107	100	

[a] The village of five completed surveys could not be determined.

[b] Source: 2010 Census for CNMI, U.S. Census Bureau, 2012.

The majority of fishermen who responded to the survey described themselves as Chamorro (64%) followed by Filipinos (19%) and Carolinians (10%) with relatively small proportions of other ethnicities (7%), Micronesians (6%), and Caucasians (4%). There were differences across islands as Saipan exhibited the highest diversity, whereas all survey respondents from Tinian and Rota identified themselves as Chamorro. As shown in Table 6, CNMI small boat fishermen responding to the survey are more likely to identify themselves as Chamorro relative to the general population of the CNMI, based on data from the 2010 CNMI Census. Other recent survey efforts (van Beurking, et al., 2006) conducted a general population survey so their demographic results more closely resemble the general population, suggesting that the small boat fishing community could differ from the general population.

Table 6.--Survey Responses: "How would you describe your race?"

Percentage of Responses [*n*]	Chamorro (%)	White (%)	Filipino (%)	Carolinian (%)	Micronesian (%)	Other (%)	Two or More (%)
Full Sample [108]	**63.9**	**3.7**	**18.5**	**10.2**	**5.6**	**6.5**	**11.1**
CNMI Census (2010)	27.4	2.4	40.4	5.2	7.3	17.3	12.7
Island							
Saipan [86]	54.7	4.7	23.3	12.8	6.9	8.1	13.9
Tinian [11]	100.0	0.0	0.0	0.0	0.0	0.0	0.0
Rota [11]	100.0	0.0	0.0	0.0	0.0	0.0	0.0
Sell Fish							
Yes [79]	64.6	3.8	21.5	3.8	5.1	5.1	6.3
Highliner [19]	47.4	10.5	42.1	0.0	0.0	5.0	5.3
Not highliner [60]	70.0	1.7	15.0	5.0	6.7	5.8	6.7
No [29]	62.1	3.5	10.3	27.6	6.9	10.3	24.1
Primary Target							
Pelagics [37]	62.2	2.7	27.0	8.1	2.7	5.4	8.1
Bottomfish [37]	75.7	0.0	13.5	5.4	5.4	2.7	8.1
Reef fish [15]	60.0	6.7	6.7	33.3	0.0	13.3	26.7
No primary [19]	47.4	10.5	21.1	5.3	15.8	10.5	10.5
Boat Ownership							
Yes [57]	64.9	3.5	12.3	8.8	5.3	8.8	8.8
No [45]	62.8	3.9	25.5	11.8	5.9	3.9	13.7

Only about half of the fishermen (52%) reported to be employed full-time, while others were employed part-time (8%) or self-employed (9%), as shown in Table 7. As suggested by the age distribution presented in Table 2, nearly 15% of survey respondents indicated that they were currently retired. Unemployment rates for fishermen who responded to the survey (15%) were consistent with the CNMI's general population unemployment figures, reported at 11% in 2010 (U.S. Census Bureau, 2012).

Table 7.--Survey Responses: “Are you currently employed?”

Percentage of Responses [*n*]	Employed Full Time (%)	Employed Part Time (%)	Retired (%)	Student Full Time (%)	Unemployed (%)	Self-employed (%)
Full Sample [108]	**51.9**	**8.3**	**14.8**	**0.9**	**14.8**	**9.3**
Island						
Saipan [86]	53.5	10.5	10.5	1.2	13.9	10.5
Tinian [11]	63.6	0.0	18.2	0.0	9.1	9.1
Rota [11]	27.3	0.0	45.5	0.0	27.3	0.0
Sell Fish						
Yes [79]	45.6	8.9	17.7	1.3	17.7	8.9
Highliner [19]	42.1	15.8	5.3	0.0	21.1	15.6
Not highliner [60]	46.7	6.7	21.7	1.7	16.7	6.7
No [29]	68.9	6.9	6.9	0.0	6.9	10.3
Primary Target						
Pelagics [37]	54.1	10.8	13.5	0.0	16.2	5.4
Bottomfish [37]	37.8	5.4	21.6	2.7	16.2	16.2
Reef fish [15]	60.0	6.7	13.3	0.0	13.3	6.7
No primary [19]	68.4	10.5	5.3	0.0	10.5	5.3
Boat Ownership						
Yes [57]	50.9	7.0	19.3	0.0	10.5	12.3
No [51]	53.0	9.8	9.8	1.9	19.6	5.9

As a group, survey respondents were generally well educated with more than 52% reporting to have completed some college, hold an associate’s degree, or hold a bachelor’s degree or higher (Table 8). Noncommercial fishermen reported having slightly higher levels of education relative to those who reported fish sales. Moreover, we find slightly higher levels education among the fishing community relative to the general population in the CNMI (U.S. Census Bureau, 2012).

Table 8.--Survey Responses: "What is the highest level of education you have completed?"

Percentage of Responses [*n*]	Less than High School Graduate (%)	High School Graduate (%)	Some College or Associate's Degree (%)	Bachelor's Degree or Higher (%)
Full Sample [108]	**9.3**	**38.9**	**35.2**	**16.7**
CNMI Census (2010)	17.6	37.0	25.2	20.2
Island				
Saipan [86]	11.6	27.9	40.7	19.8
Tinian [11]	0.0	72.7	18.2	9.1
Rota [11]	0.0	90.9	9.1	0.0
Sell Fish				
Yes [79]	8.9	45.6	31.7	13.9
Highliner [19]	21.1	47.4	26.3	5.3
Not highliner [60]	5.0	45.0	33.3	16.7
No [29]	10.3	20.7	44.8	24.1
Primary Target				
Pelagics [37]	13.5	35.1	35.1	16.2
Bottomfish [37]	5.4	48.7	35.1	10.8
Reef fish [15]	6.7	46.7	33.3	13.3
No primary [19]	10.5	21.1	36.9	31.6
Boat Ownership				
Yes [57]	5.2	36.9	36.9	21.0
No [51]	13.7	41.2	33.3	11.8

The median household income of survey respondents, using the medians of survey response categories, was $20,000 compared with the estimated 2010 median of $19,958 for the CNMI (U.S. Census Bureau, 2012). Likewise, the mean household income, using the medians of survey response categories for survey respondents was $33,034 compared with the estimated 2010 mean of $31,463 (U.S. Census Bureau, 2012). As suggested by the educational attainment results, household income for fishermen responding to the survey was found to be distributed slightly higher in comparison to the general population of the CNMI (Table 9). Nearly 51% of the general population in the CNMI lives below the U.S. poverty level (U.S. Census Bureau, 2012), which has important implications on local fish demand as well as fishing effort. These findings support patterns of fish flow throughout the community and the role of fishing in local food security as described in the *social aspects of fishing* section of this report. In addition, many fishermen cited economic conditions in describing their perceptions of future fishing participation as described in the *fisher perceptions* portion of this report.

Table 9.--Survey Responses: "What was your total household income, before taxes, in 2010, including fishing income?"

Percentage of Responses [*n*]	Less than $15,000 (%)	$15,000 - $34,999 (%)	$35,000 - $74,999 (%)	$75,000 - $99,999 (%)	$100,000 - $149,999 (%)	$150,000 or more (%)
Full Sample [105]	**31.5**	**37.1**	**20.9**	**7.6**	**0.0**	**2.9**
Island						
Saipan [83]	34.9	34.9	16.9	9.6	0.0	3.6
Tinian [11]	9.0	45.5	45.5	0.0	0.0	0.0
Rota [11]	27.2	45.6	27.2	0.0	0.0	0.0
Sell Fish						
Yes [78]	39.7	32.1	16.7	10.3	0.0	1.3
Highliner [19]	52.6	26.3	5.3	10.5	0.0	5.3
Not highliner [59]	35.6	33.9	20.3	10.2	0.0	0.0
No [27]	7.4	51.9	33.3	0.0	0.0	7.4
Primary Target						
Pelagics [34]	32.4	35.3	20.6	5.9	0.0	5.9
Bottomfish [38]	34.2	28.9	28.9	5.3	0.0	2.6
Reef fish [14]	21.4	78.6	0.0	0.0	0.0	0.0
No primary [19]	31.6	26.4	21.0	21.0	0.0	0.0
Boat Ownership						
Yes [56]	23.2	39.3	21.4	10.7	0.0	5.4
No [49]	40.8	34.7	20.4	4.1	0.0	0.0

Vessel Characteristics

This section presents a profile of fishing vessels that are currently active in the CNMI. A slight majority (52%) of survey respondents reported that they own the vessel on which they fish ($n = 57$). While there was some item nonresponse for questions addressing vessel characteristics, survey questions were dependent on vessel ownership to ensure that our survey respondents are familiar with vessel specifications, fishing activities, operations, and investment levels presented later in this report. Non-boat owners were not asked about the specific aspects of the vessel that they fish on.

As shown in Table 10, on average fishing vessels in the CNMI fleet are trailered, approximately 18 ft long with a 98 hp engine, were built in the early 1990s, and were purchased in the early 2000s. We find few differences in the vessel profile across subgroups in the fishery. The majority of larger vessels in the CNMI (greater than 21 ft) are primarily pelagic and bottomfish fishing boats, with a maximum reported vessel length of 25 ft, whereas those primarily targeting reef fish are exclusively less than 21-ft long (Table 11). Nearly 92% of vessels in the fleet reported the use of gasoline motors.

Table 10.--Vessel characteristics: means, standard errors, and medians.

Variable [*n*]		Full sample [44]	Sell Fish		Noncommercial [10]
			Highliner [5]	Not Highliner [29]	
Total length of boat (feet)	**Mean**	**17.8**	**18.4**	**18.5**	**15.8**
	Standard error	0.5	0.5	0.6	1.3
	Median	18.0	18.0	19.0	13.0
Boat Horsepower	**Mean**	**98**	**131**	**108**	**53**
	Standard error	10.4	10.0	13.6	16.5
	Median	90	140	90	25
Age of boat (years)	**Mean**	**21.9**	**23.6**	**23.1**	**17.7**
	Standard error	1.7	1.4	2.3	2.9
	Median	21.5	22.0	22.0	12.0
Current boat ownership (years)	**Mean**	**9.9**	**15.4**	**10.0**	**7.0**
	Standard error	1.0	2.4	1.3	1.1
	Median	8.0	16.0	7.0	7.5

Table 11.--Distribution of vessel size, by classification.

Percentage of Responses [*n*]	< 16 ft. (%)	16 – 20 ft. (%)	21 – 25 ft. (%)
Full Sample [52]	**30.7**	**46.2**	**23.1**
Island			
Saipan [43]	30.2	46.5	23.3
Tinian [2]	50.0	0.0	50.0
Rota [7]	28.6	57.1	14.3
Sell Fish			
Yes [39]	20.5	53.9	25.6
Highliner [5]	0.0	100.0	0.0
Not highliner [34]	23.5	47.1	29.1
No [13]	61.5	23.1	15.4
Primary Target			
Pelagics [18]	33.3	44.4	22.2
Bottomfish [22]	18.2	54.6	27.3
Reef fish [5]	40.0	60.0	0.0
No primary [7]	57.1	14.3	28.6

Survey respondents provided evidence that sharing of fishing vessels is common among the CNMI small boat fleet (Table 12). This is consistent with knowledge that a portion of fishing vessels are co-owned and others are owned by roadside fish dealers who have fishermen that work for them (Roberto[6]). On average, nearly 70% of vessel owners indicated that their vessel is used, at least part of the time, without the boat owner on board. This supports the strong community aspect of fishing that is characteristic of fishermen in the CNMI.

[6] R. Roberto, CNMI Division of Fish and Wildlife. Pers. comm., 2012.

Table 12.--Survey Response: "Do other people use the boat without you?"

Percentage of Responses [*n*]	Never (%)	Rarely (%)	Sometimes (%)	Often (%)
Full Sample [53]	**30.2**	**33.9**	**20.8**	**15.1**
Island				
Saipan [44]	34.1	25.0	22.7	18.2
Tinian [2]	0.0	50.0	50.0	0.0
Rota [7]	14.3	85.7	0.0	0.0
Sell Fish				
Yes [40]	27.5	37.5	20.0	15.0
Highliner [6]	16.7	16.7	33.3	33.3
Not highliner [34]	29.4	41.2	17.7	11.8
No [13]	38.5	23.1	23.1	15.3
Primary Target				
Pelagics [19]	21.1	21.1	26.3	31.5
Bottomfish [22]	31.8	45.5	18.2	4.5
Reef fish [5]	40.0	40.0	20.0	0.0
No Primary [7]	42.8	28.6	14.3	14.3

Fishing Activity

This section details fishing activity and operational aspects of the small boat fleet in the CNMI. Information presented in this section includes fishing avidity, trip characteristics, temporal and spatial descriptions of fishing trips, species targeting, and catch estimates that may provide useful information for managers to better understand the dynamics and heterogeneity of the fleet. This section also characterizes the overall fishing avidity of the CNMI's boat fishing participants to better understand their fishing strategies and reliance on various fishery resources. Using the medians of survey response bins, on average, the survey sample reported 37 boat fishing trips in the past 12 months. Fishermen reporting the sale of fish took more fishing trips (45 trips) on average, than noncommercial fishermen (18 trips). The distribution of total fishing trips taken in the past 12 months is presented in Table 13. Fishermen reporting the sale of fish typically spend more time out on the water with a median trip length of about 8 hours compared to approximately 6-hour trips taken by noncommercial fishermen.

On average, fishermen reported three people on board while fishing (see Tables 14 and 15). About one third (31%) of the fleet reported to be, on average, a two-person operation with a captain and one crew member, while another third (32%) typically fish with one captain and two crew members. A mere 2% of fishermen reported to always fish alone.

A majority of survey respondents (60%) reported that they always fish out of the same harbor or boat ramp. Fishermen reporting fish sales in the past 12 months were most likely to use multiple harbors (46% reported using multiple boat ramps), while noncommercial fishermen (24% using multiple ramps) were more likely to use the same harbor.

Table 13.--Survey Responses: "Approximately how many total fishing trips did you take over the past 12 months?"

Percentage of Responses [*n*]	Fewer than 12 Trips	12 – 24 Trips	25 – 49 Trips	50 – 99 Trips	100 - 200 Trips	More than 200 Trips
Full Sample [109]	**35.7**	**23.9**	**16.5**	**15.6**	**2.8**	**5.5**
Island						
Saipan [87]	35.6	27.6	13.8	13.8	2.3	6.9
Tinian [11]	54.6	9.1	18.2	18.2	0.0	0.0
Rota [11]	18.1	9.1	36.4	27.3	9.1	0.0
Sell Fish						
Yes [80]	28.7	23.8	17.5	18.8	3.7	7.5
Highliner [19]	21.1	21.1	10.5	15.8	5.2	26.3
Not highliner [61]	31.1	24.6	19.7	19.7	3.3	1.6
No [29]	55.2	24.1	13.8	6.9	0.0	0.0
Primary Target						
Pelagics [36]	38.9	27.8	13.9	8.3	2.8	8.3
Bottomfish [39]	33.3	20.5	23.1	17.9	2.6	2.6
Reef fish [16]	43.8	12.5	12.5	25.0	0.0	6.3
No target [18]	27.8	33.3	11.1	16.7	5.6	5.6
Boat Ownership						
Yes [56]	23.2	26.8	25.0	16.1	1.8	7.1
No [53]	49.0	20.8	7.6	15.0	3.8	3.8

Table 14.--Boat fishing trip characteristics, by classification: means, standard errors, and medians.

Variable [*n*]		Full Sample [109]	Sell Fish		Noncommercial [29]
			Highliner [19]	Not Highliner [61]	
Number of fishing trips	**Mean**	**37**	**71**	**36**	**18**
	Standard error	4.6	17.8	5.1	3.6
	Median	18	37	18	6
Trip length (hours)	**Mean**	**10.3**	**12**	**11.6**	**6.4**
	Standard error	1.2	2.9	1.9	0.5
	Median	8.0	9.0	8.0	6.0
Fishing hours	**Mean**	**7.0**	**8.4**	**7.5**	**5.1**
	Standard error	0.3	0.8	0.3	0.4
	Median	7.0	8.0	8.0	4.0
Fishermen on board for an average fishing trip	**Mean**	**3**	**3**	**3**	**4**
	Standard error	0.1	0.3	0.2	0.2
	Median	3	2	3	3
How many different ramps/ harbors did you use in past 12 months?	**Mean**	**2**	**2**	**2**	**1**
	Standard error	0.0	0.2	0.1	0.1
	Median	1	1	1	1
Average distance traveled to launch boat (miles, one-way)	**Mean**	**10.7**	**9.8**	**10.9**	**9.7**
	Standard error	1.5	1.0	1.8	1.6
	Median	8.0	10.0	6.0	6.0

Table 15.--Boat fishing trip characteristics, by primary target: means, standard errors, and medians.

Variable [*n*]		Pelagics [36]	Bottomfish [39]	Reef Fish [16]	No Primary [18]
Number of fishing trips	**Mean**	**40**	**37**	**40**	**32**
	Standard error	9.5	6.6	12.9	9.1
	Median	18	18	18	18
Trip length (hours)	**Mean**	**7.3**	**13.8**	**5.7**	**7.9**
	Standard error	0.3	2.4	0.5	0.8
	Median	8.0	10.0	6.0	8.0
Fishing hours	**Mean**	**5.7**	**8.7**	**5.4**	**7.6**
	Standard error	0.3	0.5	0.5	0.8
	Median	6.0	8.0	5.0	7.5
Fishermen on board for an average fishing trip	**Mean**	**3**	**3**	**3**	**4**
	Standard error	0.3	0.2	0.3	0.3
	Median	3	3	3	3
How many different ramps/ harbors did you use in past 12 months?	**Mean**	**2**	**2**	**2**	**1**
	Standard error	0.1	0.1	0.3	0.1
	Median	1	1	1	1
Average distance traveled to launch boat (miles, one-way)	**Mean**	**12.5**	**10.9**	**5.4**	**8.3**
	Standard error	1.9	2.5	1.0	1.4
	Median	10.0	5.0	4.0	8.0

CNMI small boat fishermen utilize many gear types and target many different species throughout the year (see Tables 16 and 17). On average, fishermen reported the use of 3 different gear types/target species in the past 12 months. This diversity of gear usage applied across all subgroups of the fleet. Trolling for pelagics is by far the most popular gear type (89% participated in the past 12 months), followed by fishing for deepwater (68%) and shallow-water (65%) bottomfish. Although at least half of survey respondents also reported atulai (54%) and spearfishing (50%) trips in the past 12 months.

Table 16.--Percentage of fishermen using gear types on a boat fishing trip in the past 12 months, by classification.

Gear Type/ Target species [*n*]	Full Sample [106]	Sell Fish		Noncommercial [27]
		Highliner [18]	Not Highliner [61]	
Trolling	88.7	94.4	86.9	88.9
Deepwater bottomfish	67.9	72.2	77.1	44.4
Shallow-water bottomfish	65.1	44.4	72.1	62.9
Atulai	53.8	38.9	57.4	55.6
Spearfishing	50.0	38.9	55.7	44.4
Net fishing	12.3	5.6	16.4	7.4
Other	7.6	11.1	6.5	7.4

Table 17.--Percentage of fishermen using gear types on a boat fishing trip in the past 12 months, by primary target.

Gear Type/ Primary Target [*n*]	Pelagics [37]	Bottomfish [38]	Reef Fish [15]	No Primary [16]
Trolling	97.3	86.8	66.7	93.8
Deepwater bottomfish	40.5	97.4	46.7	81.2
Shallow-water bottomfish	48.7	86.8	60.0	56.2
Atulai	45.9	63.2	53.3	50.0
Spearfishing	37.9	42.1	100.0	50.0
Net fishing	13.5	13.2	6.7	12.5
Other	2.7	7.9	13.3	12.5

Fishermen were asked to describe the share of gear usage in the past 12 months (see Table 18). Survey respondents, on average, reported that approximately 38% of their boat fishing trips in the past 12 months consisted of trolling trips, whereas about 37% of trips were some form of bottomfish fishing. Fishery highliners reported a higher percentage of trolling trips (54%) relative to other fishermen who sold fish (30%) and noncommercial fishermen (45%). Likewise, in general, deepwater bottomfish fishing appears to be associated with more commercially-motivated fishermen.

Table 18.—Survey Responses: "In the past 12 months, what percentage of your fishing trips were primarily…"

Percentage of Responses [*n*]	Trolling	Deep Bottomfish	Shallow Bottomfish	Atulai	Reef Fishing Spear	Reef Fishing Net	Other
Full Sample [106]	**37.9**	**23.6**	**13.6**	**7.7**	**14.7**	**1.5**	**1.0**
Island							
Saipan [85]	41.3	21.8	13.6	7.3	14.1	1.4	0.5
Tinian [10]	26.0	42.1	10.2	3.5	16.6	0.0	1.6
Rota [11]	23.0	20.2	17.0	14.8	19.0	3.2	4.8
Sell Fish							
Yes [79]	35.5	27.5	14.2	6.8	13.3	1.7	0.8
Highliner [18]	54.3	21.8	8.2	3.0	10.8	0.3	1.7
Not highliner [61]	30.0	29.2	16.0	7.9	14.1	2.2	0.6
No [27]	45.1	11.9	11.8	10.4	18.5	0.7	1.6
Primary Target							
Pelagics [37]	69.6	5.0	6.4	12.7	4.5	1.6	0.1
Bottomfish [38]	17.7	46.7	22.0	5.6	6.5	0.8	0.7
Reef fish [15]	11.9	7.0	8.7	4.1	64.8	0.7	2.8
No primary [16]	37.3	26.9	15.1	4.6	10.6	3.4	2.2
Boat Ownership							
Yes [55]	36.8	24.5	16.9	6.7	11.6	2.6	0.9
No [51]	39.2	22.5	10.1	8.8	17.9	0.2	1.1

A majority of boat fishing trips (78%) in the past 12 months were single day (or night) trips, although multi-day trips are common as only 51% of fishermen reported to take only single day or night trips in the past 12 months (see Table 19). Likewise, approximately 11% of survey respondents reported to always take multi-day fishing trips. The share of single day or night trips holds across nearly all subgroups in the fishery, although Saipan fishermen appear to engage in more multi-day trips than fishermen on Tinian or Rota. As one may expect fishery highliners also engage in a larger share of

multi-day trips relative to other subgroups in the fleet. Multi-day trips are associated with fishing off other islands along the Marianas island chain.

Table 19.--Survey Responses: "In the past 12 months, what percentage of your fishing trips were…"

Percentage of Trips [*n*]	Single Day/ Night Trips (%)	Multi-day Trips (%)
Full Sample [108]	**77.9**	**22.1**
Island		
Saipan [87]	75.6	24.4
Tinian [10]	84.5	15.5
Rota [11]	90.0	10.0
Sell Fish		
Yes [81]	74.4	25.6
Highliner [19]	68.7	31.3
Not highliner [62]	76.1	23.9
No [27]	88.3	11.7
Primary Target		
Pelagics [36]	85.7	14.3
Bottomfish [39]	72.8	27.2
Reef fish [15]	86.7	13.3
No primary [18]	65.8	34.2

As shown in Table 20, survey respondents indicated that their fishing trips in the past 12 months were rather evenly distributed across local (< 3 nm) and offshore waters (3–200 nm). There are few differences in spatial behavior across avidity levels and target species, with the exception of fishermen that primarily target reef species, as they reported very few trips that were *exclusively* in offshore waters, as one might expect.

Table 20.--Survey Responses: "In the past 12 months, what percentage of your *fishing* trips did you fish in…"

Percentage of Trips [*n*]	Local Waters Only (0-3 nm) (%)	Offshore Waters Only (3-200 nm) (%)	Both Local and Federal Waters (%)
Full Sample [107]	**35.6**	**22.0**	**42.4**
Island			
Saipan [86]	33.6	21.5	44.9
Tinian [10]	48.3	33.9	17.8
Rota [11]	39.9	15.3	44.8
Sell Fish			
Yes [79]	30.8	25.9	43.3
Highliner [17]	14.0	24.4	61.6
Not highliner [62]	35.4	26.4	38.2
No [28]	49.3	10.9	39.8
Primary Target			
Pelagics [36]	21.3	21.7	57.0
Bottomfish [39]	28.1	28.7	43.2
Reef fish [16]	75.3	6.3	18.4
No primary [16]	46.6	22.3	31.1

Fishermen reported a modest level of effort at offshore FADs. Approximately 71% of CNMI fishermen reported to have fished at FADs in the past 12 months, reporting, on average, that FADs were used during 22% of fishing trips (see Table 21). The importance of FADs to CNMI fishing operations varies slightly across subgroups of the fishery. As expected, FADs are more heavily used by those primarily targeting pelagic species, but Rota fishermen also tend to visit FADs more often than Saipan and Tinian fishermen.

Table 21.--Survey Responses: "In the past 12 months, how many of your fishing trips did you fish at Fish Aggregating Devices (FADs)?"

Percentage of Trips [*n*]	Mean (%)	Standard Error	Median
Full Sample [107]	**22.4**	**2.7**	**5.0**
Island			
Saipan [86]	22.3	2.9	5.0
Tinian [10]	1.5	0.8	0.0
Rota [11]	42.4	10.1	24.5
Sell Fish			
Yes [79]	24.0	3.1	5.0
Highliner [17]	22.7	6.2	24.5
Not highliner [83]	24.4	3.5	5.0
No [28]	17.9	5.4	5.0
Primary Target			
Pelagics [36]	32.2	5.1	24.5
Bottomfish [38]	14.2	3.3	5.0
Reef fish [16]	13.9	4.8	5.0
No primary [17]	28.0	8.2	5.0
Boat Ownership			
Yes [56]	27.7	3.9	24.5
No [51]	16.6	3.4	5.0

Survey respondents reported seasonal fishing patterns across all fish species with peak fishing effort reported between April and September (see Fig. 2). Clearly, weather patterns have a great influence on the frequency and scale of CNMI fishing effort. Aside from the wet season between July and October, quarterly patterns are somewhat distinct. The first quarter is often characterized by dry conditions with steady northeasterly trade winds. The second quarter is dry with relatively quiet winds. The third quarter sees winds remaining light with a higher probability of rainfall, while during the fourth quarter trade winds return with heavy rainfall and severe storm potential (Allen and Amesbury, 2012). About one third of the survey respondents on Saipan (38%) reported to fish year round for pelagics, bottomfish (36%) and reef fish (27%). However, the majority of fishermen on Tinian and Rota, respectively report to fish year round for pelagics (67%, 80%), bottomfish (70%, 70%) and reef fish (86%, 89%) The distribution of fishing effort in the CNMI, by quarter, as reported by subgroups of the fishery, is presented in Figure 3 and Table 22.

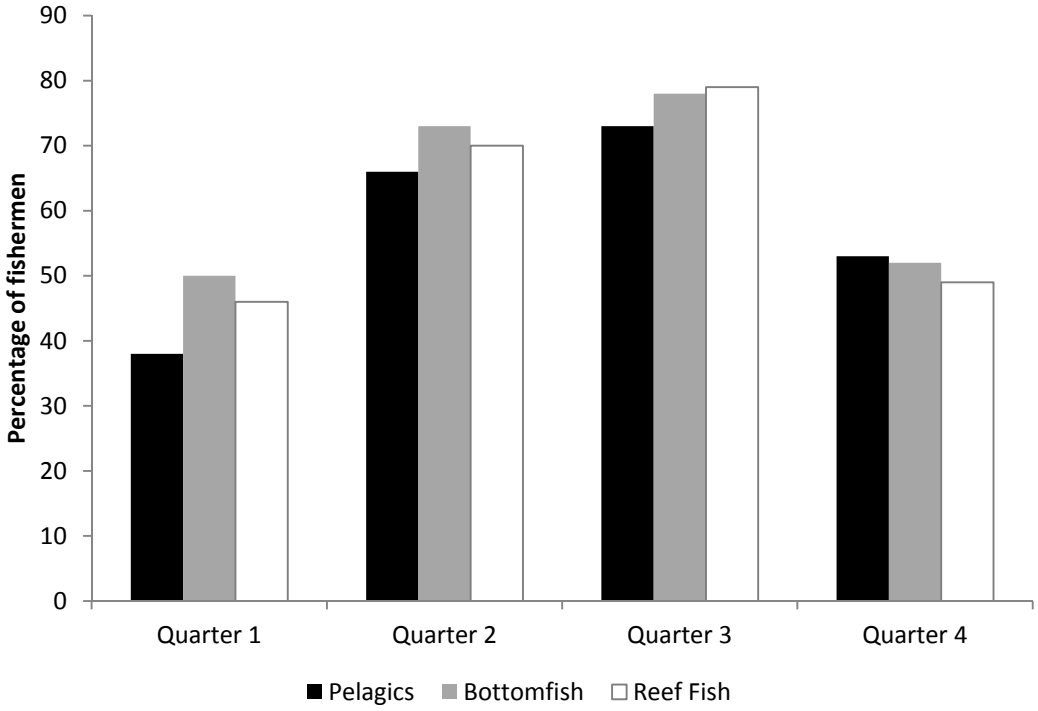

Figure 2.--Seasonality of fishing effort by target species.

Table 22.--Survey Responses: "In the past 12 months, during which months did you fish for…"

Percentage of "YES" responses [*n*]	Pelagics				Bottomfish				Reef Fish			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Full Sample [97]	**38**	**66**	**73**	**53**	**50**	**73**	**78**	**52**	**46**	**70**	**79**	**49**
Island												
Saipan [77]	56	60	69	47	42	71	75	46	35	65	73	38
Tinian [10]	67	89	89	67	70	90	90	80	86	86	100	86
Rota [10]	100	90	90	80	90	70	90	70	89	89	100	89
Sell Fish												
Yes [73]	70	67	77	58	57	80	84	59	54	72	83	56
Highliner [15]	80	60	80	60	46	77	85	46	30	60	80	40
Not highliner [58]	67	69	76	57	59	80	84	63	59	75	84	59
No [24]	38	63	63	38	30	52	61	30	27	64	68	32
Primary Target												
Pelagics [34]	56	71	82	56	26	70	59	33	35	61	83	35
Bottomfish [36]	72	75	72	64	74	87	95	76	61	83	83	61
Reef fish [11]	36	55	55	18	27	45	55	9	38	63	81	50
No primary [16]	69	44	69	44	50	63	88	56	50	71	64	50

Q1 = Jan–Mar, Q2 = Apr–Jun, Q3 = Jul–Sep, Q4 = Oct–Dec

While the survey was not designed specifically to determine annual catch levels for the fleet, we asked fishermen to report estimates of catch in the past 12 months by broad species groups (pelagics, bottomfish, and reef fish) and catch level categories (see Appendix A), in an effort to explore the relationship between economic expenditures and the scale of fishing effort. Using the midpoints of catch categories presented on the

survey, CNMI fishermen reported an average of 898 lbs of pelagic fish caught in the past 12 months, although the median of 375 lbs suggests high levels of variability in catch amounts within the fishery (see Table 23). Reported catch for bottomfish and reef fish were lower than for pelagics, with an average of 584 lbs of bottomfish and 178 lbs of reef fish reported by our survey respondents (see Table 23). Efforts were made to determine estimates of trip-level catch averages using the reported number of trips, by gear type, although there was some item nonresponse from a few fishery highliners so these estimates could be potentially biased downward slightly. The distributions of catch, by species group, are presented in Tables 25–27.

Table 23.—Reported pounds caught in past 12 months, by classification: means, standard errors, and medians.

Variable [*n*]		Full Sample [106]	Sell Fish		Non-commercial [27]
			Highliner [18]	Not Highliner [61]	
Annual pounds caught					
Total pelagic pounds caught	**Mean**	**898**	**2593**	**783**	**213**
	Standard error	196	831	232	74
	Median	375	2000	375	75
Total bottomfish pounds caught	**Mean**	**584**	**774**	**725**	**139**
	Standard error	95	202	146	62
	Median	375	375	375	25
Total reef fish pounds caught	**Mean**	**178**	**300**	**189**	**75**
	Standard error	29	70	43	27
	Median	75	251	75	13
Trip-level pounds caught					
Pelagic pounds per trip	**Mean**	**67**	**73**	**85**	**27**
	Standard error	10	22	16	6
	Median	27	60	32	13
Bottomfish pounds per trip	**Mean**	**84**	**120**	**99**	**24**
	Standard error	20	55	31	7
	Median	18	34	25	9
Reef fish pounds per trip	**Mean**	**43**	**107**	**41**	**7**
	Standard error	14	53	19	3
	Median	0	0	2	0

Table 24.—Reported pounds caught in past 12 months, by primary target: means, standard errors, and medians.

Variable [*n*]		Pelagics [37]	Bottomfish [38]	Reef Fish [15]	No primary [16]
Annual pounds caught					
Total pelagic pounds caught	**Mean**	**1151**	**776**	**392**	**1068**
	Standard error	399	339	173	408
	Median	150	375	150	375
Total bottomfish pounds caught	**Mean**	**163**	**1067**	**125**	**839**
	Standard error	39	209	49	261
	Median	75	375	25	375
Total reef fish pounds caught	**Mean**	**109**	**169**	**239**	**299**
	Standard error	35	57	55	87
	Median	13	38	175	175
Trip-level pounds caught					
Pelagic pounds per trip	**Mean**	**48**	**93**	**53**	**73**
	Standard error	13	20	20	29
	Median	13	41	33	42
Bottomfish pounds per trip	**Mean**	**101**	**102**	**33**	**49**
	Standard error	51	25	20	15
	Median	8	40	6	34
Reef fish pounds per trip	**Mean**	**14**	**23**	**21**	**30**
	Standard error	5	9	9	14
	Median	0	0	10	1

Table 25.--Survey Responses: "In the past 12 months approximately how many total pounds of *pelagic fish* did **you** catch?"

Percentage of Responses [*n*]	None	1-50 lbs	51-100 lbs	101-250 lbs	251-500 lbs	More than 500 lbs
Full Sample [108]	**6.5**	**9.3**	**16.7**	**11.1**	**32.4**	**24.1**
Island						
Saipan [86]	5.8	9.3	18.6	10.5	31.4	24.4
Tinian [11]	9.1	18.2	18.2	27.3	27.3	0.0
Rota [11]	9.1	0.0	0.0	0.0	45.5	45.5
Sell Fish						
Yes [79]	3.8	3.8	13.9	11.4	35.4	31.7
Highliner [18]	5.6	5.6	0.0	0.0	5.6	83.3
Not highliner [61]	3.3	3.3	18.0	14.8	44.3	16.4
No [29]	13.8	24.1	24.1	10.3	24.1	3.5
Primary Target						
Pelagics [37]	2.7	8.2	27.0	13.5	21.6	27.0
Bottomfish [36]	0.0	2.8	19.4	11.1	47.2	19.4
Reef fish [16]	31.3	18.8	0.0	12.5	25.0	12.5
No primary [19]	5.3	15.8	5.3	5.3	31.6	36.8
Boat Ownership						
Yes [55]	1.8	3.7	21.8	12.7	32.7	27.3
No [53]	11.3	15.1	11.3	9.4	32.1	20.8

Table 26.--Survey Responses: "In the past 12 months approximately how many total pounds of *bottomfish* did **you** catch?"

Percentage of Responses [*n*]	None	1-50 lbs	51-100 lbs	101-250 lbs	251-500 lbs	More than 500 lbs
Full Sample [112]	**15.2**	**16.1**	**7.1**	**11.6**	**25.9**	**24.1**
Island						
Saipan [90]	17.8	14.5	7.8	13.3	23.3	23.3
Tinian [11]	0.0	27.3	9.1	0.0	54.6	9.0
Rota [11]	9.1	18.2	0.0	9.1	18.2	45.5
Sell Fish						
Yes [83]	13.3	6.0	6.0	12.1	31.3	31.3
Highliner [21]	28.6	0.0	0.0	9.5	23.8	38.1
Not highliner [62]	8.1	8.1	8.1	12.9	33.8	29.0
No [29]	20.7	44.9	10.3	10.3	10.3	3.5
Primary Target						
Pelagics [37]	27.0	21.6	2.7	27.0	16.2	5.4
Bottomfish [39]	0.0	0.0	10.3	5.1	38.5	46.2
Reef fish [16]	25.0	50.0	0.0	0.0	18.8	6.3
No primary [20]	15.0	10.0	15.0	5.0	25.0	35.0
Boat Ownership						
Yes [58]	12.1	8.6	8.6	13.8	25.9	31.0
No [54]	18.5	24.0	5.6	9.3	25.9	16.7

Table 27.--Survey Responses: "In the past 12 months approximately how many total pounds of *reef fish* did **you** catch?"

Percentage of Responses [*n*]	None	1-25 lbs	26-50 lbs	51-100 lbs	101-250 lbs	More than 250 lbs
Full Sample [110]	**28.2**	**11.8**	**9.1**	**13.6**	**15.5**	**21.8**
Island						
Saipan [88]	28.4	12.5	9.0	14.8	17.1	18.2
Tinian [11]	36.4	0.0	18.1	9.1	9.1	27.3
Rota [11]	18.2	18.2	0.0	9.1	9.1	45.5
Sell Fish						
Yes [81]	29.6	4.9	7.4	12.4	19.8	25.9
Highliner [15]	40.0	0.0	0.0	26.7	13.3	20.0
Not highliner [61]	26.2	6.6	9.8	16.4	22.9	18.0
No [29]	24.2	31.0	13.8	17.2	3.5	10.3
Primary Target						
Pelagics [36]	33.3	22.2	5.6	16.7	8.3	13.9
Bottomfish [38]	36.8	2.6	13.2	10.5	21.1	15.8
Reef fish [16]	0.0	12.5	12.5	25.0	12.5	37.5
No primary [20]	25.0	10.0	5.0	5.0	20.0	35.0
Boat Ownership						
Yes [56]	25.0	10.7	8.9	14.3	16.1	25.0
No [54]	31.5	12.9	9.3	12.9	14.8	18.5

Using data from the CNMI DFW boat-based creel surveys, during 2010-2011, it is estimated that CNMI's small boat fishermen caught an average of approximately 461,752 lbs of all fish species per year (WPacFIN, 2012). There was high annual variability between 2010 and 2011 due, in part, to weather considerations and catch estimation procedures as well as the logistics of creel survey implementation.

The aggregate reported catch for fishermen in our sample was 172,026 lbs, nearly 37% of total estimated annual boat landings of 461,752 pounds across 2010 and 2011 (see Table 28). However, as stated earlier, our estimated aggregate catch from our survey respondents is likely biased downward due to item nonresponse from a few fishery highliners[7]. About half of aggregate catch from our survey respondents was made up of pelagic fish (53%), followed by bottomfish (36%) and reef fish (11%). The catch composition from our survey differs considerably from shares of annual landings, by fishing method, as estimated by the Western Pacific Fisheries Information Network (WPacFIN). The WPacFIN total estimated average boat-based landings across 2010 and 2011 was 91% trolling catch, 7% bottomfish, 1% spearfishing, and 1% "other" methods.

Table 28.--Estimated boat fishing landings: pounds caught, by method.

Gear Type (% share)	Troll	Bottom	Spear	Other	Total
2010*	495,653	40,167	3884	1353	541,057
2011*	348,991	25,704	4325	3427	382,447
Average, 2010-2011*	422,322 (91%)	32,936 (7%)	4105 (1%)	2390 (1%)	461,752
Survey Response	91,625 (53%)	61,876 (36%)	18,525 (11%)		172,026

*Source: WPacFIN, 2014.

Market Participation and Access

During 2010 and 2011, the CNMI small boat fishery had an estimated value of approximately $0.29 million and $0.22 million, respectively (WPacFIN, 2012). The values in these years continued downward trends seen in estimated commercial values over the past decade. Average fish prices in 2010 and 2011 were approximately $2.13 and $2.32 per pound, respectively. There is clearly an economic incentive for some fishery participants with access to markets to sell their fish, especially when considering the costs of fishing (to be detailed in the next section of this report), and 74% of survey respondents reported the sale of some fish in the past 12 months, although nobody reported to have sold *all* the fish they caught. On average, using the median of response categories, fishermen who reported fish sales indicated that they sold fish after approximately 47% of their fishing trips occurring in the past 12 months. Fishery highliners were the most active in the market, selling catch nearly 66% of the time. Across the fleet, there is considerable heterogeneity in market participation and access. The average percentages of trips after which sales occurred in the past 12 months, based on survey responses for subgroups of the CNMI small boat fleet, are presented in Table 29. The distribution of survey responses is presented in Table 30.

[7] Fishermen reporting the highest catch category were asked to specify an approximate catch total. Approximately 25% (n = 6) did not specify a catch total for pelagic fish caught, 22% (n = 6) for bottomfish and 29% (n = 7) for reef fish. For these nonrespondents, we simply used the median of those responding in calculating the aggregate catch estimates for the survey sample. This very well could put a downward bias on our aggregate catch estimates, especially when considering the scale of catch. Responses ranged depending on species groups from 700 – 12,000 lbs (pelagics), 550 – 7,000 lbs (bottomfish), and 300 – 2000 lbs (reef fish).

Table 29.--Survey Responses: In the past 12 months, after what percentage of your fishing trips did you sell a portion of your catch? (*all responses*)

Percentage Sold [*n*]	Mean (%)	Standard Error	Median
Full Sample [110]	**34.8**	**3.5**	**24.5**
Island			
Saipan [88]	35.7	3.9	24.5
Tinian [11]	22.9	8.6	24.5
Rota [11]	39.3	11.1	49.5
Sell Fish			
Yes [81]	47.3	3.9	49.5
Highliner [19]	66.1	8.5	74.5
Not highliner [62]	41.5	4.1	37.0
Primary Target			
Pelagics [37]	26.4	5.7	5.0
Bottomfish [39]	43.2	5.9	49.5
Reef fish [16]	27.9	8.9	5.0
No primary [23]	39.8	9.3	37.0
Boat Ownership			
Yes [57]	33.7	4.5	24.5
No [53]	35.9	5.4	24.5

Table 30.--Distribution of survey responses: In the past 12 months, after what percentage of your fishing trips did you sell a portion of your catch? (*all responses*)

Percentage of Responses [*n*]	Almost All (90%-100%)	Most (60%-89%)	About Half (40%-59%)	Some (10%-39%)	Very Few (1%-9%)	None
Full Sample [110]	**13.4**	**17.3**	**10.9**	**11.8**	**13.6**	**32.7**
Island						
Saipan [88]	14.8	18.2	10.2	10.2	11.4	35.2
Tinian [11]	9.1	0.0	9.1	36.4	18.2	27.2
Rota [11]	9.0	27.3	18.2	0.0	27.3	18.2
Sell Fish						
Yes [81]	20.2	25.3	16.5	17.8	20.2	0.0
Highliner [19]	49.1	38.6	12.3	0.0	0.0	0.0
Not highliner [62]	12.3	21.9	18.7	21.9	25.2	0.0
Primary Target						
Pelagics [37]	8.1	16.2	5.4	13.5	13.5	43.2
Bottomfish [39]	18.0	20.5	12.8	15.4	15.4	17.9
Reef fish [16]	12.5	6.3	18.7	6.3	12.5	43.7
No primary [18]	16.7	22.2	11.1	5.6	11.1	33.3
Boat Ownership						
Yes [57]	8.8	19.3	14.0	14.0	12.3	31.6
No [53]	18.9	15.1	7.6	9.4	15.1	33.9

In addition to the frequency of market participation, we sought to better understand the scale of participation in commercial markets. On average, fishermen that reported the sale of fish indicated that they sold approximately 38% of their total catch in the past 12 months. Largely by definition, fishery highliners sold the largest percentage of their catch at 76%, relative to other fishermen with sales, who sold about 26% of their catch. Cost recovery was cited as the primary motivation for the sale of fish. The average percentages of fish sold in the past 12 months, based on medians of survey response categories for

subgroups of the CNMI small boat fleet, are presented in Table 31. The distribution of survey responses is presented in Table 32.

Table 31.--Survey Responses: Percentage of fish sold (all responses).

Percentage Sold [*n*]	Mean (%)	Standard Error	Median
Full Sample [110]	**27.7**	**2.8**	**14.5**
Island			
Saipan [88]	29.8	3.3	17.0
Tinian [11]	17.0	6.9	10.0
Rota [11]	21.1	5.9	14.0
Sell Fish			
Yes [81]	37.6	3.1	35.0
Highliner [19]	76.3	3.7	70.0
Not highliner [62]	25.7	2.5	18.5
Primary Target			
Pelagics [37]	24.8	5.3	5.0
Bottomfish [39]	31.5	4.4	20.0
Reef fish [16]	22.0	7.2	4.5
No primary [18]	30.2	7.2	15.0
Boat Ownership			
Yes [57]	26.5	3.8	15.0
No [53]	28.9	4.3	10.0

Table 32.--Distribution of survey responses: Percentage of fish sold (all responses).

Percentage of Responses [*n*]	Almost All (90%-100%)	Most (60%-89%)	About Half (40%-59%)	Some (10%-39%)	Very Little (1%-9%)	None
Full Sample [110]	**5.5**	**15.4**	**15.4**	**24.6**	**12.7**	**26.4**
Island						
Saipan [88]	6.8	18.2	14.8	20.4	11.4	28.4
Tinian [11]	0.0	9.1	9.1	45.5	9.1	27.2
Rota [11]	0.0	0.0	27.3	36.4	27.3	9.0
Sell Fish						
Yes [81]	7.4	21.0	21.0	33.3	17.3	0.0
Highliner [19]	31.6	63.2	5.2	0.0	0.0	0.0
Not highliner [62]	0.0	8.0	25.8	43.6	22.6	0.0
Primary Target						
Pelagics [37]	8.1	16.3	5.4	18.9	13.5	37.8
Bottomfish [39]	5.1	15.4	20.5	38.5	12.8	7.7
Reef fish [16]	6.3	0.0	25.0	12.5	12.5	43.8
No primary [18]	0.0	27.8	16.7	16.7	11.0	27.8
Boat Ownership						
Yes [57]	5.3	14.0	12.3	33.3	12.3	22.8
No [53]	5.7	16.9	18.9	15.1	13.2	30.2

As exact pounds sold and revenue totals were not a priority for this survey, and to assuage recall bias and confidentiality concerns, fishermen were given rather broad percentage sold and revenue categories so we could understand market participation within the fleet in general terms (see Appendix A). The average pounds sold of all fish species combined (pelagics, bottomfish, and reef fish) and gross revenues, using the medians of revenue categories and self-reported revenues for those earning revenues

greater than the highest revenue category ($10,000), are presented in Table 33. The estimated means are significantly higher than the medians, suggesting that the means are heavily influenced by fishery highliners who clearly are much more commercially active. Estimations for pounds sold and revenues per trip (using reported percentage of trips with fish sales) are also provided. Additionally, the distribution of reported revenues in the past 12 months is shown in Figure 3.

Table 33.--Market participation in past 12 months: means, standard errors, and medians.

Variable [*n*]		Full Sample [110]	Sell Fish Sample* [81]	Highliner* [19]	Not Highliner* [62]
Pounds sold	**Mean**	**711**	**966**	**2603**	**464**
	Standard error	150	97	631	113
	Median	99	231	1544	150
Pounds sold per trip	**Mean**	**52**	**73**	**111**	**63**
	Standard error	10	13	38	14
	Median	9	26	57	17
Gross revenue (dollars)	**Mean**	**2802**	**3818**	**7267**	**2816**
	Standard error	405	506	1393	445
	Median	300	3000	5250	750
Gross revenue (dollars) per trip	**Mean**	**265**	**375**	**427**	**362**
	Standard error	48	64	186	65
	Median	50	165	175	164

*Limited to fishermen who reported the sale of fish in past 12 months.

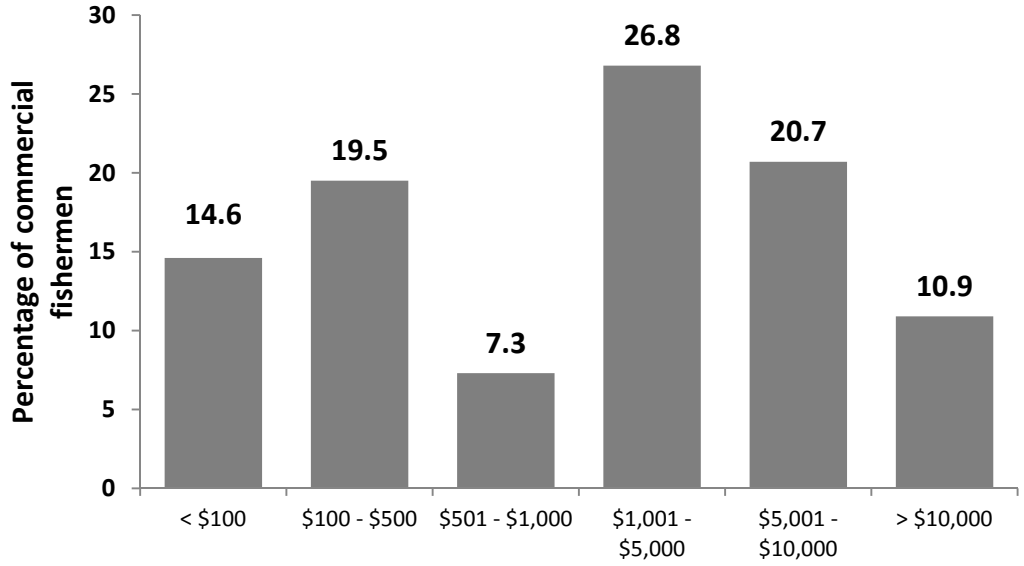

Figure 3.--Distribution of gross revenues in the past 12 months for fishermen reporting the sale of fish.

CNMI fishermen reported a moderate reliance on fishing as a source of personal income, although clearly the overwhelming majority of fishermen do not rely on fishing revenues as a primary source of income, and cost recovery serves as a primary motivation for fish sales. On average, across the fleet, using the medians of survey response categories, fishermen who sold fish reported approximately 36% of personal income from the sale of fish (Table 34). There were some island-specific differences although this could be attributed to low sample sizes. The distribution of fishing income is presented in Table 35.

Table 34.--Survey Responses: "In the past 12 months, what percent of your personal income came from fishing?" *(for those who reported the sale of fish).*

Percentage of Personal Income [*n*]	Mean (%)	Standard Error	Median
Full Sample [80]	**36.3**	**3.3**	**25.0**
Island			
Saipan [62]	39.7	3.9	25.0
Tinian [8]	12.5	3.7	5.0
Rota [10]	24.5	7.8	37.5
Sell Fish			
Highliner [18]	53.1	6.7	50.0
Not highliner [62]	31.4	3.7	25.0
Primary Target			
Pelagic [23]	36.7	6.9	25.0
Bottomfish [35]	33.3	4.8	25.0
Reef fish [9]	36.7	9.4	25.0
No primary [13]	43.1	8.5	50.0
Boat Ownership			
Yes [43]	31.9	3.9	25.0
No [37]	41.4	5.6	25.0

Table 35.--Survey Responses: "In the past 12 months, what percent of your personal income came from fishing?" *(for those who reported the sale of fish).*

Percentage of Responses [*n*]	Almost All (90%-100%)	Most (60%-89%)	About Half (40%-59%)	Some (10%-39%)	Very Little (1%-9%)
Full Sample [80]	**11.3**	**8.7**	**20.0**	**30.0**	**30.0**
Island					
Saipan [62]	14.5	9.6	19.4	30.7	25.8
Tinian [8]	0.0	0.0	0.0	37.5	62.5
Rota [10]	0.0	10.0	40.0	20.0	30.0
Sell Fish					
Highliner [18]	22.2	11.1	27.8	38.9	0.0
Not highliner [62]	8.1	8.1	17.7	27.4	38.7
Primary Target					
Pelagics [23]	17.4	4.4	17.4	26.0	34.8
Bottomfish [35]	8.6	8.6	17.1	34.3	31.4
Reef fish [9]	11.1	0.0	33.3	33.3	22.2
No primary [13]	7.6	23.1	23.1	23.1	23.1
Boat Ownership					
Yes [43]	7.0	4.7	20.9	39.5	27.9
No [37]	16.3	13.5	18.9	18.9	32.4

While about a third of survey respondents who reported the sale of fish (30%) considered fish revenues to contribute *very little* to their personal income, roughly 40% of fishermen who reported sales of fish rely on fishing for about half or more of their personal income. The share of fishing income is rather evenly distributed across species groups for CNMI fishermen (Table 36). Fishery highliners rely more on pelagic revenues (51% of fishing income) than other fishermen who sell fish, who derive the largest share of fishing income from bottomfish (40%). As one may expect, the subgroups most reliant on revenues from bottomfish and reef are those fishermen for whom these are their respective target species. However, even these groups of fishermen report, on average, at least 20% of fishing revenues from pelagic fish.

Table 36.--Mean Survey Responses: "In the past 12 months, what percent of your fishing income came from…" *(for those who sold fish)*

Percentage Fishing Income [*n*]	Pelagics (%)	Bottomfish (%)	Reef Fish (%)
Full Sample[*] [79]	**38.4**	**37.1**	**24.5**
Island			
Saipan [61]	38.3	38.2	23.5
Tinian [8]	43.3	31.3	25.6
Rota [10]	35.4	34.8	29.8
Sell Fish			
Highliner [19]	50.7	27.2	22.1
Not highliner [60]	34.5	40.3	25.2
Primary Target			
Pelagic [23]	59.7	19.3	21.0
Bottomfish [35]	29.2	54.9	15.9
Reef fish [9]	23.4	12.6	64.0
No primary [12]	35.8	37.8	26.4
Boat Ownership			
Yes [43]	40.0	39.9	20.1
No [36]	36.5	33.7	29.8

[*] Limited to fishermen who reported the sale of fish in past 12 months.

Market channels and utilization were detailed in this survey (see Table 37). Based on survey responses, the most prevalent avenue for marketed fish was informal fish sales amongst friends and social networks (40%), with sizable sales to roadside dealers (27%) and retail markets (17%), followed by restaurants (12%), wholesalers (1%) and other market outlets (3%). There were clear island-specific issues of market utilization as the overwhelming majority of fish on Tinian and Rota were sold using informal markets, whereas the largest share of fish was reported to be sold through roadside dealers (34%) on Saipan. In considering market participation and access, 60% of Saipan fishermen reported sales to roadside dealers, 57% sold to friends and neighbors, 46% sold to retail markets, while 38% sold directly to restaurants. On Tinian and Rota most fishermen sold through social networks, 100% and 90% respectively, while 50% of Rota fishermen sold a portion of catch directly to retail markets. The average distributions by market channel, as reported by survey respondents are presented in Table 38, and the percentage of respondents who reported using each particular market channel is presented in Table 38.

Table 37.--Survey Responses: "Where do you sell your catch?"

Percentage of Catch [*n*]	Roadside Dealer (%)	Retail Markets/ Stores (%)	Restaurants (%)	Friends/ Neighbors/ Co-workers (%)	Wholesaler (%)	Other (%)
Full Sample* [81]	**26.7**	**16.8**	**11.6**	**40.4**	**1.4**	**3.1**
Island						
Saipan [63]	33.6	18.9	13.5	28.5	1.5	4.0
Tinian [8]	3.1	3.8	0.0	93.1	0.0	0.0
Rota [10]	2.0	13.5	9.5	73.0	2.0	0.0
Sell Fish						
Highliner [19]	39.9	31.2	4.6	16.4	0.3	7.6
Not highliner [62]	22.7	12.3	13.8	47.8	1.8	1.6
Primary Target						
Pelagics [23]	31.9	21.7	13.5	31.3	0.9	0.7
Bottomfish [36]	22.8	8.5	8.2	52.3	2.2	6.1
Reef fish [9]	20.6	33.9	0.6	45.0	0.0	0.0
No primary [16]	32.7	19.0	25.7	20.2	1.2	1.2

*Limited to fishermen who reported the sale of fish in past 12 months.

Table 38.--Market Utilization, by classification: percentage of respondents using outlet.

Market Outlet [*n*]	Full Sample* [81]	Sell Fish	
		Highliner [19]	Not Highliner [62]
Roadside dealer	49.4	78.9	40.3
Retail markets/stores	43.2	68.4	5.5
Restaurants	35.8	31.6	37.1
Friends/neighbors/coworkers	65.4	63.2	66.1
Wholesaler	8.6	5.3	9.7
Other	9.9	26.3	4.8

*Limited to fishermen who reported the sale of fish in past 12 months.

It would appear that the diversity of market outlets pursued is related to commercial reliance on fishery resources, as only about half of survey respondents (52%) reported using more than one market channel in the past 12 months, either by choice or by necessity (Table 39). For the purpose of this report, we simply consider market channel as defined in Table 38. We do not have a distinction as to how many *different* markets or dealers or stores one may sell to, we consider "markets and stores" as one market channel.

Table 39.--Market Utilization: percentage of respondents using different outlets.

Number of Different Market Outlets Used [*n*]	Full Sample* [81]	Sell Fish	
		Highliner [19]	Not Highliner [62]
One	48.2	31.6	53.3
Two	19.8	10.5	22.6
Three	17.3	31.6	12.9
Four	4.9	10.5	3.2
Five or More	9.8	15.8	8.0

*Limited to fishermen who reported the sale of fish in past 12 months.

Survey responses suggest that there are significant market limitations for CNMI fishermen. Less than half of fishermen (43%) indicated that they can sell all of their fish catch if they want to, no matter the species. It would appear that bottomfish afford the highest market demand on Saipan, whereas markets on Tinian may be problematic for fishermen looking to sell their catch. Fishery highliners appear to have well-established market relationships, as 65% confirmed that they were able to sell all the catch they wanted to sell, with some respondents actually fishing specifically for roadside dealers.

Table 40.--Survey Responses: "Can you usually sell all of your fish if you want to?"

Percentage of "YES" Responses [*n*]	*Pelagics*	*Bottomfish*	*Reef Fish*	*Sell all fish*
Full Sample[a] [77]	**55.9**	**71.2**	**61.4**	**42.9**
Island				
Saipan [59]	60.8	79.6	67.5	49.2
Tinian [8]	28.6	28.6	28.6	12.5
Rota [10]	50.0	60.0	60.0	30.0
Sell Fish				
Highliner [17]	68.8	84.6	81.8	64.7
Not highliner [60]	51.9	67.9	56.5	36.7
Primary Target				
Pelagics [21]	57.1	56.3	42.9	42.9
Bottomfish [35]	53.3	82.4	70.8	42.9
Reef fish [9]	66.7	40.0	55.6	44.4
No primary [12]	54.6	72.7	70.0	41.7

[*] Limited to fishermen who reported the sale of fish in past 12 months.

The survey included an open-ended probe for survey respondents who felt that they could not usually sell all of the fish they would have liked to sell. Market conditions were cited as the primary limiting factor in fishermen's ability to sell their catch, and additional reasons included the catch of undesirable/non-target species, the fish being too small, low prices, and picky customers. Again, with a few exceptions, the emphasis on cost recovery proved to be the primary motivation for market participation. A number of fishermen emphasized the subsistence motivation of their fishing as a rationale for not selling fish.

The aggregate revenue for survey respondents was approximately $305,400. This is nearly 55% of the average estimated annual commercial revenues of $556,396 across 2010 and 2011 (see Table 34). However, a caveat in our estimated aggregate revenue from our sample is that we used the medians of the revenue categories to calculate the total. Additionally, the pounds sold values are derived from the reported percentage of fish sold as applied to reported total catch (and subject to previously mentioned caveats associated with this estimate). Fishermen responding to our survey reported the sale of approximately 76,843 lbs of fish, equating to an average price of $3.97. On the surface, this average price may appear problematic compared to the estimated market price of $2.21, although given that nearly 40% of fish was reported to be sold through informal markets to friends and social networks (see Table 38) it is not unreasonable to find higher prices relative to formal markets. Additionally, bottomfish and reef fish typically command higher prices and could be underrepresented by existing market monitoring programs (Bak, 2012).

Table 41.--Estimated boat fishing pounds sold and revenues.

	Pounds Sold	Revenues	Average Price
2010*	285,378	608,970	2.13
2011*	217,092	503,821	2.32
Average, 2010-2011*	251,235	556,396	2.21
Survey Response (% estimated total)	76,843 (31%)	305,400 (55%)	3.97

*Source: WPacFIN, 2011: Commercial Landings CNMI (Saipan).

Trip Costs

This section presents a snapshot of trip costs incurred by CNMI boat fishing trips during 2010 and 2011. Fishermen surveyed were asked to state the month and year of their most recent fishing trip to prompt recall and then asked to detail trip-related expenditures of their most recent fishing trip for their two most common gear types (where applicable). For pelagic fishing trips taken in the past 12 months (at time of survey), the average trip cost was approximately $188 with a median cost of $179 (see Table 42). As one may expect, fuel expenses were the largest contributor to total trip expenditures. The average pelagic fishing trip expenditures included $129 for boat fuel and $17 for truck fuel, leading fuel costs to account for a majority (78%) of total trip expenditures. Food and beverage was the next largest contributor to total trip costs at $19 (10%), followed by bait/tackle (7%) and ice (6%). On average, fishermen with fish sales spent a larger percentage on fuel and ice than noncommercial fishermen, whereas noncommercial fishermen spent a larger percentage on food and beverage.

Table 42.--Most recent *pelagic* fishing trip costs, by classification: means, standard errors, and medians.

Variable [*n*]		Full Sample [52]		Sell Fish				Noncommercial [11]	
				Highliner [10]		Not Highliner [37]			
		$ per Trip	% of Total Trip Cost	$ per Trip	% of Total Trip Cost	$ per Trip	% of Total Trip Cost	$ per Trip	% of Total Trip Cost
Boat fuel	**Mean**	**128.87**	68.5	**123.90**	75.9	**148.23**	67.9	**78.81**	63.4
	Standard error	10.0		16.42		13.04		20.32	
	Median	117.50		100.00		150.00		50.00	
Truck fuel	**Mean**	**17.38**	9.2	**9.00**	5.5	**21.45**	9.8	**13.55**	10.9
	Standard error	3.05		0.67		4.86		3.53	
	Median	10.00		10.00		15.00		10.00	
Ice	**Mean**	**10.42**	5.5	**10.20**	6.2	**12.13**	5.5	**5.81**	4.7
	Standard error	0.94		1.45		1.37		0.94	
	Median	10.00		11.00		10.00		5.00	
Bait/tackle	**Mean**	**12.13**	6.6	**12.40**	7.6	**12.94**	5.9	**9.64**	7.8
	Standard error	2.63		9.82		3.00		3.25	
	Median	2.50		0.00		8.00		6.00	
Food and beverage	**Mean**	**19.23**	10.2	**7.80**	4.8	**23.90**	10.9	**16.45**	13.2
	Standard error	2.88		1.75		4.31		4.70	
	Median	10.00		7.50		15.00		15.00	
Total trip cost	**Mean**	**188.04**		**163.30**		**218.65**		**124.27**	
	Standard error	14.03		19.54		18.97		25.80	
	Median	179.00		153.50		213.00		80.00	

While sample sizes were small, there were slight differences in trip costs across islands, although the overall cost structure was rather consistent. The mean and median pelagic trip costs for Saipan and Rota were quite similar, whereas Tinian fishermen reported lower costs associated with their trips, specifically fuel costs.

Table 43.--Most recent *pelagic* fishing trip costs, by island: means, standard errors, and medians.

Variable [*n*]		Saipan [41]		Tinian [7]		Rota [4]	
		$ per Trip	% of Total Trip Cost	$ per Trip	% of Total Trip Cost	$ per Trip	% of Total Trip Cost
Boat fuel	**Mean**	**133.85**	67.6	**89.71**	68.1	**146.25**	79.2
	Standard error	11.50		23.81		33.75	
	Median	140.00		70.00		162.50	
Truck fuel	**Mean**	**18.51**	9.4	**12.14**	9.2	**15.00**	8.1
	Standard error	3.84		2.14		2.89	
	Median	10.00		10.00		15.00	
Ice	**Mean**	**10.80**	5.5	**7.86**	7.7	**11.00**	5.9
	Standard error	1.12		1.55		3.32	
	Median	10.00		10.00		10.00	
Bait/tackle	**Mean**	**13.24**	6.7	**12.57**	3.4	**0.00**	0.0
	Standard error	3.24		3.51		0.00	
	Median	0.00		10.00		0.00	
Food and beverage	**Mean**	**21.46**	10.8	**10.00**	11.6	**12.50**	6.8
	Standard error	3.54		2.89		2.50	
	Median	15.00		10.00		10.00	
Total trip cost	**Mean**	**197.88**		**132.29**		**184.75**	
	Standard error	16.41		29.98		37.45	
	Median	190.00		105.00		192.50	

For bottomfish fishing trips taken in 2010 and 2011, the average trip cost was approximately $179 with a median cost of $138 (see Table 44). Again, fuel expenses were the largest contributor to total trip expenditures. For the less fuel-intensive bottomfish fishing, fuel accounts for a high (70%) but smaller share of total trip expenditures relative to pelagic fishing. The average bottomfish fishing trip expenditures included $112 for boat fuel and $14 for truck fuel, leading fuel costs to account for a majority (70%) of total trip expenditures. Food and beverage was the next largest contributor to total trip costs at $21 (12%), followed by bait/tackle (11%) and ice (7%). On average, noncommercial fishermen spent a smaller percentage on ice, relative to fishermen who sell a portion of their catch. Slight differences in trip costs across islands were found with Saipan and Rota fishermen incurring greater costs for bottomfish trips relative to Tinian fishermen, although these differences could be attributed to small sample sizes on Tinian and Rota, as well as the fact that distance to fishing grounds varies across boat launch areas and some bottomfish fishermen on Saipan reported to travel along the island chain (both north and south) on bottomfish trips (Table 45).

Table 44.--Most recent *bottomfish* trip costs, by classification: means, standard errors, and medians.

Variable [*n*]		Full Sample [59]		Sell Fish: Highliner [7]		Sell Fish: Not Highliner [39]		Noncommercial [13]	
		$ per Trip	% of Total Trip Cost	$ per Trip	% of Total Trip Cost	$ per Trip	% of Total Trip Cost	$ per Trip	% of Total Trip Cost
Boat fuel	**Mean**	**112.31**	62.3	**90.00**	68.3	**123.95**	61.6	**89.38**	65.1
	Standard error	13.67		11.95		17.66		31.64	
	Median	100.00		100.00		100.00		40.50	
Truck fuel	**Mean**	**14.47**	8.0	**9.29**	7.0	**15.77**	7.8	**13.38**	9.7
	Standard error	1.85		0.71		2.61		2.89	
	Median	10.00		10.00		10.00		10.00	
Ice	**Mean**	**11.64**	6.5	**10.43**	7.9	**13.03**	6.5	**8.15**	5.9
	Standard error	1.71		1.49		2.52		1.35	
	Median	10.00		10.00		10.00		10.00	
Bait/Tackle	**Mean**	**19.75**	10.9	**10.71**	8.1	**24.54**	12.2	**10.23**	7.5
	Standard error	3.42		2.97		4.94		2.33	
	Median	15.00		15.00		18.00		10.00	
Food and beverage	**Mean**	**20.78**	11.5	**11.43**	8.7	**24.00**	11.9	**16.15**	11.8
	Standard error	3.79		2.37		5.60		2.48	
	Median	10.00		10.00		13.00		15.00	
Total trip cost	**Mean**	**178.95**		**131.86**		**201.29**		**137.31**	
	Standard error	21.74		13.07		29.97		37.32	
	Median	138.00		145.00		150.00		78.00	

Table 45.--Most recent *bottomfish* trip costs, by island: means, standard errors, and medians.

Variable [*n*]		Saipan [48]		Tinian [5]		Rota [6]	
		$ per Trip	% of Total Trip Cost	$ per Trip	% of Total Trip Cost	$ per Trip	% of Total Trip Cost
Boat fuel	**Mean**	**118.38**	67.6	**85.20**	63.9	**86.33**	61.9
	Standard error	16.25		31.86		21.65	
	Median	100.00		70.00		76.50	
Truck fuel	**Mean**	**15.50**	9.4	**11.00**	8.2	**9.17**	6.6
	Standard error	2.22		2.45		2.39	
	Median	10.00		10.00		7.50	
Ice	**Mean**	**11.46**	5.5	**9.00**	6.7	**15.33**	10.9
	Standard error	2.08		1.18		2.47	
	Median	10.00		10.00		13.50	
Bait	**Mean**	**20.15**	6.7	**18.20**	13.6	**17.83**	12.8
	Standard error	4.17		3.29		3.83	
	Median	15.00		18.00		15.00	
Food and beverage	**Mean**	**23.15**	10.8	**10.00**	7.5	**10.84**	7.8
	Standard error	4.58		2.74		2.00	
	Median	15.00		10.00		10.00	
Total trip cost	**Mean**	**188.64**		**133.40**		**139.50**	
	Standard error	26.16		38.70		24.08	
	Median	146.00		105.00		124.50	

For reef fishing trips taken in 2010 and 2011, the average trip cost was approximately $108 with a median cost of $94 (see Table 46). Fuel expenses were again the largest contributor to total trip expenditures and had a share similar to other fishing methods. The average reef fishing trip expenditures included $62 for boat fuel and $15 for truck fuel, leading fuel costs to account for a majority (71%) of total trip expenditures. Food and beverage was the next largest contributor to total trip costs at $22 (20%), followed by ice (5%) and bait/tackle (3%). Contrary to other trip types, on average, noncommercial fishermen spent a larger amount on reef fishing trips, relative to fishermen who reported the sale of fish, primarily due to larger crew sizes and increased food and beverage expenses. There were few island-specific differences and Tinian and Rota observations were combined for confidentiality considerations (Table 47).

Table 46.--Most recent *reef fish* trip costs, by classification: means, standard errors, and medians.

Variable [*n*]		Full Sample [20]		Sell Fish [11]		Noncommercial [9]	
		$ per Trip	% of Total Trip Cost	$ per Trip	% of Total Trip Cost	$ per Trip	% of Total Trip Cost
Boat fuel	**Mean**	**62.25**	57.6	**50.45**	64.0	**76.67**	52.4
	Standard error	10.67		12.59		17.64	
	Median	50.00		40.00		60.00	
Truck fuel	**Mean**	**15.15**	14.0	**12.27**	15.6	**20.89**	14.3
	Standard error	3.09		2.64		5.90	
	Median	10.00		10.00		20.00	
Ice	**Mean**	**5.85**	5.4	**5.36**	6.8	**6.44**	4.4
	Standard error	1.39		1.29		2.76	
	Median	4.00		4.00		3.00	
Bait/tackle	**Mean**	**3.30**	3.1	**3.27**	4.1	**3.33**	2.3
	Standard error	1.49		2.00		2.36	
	Median	0.00		0.00		0.00	
Food and beverage	**Mean**	**21.60**	19.9	**7.45**	9.5	**38.88**	26.6
	Standard error	6.47		1.63		12.21	
	Median	10.00		5.00		20.00	
Total trip cost	**Mean**	**108.15**		**78.80**		**146.21**	
	Standard error	15.04		15.90		22.24	
	Median	94.00		73.00		150.00	

Table 47.--Most recent *reef fish* trip costs, by island: means, standard errors, and medians.

Variable [*n*]		Saipan [15]		Tinian/Rota [5]	
		$ per Trip	% of Total Trip Cost	$ per Trip	% of Total Trip Cost
Boat fuel	**Mean**	**58.33**	53.3	**74.00**	68.5
	Standard error	12.72		20.39	
	Median	50.00		60.00	
Truck fuel	**Mean**	**17.87**	16.3	**11.00**	10.3
	Standard error	3.90		3.67	
	Median	10.00		5.00	
Ice	**Mean**	**4.93**	4.5	**8.60**	7.9
	Standard error	1.67		2.18	
	Median	3.00		10.00	
Bait	**Mean**	**3.60**	3.3	**2.40**	2.2
	Standard error	1.85		2.40	
	Median	0.00		0.00	
Food and beverage	**Mean**	**24.80**	22.6	**12.00**	11.1
	Standard error	8.50		2.55	
	Median	10.00		10.00	
Total trip cost	**Mean**	**109.53**		**108.00**	
	Standard error	18.71		24.93	
	Median	94.00		94.00	

Using data from the CNMI DFW boat-based creel surveys, during 2010-2011, it is estimated that CNMI small boat fishermen combined took an average of approximately 5624 boat fishing trips per year (WPacFIN, 2012). The majority of trips were pelagic trips (66%) followed by bottomfish (29%), reef fish (2%) and other gear types (3%). Using trip cost measures from the survey sample we estimate the annual direct sales impact from trip-related expenses during 2010-2011 to range from approximately $0.9 million (using median trip costs) to $1.0 million (using mean trip costs) (Table 48).

The aggregate number of trips reported for fishermen in the survey sample was approximately 4086 trips, nearly 73% of total estimated annual boat fishing trips (averaged between 2010 and 2011). Considering fisher classification and trip type we estimate total trip-related expenditures for our survey sample to range from $0.6 million (using median trip costs) to $0.7 million (using mean trip costs).

Table 48.--Direct economic impact, trip-related expenditures (dollars).

	Total Trips	Median Estimate ($)	Mean Estimate ($)
2010	6275*	1,030,740	1,150,536
2011	4973*	824,049	917,896
Average, 2010-2011	5624*	927,395	1,034,216
Survey Response	4086	604,182	719,718

*Source: WPacFIN, 2012.

Annual Fishing Expenditures

In addition to variable trip costs, fishing requires significant annual fixed-cost expenditures. A detailed accounting of annual expenditures as reported by survey respondents is presented in Table 49. This table presents fleet-level averages for major expenditure categories and the prevalence each expenditure category is noted in the table. Nearly every survey respondent (88%) reported to incur some non-trip-related fishing expenditure during 2010. The categories with the highest percentage of fishermen reporting expenditures were fishing gear (84%), oil and lube (67%), repair and maintenance (67%), safety equipment (58%), and fees (49%). Repair and maintenance was the category with the highest average expenditure in 2010, followed by gear expenditures. For the remainder of expenditure categories, the majority of fishermen reported no expenditures during 2010. On average, survey respondents reported approximately $3020 in fishing-related expenditures with a median expenditure of $1150. As annual fishing expenditures can vary dramatically, it is advised that one consider median expenditures when evaluating differences among subgroups in the fishery. For a more accurate accounting of true "out-of-pocket" expenditures, see Table 50 which presents average expenditures limited to fishermen reporting non-zero expenditures for each category.

Nonresponse to the expenditure section (16%) was higher than one would hope for and proved far more problematic than any other section of the survey. While approximately 5% (n = 3) of boat owners left the expenditure section blank, the bulk of missing expenditure survey respondents were not boat owners. Nearly 27% (n = 14) of non-boat owners did not complete the expenditure section. Additionally, of those completing the expenditure section, 20% (n = 10) reported zero fishing related expenditures in 2010, so it is likely that a portion of those not completing the section could very well have simply not had fishing related expenditures during 2010.

The top expenditure categories for non-boat owners matched those of the full sample as the categories with the highest percentage of non-boat owner fishermen reporting expenditures were fishing gear (70%), oil and lube (30%), repair and maintenance (30%), safety equipment (27%), and fees (14%). Fishing gear ($407) was the category with the highest average expenditure in 2010 for non-boat owners, while the majority of non-boat-owner fishermen reported no expenditures during 2010 for the remainder of expenditure categories. All expenditure categories were significantly lower for non-boat owners relative to boat owners, as one would expect. The average annual fishing related expenditures in 2010 for non-boat owners was approximately $539 (median = $175), compared to $5121 for boat owners (median = $3075).

Table 49.--Annual fishing expenditures in 2010 (including zero expenditure responses): means, standard errors, and medians.

Variable [*n*]	% of Fleet with Expenditure		Full Sample [87]	Sell Fish		Noncommercial [20]
				Highliner [13]	Not Highliner [54]	
Boat insurance		**Mean**	**46**	**0**	**74**	**0**
		Standard error	35	0	57	0
	5.6	Median	0	0	0	0
Loan payments		**Mean**	**274**	**92**	**113**	**825**
on the boat		Standard error	140	92	93	547
	10.1	Median	0	0	0	0
Financial svcs.:		**Mean**	**25**	**77**	**22**	**0**
bookkpng/acctg		Standard error	10	52	9	0
	10.1	Median	0	0	0	0
Repair, maint.		**Mean**	**1036**	**850**	**1305**	**428**
for vessel, engs,		Standard error	222	293	344	136
or trailer	67.4	Median	300	500	300	150
Oil and lube		**Mean**	**243**	**540**	**212**	**135**
		Standard error	44	171	52	36
	67.4	Median	70	300	50	73
Gear		**Mean**	**742**	**512**	**875**	**532**
		Standard error	117	167	169	186
	84.3	Median	300	250	450	250
Electronics		**Mean**	**296**	**23**	**421**	**135**
		Standard error	102	16	161	64
	33.7	Median	0	0	0	0
Fees		**Mean**	**65**	**73**	**38**	**132**
		Standard error	15	28	7	59
	49.4	Median	15	0	23	8
Safety		**Mean**	**293**	**72**	**168**	**179**
equipment		Standard error	100	32	41	80
	58.4	Median	100	0	100	85
Other		**Mean**	**2**	**0**	**4**	**0**
		Standard error	2	30	4	0
	1.1	Median	0	0	0	0
Annual fishing		**Mean**	**3020**	**2239**	**3231**	**2366**
expenditures in		Standard error	461	493	647	712
2010	87.6	Median	1150	1400	1105	1055

Table 50.--Annual fishing expenditures in 2010 (excluding zero expenditure responses): means, standard errors, and medians.

Variable [*n*]		Sell Fish			
		Full Sample	Highliner	Not Highliner	Noncommercial
		[5]	[0]	[4]	[1]
Boat insurance	**Mean**	**1996**		**995**	
	Standard error	1131	n/a	682	n/a
	Median	700		450	
		[9]	[1]	[5]	[3]
Loan payments	**Mean**	**3311**		**2420**	**5500**
on the boat	Standard error	1126	n/a	1267	2466
	Median	1500		400	5000
		[9]	[2]	[6]	[1]
Financial svcs.:	**Mean**	**461**		**192**	
bookkpng/acctg	Standard error	199	n/a	45	n/a
	Median	250		200	
		[60]	[9]	[36]	[15]
Repair, maint.	**Mean**	**1648**	**1228**	**2091**	**837**
for vessel, engs,	Standard error	310	357	485	277
or trailer	Median	600	850	850	400
		[58]	[9]	[36]	[14]
Oil and lube	**Mean**	**365**	**780**	**651**	**193**
	Standard error	59	199	332	43
	Median	150	600	150	100
		[75]	[13]	[44]	[18]
Gear	**Mean**	**872**	**512**	**1076**	**636**
	Standard error	129	167	195	199
	Median	500	250	700	300
		[30]	[2]	[21]	[7]
Electronics	**Mean**	**859**		**1083**	**385**
	Standard error	269	n/a	374	143
	Median	300		380	200
		[44]	[6]	[28]	[10]
Fees	**Mean**	**128**	**158**	**73**	**264**
	Standard error	27	37	9	103
	Median	100	100	50	100
		[50]	[8]	[51]	[13]
Safety	**Mean**	**271**	**175**	**198**	**283**
equipment	Standard error	49	16	37	115
	Median	150	175	175	100
		[1]	[0]	[1]	[0]
Other	**Mean**				
	Standard error	n/a	n/a	n/a	n/a
	Median				

In an effort to understand how much of these fishing-related expenditures stay in the CNMI and contribute to the local economy, we asked fishermen what percentage of these expenditures were made off-island, either in person, online, or through a mail-order catalog. While 33% of fishermen reported that *all* fishing-related expenditures were local, the majority (67%) reported to make off-island purchases during 2010. It would appear that about two-thirds of the reported non-trip-related fishing expenditures (64%) can be directly linked to the CNMI economy, as on average approximately 36% of expenditures is attributed to off-island sources. The average percentage of off-island expenditures for subgroups of the fishery is presented in Table 51.

Table 51.--Survey Responses: "What percentage of these expenditures was purchased off-island?"

Percentage of Expenditures [*n*]	Mean (%)	Standard Error	Median
Full Sample [87]	**35.7**	**3.9**	**20.0**
Island			
Saipan [69]	35.5	4.2	20.0
Tinian [9]	35.6	16.1	5.0
Rota [9]	37.8	14.9	10.0
Sell Fish			
Yes [67]	36.8	4.7	20.0
Highliner [15]	27.7	10.3	5.0
Not highliner [52]	39.4	5.3	40.0
No [20]	32.3	6.8	20.0
Primary Target			
Pelagic [25]	31.8	7.1	20.0
Bottomfish [34]	34.3	5.9	20.0
Reef fish [12]	18.3	8.2	0.0
No primary [16]	58.1	10.3	55.0
Boat Ownership			
Yes [52]	38.5	5.1	20.0
No [35]	31.7	6.3	10.0

The aggregate fishing expenditures reported in the past 12 months for fishermen in our sample was approximately $0.31 million. Considering off-island purchases, our survey sample reported approximately $0.20 million of durable good fishing expenditures that can be directly attributed to the CNMI economy (Table 52).

Levels of Investment

In the survey, CNMI fishermen detailed the significant levels of investment they have made in fishing. The average vessel in the fleet cost approximately $22,536 when purchased (see Table 52). Nearly 85% of vessels were purchased used and, on average, approximately 14% required financing. Financing amounts varied widely ranging from approximately $3000 to $25,000, as shown in Table 52.

Table 52.--Vessel purchase characteristics: means, standard errors, and medians.

Variable [*n*]		Full Sample	Sell Fish		
			Highliner	Not Highliner	Noncommercial
Boat cost (in dollars)	**Mean**	**10,800**	**9600**	**11,716**	**8470**
	Standard error	1592	4020	2153	2284
	Median	8000	5000	9,000	6500
		[47]	[5]	[32]	[10]
Purchased new/ used (%)	New	15.4	0.0	17.7	16.7
	Used	84.6	100.0	82.4	83.3
		[51]	[5]	[34]	[12]
Purchased financed? (%) [49]	Cash only	81.6	66.7	90.3	66.7
	Cash and loan	14.3	33.3	6.5	25.0
	Loan only	4.1	0.0	3.2	8.3
		[49]	[6]	[31]	[12]

To better understand the overall investment that CNMI fishermen currently have in fishing, they were asked to estimate a current market value of the electronics and gear that they currently use (considering age and condition). Likewise, fishermen were asked to estimate a current market value for their boat (considering age and condition, including trailer, if applicable). On average, the current value of electronics currently used for fishing in the CNMI is approximately $3994 (with a median of $1750). Average investment in fishing gear was rather consistent across subgroups of the fishery (see Table 53). Many estimated the market value of their vessel to be similar to, if not slightly higher than, the purchase price in nominal terms; this appears to be largely based on investments and improvements to the vessel and motors over time.

Table 53.--Levels of investment (in dollars): means, standard error, minimums, and maximums.

Variable [*n*]		Full Sample	Sell Fish		
			Highliner	Not Highliner	Noncommercial
Market value, electronics	**Mean**	**3994**	**2000**	**8062**	**1067**
	Standard error	885	736	1720	624
	Median	1750	2000	2800	500
		[42]	[4]	[29]	[9]
Market value, gear	**Mean**	**2686**	**3943**	**2673**	**1930**
	Standard error	423	2076	478	266
	Median	2000	1500	2000	2000
		[84]	[12]	[53]	[19]
Market value, boat *(including motor(s) and trailer)*	**Mean**	**10,404**	**11,750**	**11,016**	**8136**
	Standard error	1049	1181	1344	2117
	Median	10,000	11,000	10,000	5000
		[47]	[4]	[32]	[11]

Fishermen were asked to describe when they last upgraded their fishing electronics to better understand the role of technology in fishing operations. Only about 35% of the fleet had upgraded their fishing electronics within the past year, whereas the remainder of survey respondents was split between 1 and 3 years ago (29%) and more than 3 years ago (37%).

Crew Considerations

As noted earlier in the vessel characteristics section, a number of fishermen completing the survey (approximately 48%) identified themselves as non-boat owners. While not the captain on fishing trips, crew fishermen are often an integral part of fishing operations. Just over half (55%) of crew fishermen indicated that they always fish on the same boat, although only 45% reported to always fish with the same captain.

Fishermen were asked about compensation arrangements for their time and assistance and found a diversity of responses across the fleet. About 45% of crew fishermen reported that they receive no compensation for their time as crew members, many of which indicated that they were family or friends who simply enjoyed fishing. Additionally, 15% reported that they contribute a portion of trip costs in exchange for the fishing opportunity. According to crew survey respondents who receive compensation, approximately 40% reported that they keep a percentage of total fish caught on a trip with the mean percentage being 39%. No crew fishermen reported that they keep all the fish they catch on a trip. For crew members involved in trips where fish are sold, 71% reported that they receive a share of trip revenues (an average of 33% of trip revenues). An additional 30% stated that compensation varied from trip to trip.

Social Aspects of Fishing

This section describes important social and cultural considerations that are useful in understanding the underlying motivations and behavior of CNMI small boat fishermen. Catch disposition, social networks, social standing, food security, and issues related to fisher classification are also discussed.

Catch Disposition

The ultimate disposition of catch from CNMI fishermen reflects the diverse social, cultural, and economic motivations for fishing. Approximately 28% of fish catch was reported to be consumed at home, while 38% was given away to relatives, friends or crew, and approximately 29% of fish was sold, in the past 12 months. The remaining catch was either released (2%) or exchanged for goods and services (3%). This diversity of catch disposition extends across all subgroups of the fishery including fishery highliners who, despite their avid market participation, still retain approximately 22% of the fish they catch for home consumption and participation in traditional fish-sharing networks and customary exchange (Severance, 2010).

In general, we find that Saipan fishermen tend to sell a higher share of their catch relative to Rota and Tinian fishermen (see Table 54). The significant percentage of fish caught for home consumption and for distribution to relatives and friends reflects the strong family and social connections associated with fishing in the CNMI. These findings validate the importance of fishing in terms of building and maintaining social and community networks, perpetuating fishing traditions, and providing fish to local communities as a source of food security (Severance, 2010).

Table 54.--Survey Responses: "In the past 12 months, what percentage of your catch was…"

Percentage of Responses [*n*]	Catch and Release (%)	Consumed at Home (%)	Given to relatives (%)	Given to Friends/ Neighbors (%)	Given to Crew (%)	Fiestas/ Cultural Event (%)	Exchanged for goods/ services (%)	Sold (%)
Full Sample [112]	**2.5**	**27.8**	**12.6**	**9.7**	**9.1**	**6.6**	**2.8**	**28.9**
Island								
Saipan [90]	2.1	26.6	12.2	8.7	9.4	7.1	2.6	31.3
Tinian [11]	7.0	42.3	13.5	13.7	3.7	2.0	0.8	17.0
Rota [11]	1.2	22.7	15.4	14.0	12.4	6.9	6.4	21.1
Sell Fish								
Yes [83]	2.3	24.7	9.3	6.7	8.1	6.3	3.5	39.0
Highliner [21]	0.4	7.5	4.5	1.7	3.7	3.7	0.4	78.2
Not highliner [62]	2.9	30.5	10.9	8.5	9.6	7.2	4.5	25.7
No [29]	2.9	36.5	22.1	18.3	12.0	7.2	0.9	0.0
Primary Target								
Pelagics [37]	1.9	33.2	11.2	9.4	10.6	7.1	1.7	24.8
Bottomfish [39]	3.9	26.7	10.4	7.6	8.2	7.6	4.0	31.5
Reef fish [16]	1.0	26.8	19.1	16.0	8.1	4.6	2.4	22.0
No primary [20]	1.9	20.6	14.4	9.4	9.0	5.2	2.7	36.9
Boat Ownership								
Yes [58]	2.5	27.2	11.8	10.4	9.1	8.5	2.8	27.7
No [54]	2.4	28.3	13.6	8.9	9.2	4.5	2.8	30.2

Social Networks

In addition to the social aspects of catch disposition, strong social networks occur among the fishing community in the CNMI. Fishing in the CNMI is by nature a social activity as only 3% of fishermen reported to fish alone, and 70% reported that their boat is used without them on occasion (Table 12). However, only a quarter of fishermen responding to our survey (25%) reported to be a member of a fishing club, association or group. The Saipan Fishermen's Association (SFA) was the most common fishing organization represented by the survey respondents. Fishing organization membership varied slightly by island as Saipan fishermen seem to have more organizations than the islands of Tinian and Rota. Participation in fishing organizations varied slightly by primary target as very few bottomfish fishermen (3%) were members of a fishing group. The active fishing groups and organizations in the CNMI and the distribution of membership among survey respondents are presented in Table 55.

Table 55.--Survey Responses: "Are you a member of a fishing club/association or group?"

Percentage of Responses [*n*]	MUFF[a] (%)	MASC[b] (%)	SFA[c] (%)	Other[d] (%)	Multiple (%)
Full Sample [104]	**0.9**	**7.7**	**17.3**	**3.8**	**4.8**
Island					
Saipan [83]	1.2	8.4	21.7	3.6	6.0
Tinian [10]	0.0	10.0	0.0	10.0	0.0
Rota [11]	0.0	0.0	0.0	0.0	0.0
Sell Fish					
Yes [76]	1.3	7.9	15.8	3.9	5.3
Highliner [17]	0.0	17.6	17.6	5.9	5.9
Not highliner [59]	1.7	5.1	15.3	3.4	3.4
No [28]	0.0	3.6	21.4	3.6	3.6
Primary Target					
Pelagics [36]	0.0	5.6	27.8	5.6	5.6
Bottomfish [37]	2.7	0.0	0.0	2.7	0.0
Reef fish [11]	0.0	21.4	14.3	0.0	7.1
No primary [23]	0.0	17.6	35.3	5.9	11.8
Boat Ownership					
Yes [54]	0.0	7.4	20.4	3.7	5.6
No [39]	2.0	8.0	14.0	4.0	4.0

[a]MUFF: Marianas Underwater Fishing Federation [GUAM]
[b]MASC: Marianas Apnea Spearfishing Club [MARIANAS]
[c]SFA: Saipan Fishermen's Association [CNMI]
[d]OTH: Other fishing group

Social Standing

The results presented thus far confirm that fishing is an integral part of the culture in the CNMI. Fishermen were asked to consider their relationship to the non-fishing community to better understand their perception of social standing. The majority of fishermen (57%) agreed that as a fisherman, they are respected by the greater community. While nearly a third of respondents were neutral (27%) and some were hesitant to express an opinion or simply did not know (13%), we found that very few (3%) felt that they were not respected by the community which validates the social and cultural importance of fishing practices and traditions (Table 56).

Table 56.--Survey Responses: "As a fisherman, I am respected by the community"

Percentage of Responses [*n*]	Strongly Agree (%)	Somewhat Agree (%)	Neutral (%)	Somewhat Disagree (%)	Strongly Disagree (%)	Don't Know (%)
Full Sample [106]	**37.7**	**18.9**	**27.4**	**1.9**	**0.9**	**13.2**
Island						
Saipan [84]	33.3	16.7	33.3	1.2	1.2	14.3
Tinian [11]	45.5	27.3	9.1	0.0	0.0	18.1
Rota [11]	63.6	27.3	0.0	9.1	0.0	0.0
Sell Fish						
Yes [79]	44.3	16.5	24.0	2.5	1.3	11.4
Highliner [19]	42.1	21.1	10.5	5.3	5.3	15.8
Not highliner [60]	45.0	15.0	28.3	1.7	0.0	10.0
No [27]	18.5	26.0	37.0	0.0	0.0	18.5
Primary Target						
Pelagics [35]	37.1	28.6	22.9	0.0	0.0	11.4
Bottomfish [38]	50.0	10.5	23.7	2.6	0.0	13.2
Reef fish [14]	28.5	14.3	42.9	0.0	0.0	14.3
No primary [19]	21.0	21.0	31.6	5.3	5.3	15.8
Boat Ownership						
Yes [55]	41.8	18.2	21.8	3.6	0.0	14.6
No [51]	33.3	19.6	33.3	0.0	1.9	11.8

Food Security

In addition to the social importance evident in the disposition of CNMI small-boat catch, a majority of fishermen consider the fish they catch to be an important source of food for their families (see Table 57) with 86% of survey respondents attesting to the importance of pelagic fish for family consumption, and these perceptions strengthen when one considers bottomfish (91%) and reef fish (93%). There was little variation across subgroups of the fishery, with perhaps an exception being the relationship of fishery highliners as this relationship likely demonstrates the economic importance of catch for this subgroup. These results clearly demonstrated that fish caught in the CNMI are an important source of food security for fishermen and local communities.

Table 57.--Survey Responses: "Are the fish you catch an important source of food for your family?"

Percentage of Respondents* [*n*]	*Pelagics*	*Bottomfish*	*Reef Fish*
Full Sample [112]	**86.0**	**90.6**	**93.1**
Island			
Saipan [90]	83.5	89.3	90.9
Tinian [11]	90.0	90.0	100.0
Rota [11]	100.0	100.0	100.0
Sell Fish			
Yes [83]	84.0	88.7	90.5
Highliner [21]	64.7	71.4	66.7
Not highliner [62]	89.7	92.9	96.1
No [29]	92.0	96.0	100.0
Primary Target			
Pelagics [37]	83.8	89.3	92.3
Bottomfish [39]	89.2	89.7	90.3
Reef fish [16]	90.9	100.0	100.0
No primary [20]	80.0	88.2	92.9
Boat Ownership			
Yes [58]	81.8	84.3	86.4
No [54]	91.1	97.8	100.0

*Limited to fishermen reporting catch of each species group.

Fisher Classification

An inherent difficulty in the future management of this and other small boat fisheries in the western Pacific region is that of fisher classification. While the Magnuson-Stevens Fishery Conservation and Management Act (MSA) has clear legal definitions of commercial fishing, these regulatory definitions do not consider cultural motivations towards fishing in the western Pacific and are not adequate to properly describe fishing behavior, attitudes, and perceptions. Research has shown that fisher perceptions do not align well with regulatory frameworks in many western Pacific small boat fisheries (Hospital and Beavers, 2012a; Hospital and Beavers, 2012b; Hospital, et al., 2011; Hamilton, 1998).

To help improve understanding of this, fishermen were first asked to define what "commercial" fishing meant to them. Fishermen were presented with a menu of options, including behavior that would meet federal definitions, and a variety of scales of market participation. Fishermen could choose any and all responses that they felt applied to define a fisherman as commercial. As shown in Table 58, the highest percentage of responses were associated with deriving *all* personal income from fishing (39%), selling *all* catch (31%) and selling 50% of catch (27%). However, there was less agreement on legally established definitions. For instance, the MSA defines "commercial" fishing to encompass any fish entering commerce, whereas only 3% of fishermen considered selling small amounts of fish (less than 25% of catch) to be commercial fishing. The majority of fishermen (66%) only chose one response to this question and 34% of these fishermen agreed that one must derive *all* personal income from fishing to be considered a

commercial fisherman. An additional 21% felt that one must sell *all* their catch to be considered a commercial fisherman.

As mentioned in the market participation and access section, nearly 74% of fishermen responding to the survey reported to have sold fish in the past 12 months. Of these, approximately 47% reported to have sold 25% or less of their fish catch in the past 12 months, and 32% reported to have sold more than 50% of their catch.

Table 59.--Survey Responses: "How would you define a fisherman as commercial (check all that apply)?"

Percentage of Responses [*n*]	Sell at least one fish	Sell 25% of catch	Sell 50% of catch	Sell all catch	25% personal income	50% personal income	*All* personal income
Full Sample [112]	**2.7**	**9.9**	**26.8**	**31.3**	**13.4**	**20.5**	**39.3**
Island							
Saipan [90]	3.3	10.0	27.8	35.6	15.6	21.1	37.8
Tinian[11]	0.0	9.1	18.2	27.3	0.0	9.1	36.4
Rota [11]	0.0	9.1	27.3	0.0	9.1	27.3	54.6
Sell Fish							
Yes [83]	1.2	7.2	31.3	28.9	9.6	24.1	39.8
Highliner [21]	4.8	0.0	33.3	33.3	9.5	19.1	23.8
Not highliner [62]	0.0	9.7	30.7	27.4	9.7	25.8	45.2
No [29]	6.9	17.2	13.8	37.9	24.1	10.3	37.9
Primary Target							
Pelagics [37]	2.7	8.1	16.2	24.3	13.5	16.2	37.8
Bottomfish [39]	0.0	10.3	30.8	41.0	12.8	23.1	46.2
Reef fish [16]	0.0	18.8	37.5	25.0	18.8	25.0	43.8
No primary [20]	10.0	5.0	30.0	30.0	10.0	20.0	25.0
Boat Ownership							
Yes [58]	3.5	8.6	22.4	27.6	15.5	17.2	32.8
No [54]	1.9	11.1	31.5	35.2	11.1	24.1	46.3

After asking fishermen to define commercial fishing, a follow-up question asked fishermen to self-classify themselves. The highest association was with subsistence fishing (46%) followed by recreational expense (30%) and cultural (30%). Recreational expense was defined as, "I fish primarily for sport or pleasure, but I also sell a few fish to recover trip expenses." Therefore it is clear that cost recovery is a primary motivator for fish sales amongst many fishermen in the CNMI. Approximately 33% reported commercial motivations, identifying as either full-time or part-time commercial fishermen, which seems to show a degree of accordance of fisher perceptions of classification and behavior. The difficulty of categorizing fishing activity in the CNMI is also evident from the high percentage of fishermen who chose multiple responses to this question. Nearly 37% of respondents provided multiple classifications to define themselves. The distribution of self-classification by subgroups of the fishery is presented in Table 59.

Table 59.--Survey Responses: "How would you define yourself as a fisherman? (check all that apply)"*

Percentage of Responses [*n*]	Full-Time Commercial	Part-Time Commercial	Cultural	Subsistence	Recreational Expense	Purely Recreational	Multiple Motivations
Full Sample [112]	**15.2**	**17.9**	**29.5**	**46.4**	**30.3**	**17.9**	**36.6**
Island							
Saipan [90]	18.9	17.8	28.9	36.7	28.9	16.7	31.1
Tinian [11]	0.0	9.1	27.3	81.8	27.3	27.3	54.6
Rota [11]	0.0	27.3	36.4	90.9	45.5	18.2	63.6
Sell Fish							
Yes [83]	20.5	24.1	25.3	48.2	33.7	8.4	38.6
Highliner [21]	42.9	42.9	14.3	14.3	4.8	4.8	14.3
Not highliner [62]	12.9	17.7	29.0	59.7	43.6	9.7	46.8
No [29]	0.0	0.0	41.4	41.4	20.7	44.8	31.0
Primary Target							
Pelagics [37]	10.8	18.9	29.7	35.1	24.3	18.9	27.0
Bottomfish [39]	17.9	20.5	23.1	58.9	41.0	7.7	48.7
Reef fish [13]	6.3	18.8	37.5	43.8	25.0	31.3	37.5
No primary [23]	25.0	10.0	35.0	45.0	25.0	25.0	30.0
Boat Ownership							
Yes [58]	12.1	15.5	27.6	44.8	39.7	20.7	37.9
No [54]	18.5	20.4	31.5	48.2	20.3	14.8	35.2

*Does not sum to 100% because fishermen were allowed to indicate multiple classifications.

Fisher Perceptions

The survey also made efforts to elicit some attitudes and perceptions from the CNMI's small-boat fishermen. This section will detail the results of these questions including perceptions of recent fishing conditions and participation, expectations for the Marianas Trench Marine National Monument, attitudes towards marine protected areas (MPAs), and impacts of military exercises in the region.

Fishing Conditions and Participation

We asked fishermen their perceptions of fishing conditions in recent years in the context of catchability. A majority of fishermen feel that it has become harder to catch all species of fishing including bottomfish (71%), reef fish (71%) and pelagic (69%) in recent years. Nearly 43% of fishermen reported that all species groups have become harder to catch in the last 5 years. There were few differences across subgroups in the fishery. The distribution of responses is presented in Table 60.

Table 60.--Survey Responses: "In the last five (5) years, do you believe it has become easier, harder, or about the same to catch…"

Percentage of "YES" Respondents* [*n*]	*Pelagics*			*Bottomfish*			*Reef Fish*		
	Easier	*Same*	*Harder*	*Easier*	*Same*	*Harder*	*Easier*	*Same*	*Harder*
Full Sample [105]	**6.3**	**25.0**	**68.7**	**5.4**	**22.8**	**71.7**	**9.6**	**19.3**	**71.1**
Island									
Saipan [74]	6.7	25.3	68.0	7.0	21.1	71.9	9.4	18.8	71.9
Tinian	0.0	30.0	70.0	0.0	30.0	70.0	0.0	22.2	77.8
Rota [62]	9.1	18.2	72.7	0.0	27.3	72.7	20.0	20.0	60.0
Sell Fish									
Yes [94]	5.5	24.7	69.8	4.4	23.2	72.4	6.7	15.0	78.3
Highliner [15]	11.8	5.9	82.4	0.0	0.0	100.0	0.0	0.0	100.0
Not highliner [79]	3.6	30.4	66.0	5.5	65.5	29.0	8.5	19.2	72.3
No [42]	8.7	26.1	65.2	8.7	21.7	69.6	17.4	30.4	52.1
Primary Target									
Pelagics [89]	8.5	22.9	68.6	10.0	20.0	70.0	12.0	16.0	72.0
Bottomfish [16]	0.0	27.8	72.2	5.3	26.3	68.4	3.6	25.0	71.4
Reef fish [9]	11.1	22.2	66.7	0.0	30.0	70.0	20.0	20.0	60.0
No primary [22]	12.5	25.0	62.5	0.0	14.3	85.7	6.7	13.3	80.0
Boat Ownership									
Yes [95]	5.6	22.2	72.2	3.9	15.7	80.4	4.9	17.1	78.0
No [41]	7.1	28.6	64.3	7.3	31.7	60.9	14.3	21.4	64.3

*Limited to fishermen reporting catch of each species group.

Survey respondents were given the chance to expand on their answers to this question with an open ended prompt: "What has made it easier or harder to catch these fish?", and nearly 75% of survey respondents left comments. These comments focused almost exclusively on why it has become *harder* to catch fish. The themes that fishermen comments most commonly point to include the costly and ever-rising price of fuel (26% of comments), an excessive and growing number of fishermen (19% of comments), depleted fish stocks and/or the displacement of fish from nearshore waters to more distant waters (16% of comments), changes in climate and weather (14% of comments), and overfishing (9% of comments). Although there were few explanations of why it would be *easier* to catch fish, a couple of respondents (3% of comments) noted that high unemployment rates would give more fishermen more time to fish.

Likewise, fishermen provided their perceptions of fishing participation in the coming year. Despite finding that, in general, fishermen report that it has become harder to catch fish in recent years, a majority of fishermen feel that more people will be involved in all types of fishing in the coming year (see Table 61). As suggested by the comments concerned with the rising costs of fishing, fishermen feel most strongly that more people will be involved in fishing for reef fish relative to other fish groups. There were few differences across subgroups in the fishery. The distribution of responses is presented in Table 61.

Table 61.--Survey Responses: "In the next year do you think *more* people will be involved in fishing?"

Percentage of "YES" Respondents* [*n*]	*Pelagics*	*Bottomfish*	*Reef Fish*
Full Sample [101]	**65.6**	**78.2**	**83.2**
Island			
Saipan [81]	67.1	81.7	83.8
Tinian [9]	77.8	88.9	100.0
Rota [11]	45.5	40.0	60.0
Sell Fish			
Yes [74]	63.8	77.0	81.9
Highliner [18]	64.7	72.2	76.5
Not highliner [56]	63.5	78.6	83.6
No [27]	70.4	81.5	86.2
Primary Target			
Pelagics [35]	51.4	62.9	68.6
Bottomfish [36]	71.9	86.1	86.1
Reef fish [13]	78.6	76.9	92.9
No primary [17]	73.3	94.1	100.0
Boat Ownership			
Yes [54]	66.7	79.6	84.9
No [47]	64.4	76.6	81.3

*Limited to fishermen reporting catch of each species group.

Respondents were given space to expand on their previous answers and were encouraged to do so with an open-ended prompt "Why do you feel this way?" Approximately 66% of survey respondents took the opportunity to leave additional feedback. The majority of commenters (63%) gave reasoning for why they expected there to be *more* people involved in fishing. The most prevalent explanation for this was that a weak economy would necessitate more fishing (39% of comments), with 17% pointing specifically to the need to put food on the table and 5% noting that fishing was needed to provide extra income in such an economy. The ever-increasing cost of fuel was the next most popular issue (27% of comments) and was, interestingly, often mentioned as the reason for both an expected decrease in fuel-intensive pelagic fishing and an expected increase in bottomfish and reef fishing that would offset the decrease in trolling. There was some discussion of market considerations (12% of comments) that included reasoning for less fishing based on insufficient access to a market (4% of comments) and for more fishing (8% of comments) based on the impending establishment of a co-op in Saipan, development of new fisheries, and increasing demand from the local population and from off-island markets. Also notable, 9% of those providing comments noted that interest in fishing and the popularity of the sport is growing. A few were of the opinion that fishing would increase because it is part of the island way-of-life, and a few fishermen, conversely, opined that fishing would decrease because of diminishing fish stocks.

Marianas Marine National Monument and Closed Areas (MPAs)

On January 16, 2009, Presidential Proclamation 8335 declared the establishment of the Marianas Trench Marine National Monument. The Marianas Trench Marine National Monument (Monument) consists of three units: the Trench, Volcanic and Islands Units. The Trench and Volcanic Units include only the submerged lands within these areas. The Trench Unit is of most interest to Guam fishermen as it is located to the south and east of the island, whereas the Volcanic and Islands Units are in CNMI waters.

In the survey questionnaire because the establishment of the Monument was a rather contentious issue among the communities in the Marianas, when posed the question, "how familiar are you with the Marianas Trench Marine National Monument?" the overwhelmingly majority (92%) of CNMI fishermen reported to be at least somewhat familiar with the Monument (see Table 62).

Table 62.--Survey Responses: "How Familiar are you with the Marianas Trench Marine National Monument?"

Percentage of Responses [*n*]	Extremely Familiar (%)	Somewhat Familiar (%)	I have not heard of it (%)
Full Sample [104]	**21.2**	**71.2**	**7.6**
Island			
Saipan [82]	24.4	69.5	6.1
Tinian [11]	9.1	72.7	18.2
Rota [11]	9.1	81.8	9.1
Sell Fish			
Yes [75]	21.3	68.0	10.7
Highliner [18]	5.6	83.3	11.1
Not highliner [57]	26.3	63.2	10.5
No [29]	20.7	79.3	0.0
Primary Target			
Pelagics [36]	25.0	69.4	5.6
Bottomfish [36]	22.2	72.2	5.6
Reef fish [15]	6.7	80.0	13.3
No primary [17]	23.5	64.7	11.8

Aside from the intrinsic benefits of establishing marine monuments, a number of organizations supporting the establishment of the Monument touted numerous economic benefits associated with the Monument. These benefits were largely attributed to the Commonwealth of the Northern Mariana Islands (CNMI), and reports estimated the Monument could generate in excess of $10 million in spending, over $14 million in sales, almost $5 million in tax revenues, and account for almost 400 jobs (Iverson, 2008). Fishermen provided their insights into the perceived benefits from the Monument. The analysis of perceived benefits for the establishment of the Monument is somewhat confounded by the high levels of uncertainty and unfamiliarity with potential benefits, but a minority (31%) of CNMI fishermen believe the Monument will benefit the local economy while 40% feel that the closed Monument areas have the potential to improve catch rates for CNMI fishermen (see Table 63).

Table 63.--Survey Responses: "Do you feel the Marianas Trench Marine National Monument will benefit…?"

Percentage of "YES" Respondents [*n*]	*The local economy*			*Your catch rates*		
	Yes	No	Don't Know	Yes	No	Don't Know
Full Sample [105]	**23.8**	**31.4**	**44.8**	**11.5**	**40.4**	**48.1**
Island						
Saipan [83]	22.9	36.1	41.0	10.9	45.1	44.0
Tinian [11]	18.2	9.1	72.7	18.2	18.2	63.6
Rota [11]	36.4	18.2	45.4	9.1	27.3	63.6
Sell Fish						
Yes [76]	18.4	32.9	48.7	12.0	44.0	44.0
Highliner [19]	15.8	31.6	52.6	10.5	42.1	47.4
Not Highliner [57]	19.3	33.3	47.4	12.5	44.6	42.9
No [29]	37.9	27.6	34.5	10.3	31.0	58.7
Primary Target						
Pelagics [36]	27.8	27.8	44.4	8.6	34.3	57.1
Bottomfish [36]	11.1	36.1	52.8	8.3	50.0	41.7
Reef Fish [15]	26.7	26.7	46.6	20.0	26.7	53.3
No primary [18]	38.9	33.3	27.8	16.7	44.4	38.9
Boat Ownership						
Yes [56]	16.1	33.9	50.0	3.6	47.3	49.1
No [49]	32.7	28.6	38.7	20.4	32.7	46.9

A major concern for fishermen who have traditionally fished inshore is the loss of accessible fishing grounds caused by the establishment of marine protected areas (MPAs). The CNMI currently has nine MPAs across the islands of Saipan, Tinian, and Rota, some as managed protected areas with various restrictions and others as "no take" reserves (Starmer et al., 2008).

Fishermen were asked to report on their perception of the effectiveness of existing MPAs in promoting sustainable nearshore fisheries. A majority of fishermen (60%) reported that MPAs have been at least somewhat effective. The distribution of responses is presented in Table 64.

Table 64.--Survey Responses: "How effective do you feel Marine Preserve Areas (MPAs) have been in promoting sustainable nearshore fisheries in the Marianas?"

Percentage of Responses [*n*]	Extremely Effective (%)	Somewhat Effective (%)	Neutral (%)	Somewhat Ineffective (%)	Not Effective At All (%)
Full Sample [101]	**25.7**	**34.7**	**28.7**	**4.0**	**6.9**
Island					
Saipan [80]	23.7	32.5	33.7	3.7	6.4
Tinian [10]	20.0	40.0	10.0	10.0	20.0
Rota [11]	45.5	45.5	9.0	0.0	0.0
Sell Fish					
Yes [73]	24.7	36.9	27.4	5.5	5.5
Highliner [18]	22.2	44.4	22.2	11.1	0.0
Not highliner [55]	25.4	34.6	29.1	3.6	7.3
No [28]	28.6	28.6	32.1	0.0	10.7
Primary Target					
Pelagics [35]	31.4	34.3	20.0	2.9	11.4
Bottomfish [34]	23.5	32.4	29.4	5.9	8.8
Reef fish [15]	26.7	46.6	26.7	0.0	0.0
No primary [17]	17.6	29.4	47.1	5.9	0.0
Boat Ownership					
Yes [56]	28.7	32.1	25.0	7.1	7.1
No [45]	22.2	37.8	33.3	0.0	6.7

While a majority of fishermen agreed that the marine protected areas have been at least somewhat effective in promoting sustainable nearshore fisheries, some do not agree with many aspects of their design, management, and enforcement. As shown in the comments in Appendix B, fishermen insist that additional research is needed on the efficacy of existing MPAs.

Military Impacts

Farallon de Medinilla (FDM) is an uninhabited small island in the CNMI located approximately 45 nautical miles (83 km) north of Saipan and is the smallest island in the archipelago. It is currently leased to the U.S. Military as a bombing range and a significant amount of controversy has arisen, especially in the past 10 years, with regard to the U.S. Navy's use of this island (Bearden et al., 2005). Given safety concerns, the waters surrounding FDM are closed prior to and during bombing exercises. A variety of fish species that have become uncommon around the populated islands of Saipan and Tinian are more abundant around FDM with over 350 species of fish identified (Bearden et al., 2005), leading to potential conflicts with fishermen who make trips to FDM.

Fishermen were asked to report on what percentage of their fishing trips, by trip type, in the past 12 months were affected by military exercises. More than a third of fishermen (35%) reported that military exercises affected pelagic trips, while 33% reported affected bottomfish trips and 28% reported affected reef fishing trips. The average percentage of trips affected by military exercises, by trip type, across subgroups of the fishery is presented in Table 65.

Table 65.--Survey Responses: "In the past 12 months, what percent of your fishing trips were affected by military exercises?"

Percentage of Responses [*n*]	*Pelagics* Mean	*Pelagics* St. Error	*Pelagics* Median	*Bottomfish* Mean	*Bottomfish* St. Error	*Bottomfish* Median	*Reef Fish* Mean	*Reef Fish* St. Error	*Reef Fish* Median
Full Sample [96]	**11.6**	**2.3**	**0.0**	**11.3**	**2.3**	**0.0**	**10.6**	**2.4**	**0.0**
Island									
Saipan [75]	13.7	2.8	0.0	13.3	2.8	0.0	12.5	2.9	0.0
Tinian [10]	1.0	0.7	0.0	1.1	0.7	0.0	1.0	0.7	0.0
Rota [11]	6.7	4.8	0.0	6.7	4.8	0.0	7.4	5.3	0.0
Sell Fish									
Yes [69]	13.1	2.9	0.0	13.1	2.9	0.0	12.2	3.0	0.0
Highliner [17]	10.5	4.7	0.0	7.9	4.1	0.0	11.2	5.9	0.0
Not highliner [52]	13.9	3.5	0.0	14.9	3.6	0.0	12.6	3.6	0.0
No [27]	7.9	3.4	0.0	6.5	3.6	0.0	6.5	3.5	0.0
Primary Target									
Pelagic [34]	9.0	2.6	0.0	10.9	3.5	0.0	4.9	2.5	0.0
Bottomfish [33]	13.2	4.2	0.0	13.2	3.9	0.0	13.9	4.4	0.0
Reef fish [14]	5.3	3.8	0.0	5.7	4.1	0.0	8.2	4.6	0.0
No primary [15]	19.9	8.9	0.0	12.5	8.3	0.0	17.8	9.3	0.0
Boat Ownership									
Yes [53]	13.8	3.1	0.0	14.5	3.3	0.0	13.2	3.4	0.0
No [43]	8.8	3.3	0.0	7.1	3.1	0.0	7.8	3.3	0.0

While we did not explicitly ask fishermen how their trips were affected by military exercises, it is clear significant impacts could occur including economic impacts such as increased travel costs to launch a vessel, increased search costs associated with not fishing in familiar and productive fishing grounds, changing targeting methods to more fuel-intensive methods such as trolling…to not fishing at all, which may have important social and cultural impacts associated with it.

Comments from Fishermen

At the end of the survey, space was provided for additional comments regarding management and research suggestions. To the prompt "Do you have any suggestions for how the Marianas' fisheries should be managed or topics that you feel need further study?" approximately 23% of survey respondents provided feedback on a broad range of subjects. All comments can be found, loosely organized by subject, in Appendix B. Most commonly noted were a variety of opinions on how to better manage the fisheries. Fishermen expressed the desire for a community-based management system and for more fisheries-related educational programs for the public. Fishermen asked for better funding and enforcement of the current MPAs and presented differing opinions regarding the role and use of nets and scuba spear. Some commenters expressed the need for better fishing infrastructure – particularly for more boat ramps and FADs. Lastly, some Tinian and Rota fishermen appeared to support the development of creel surveys on their islands.

CONCLUSION

Using results of a survey fielded in 2011, this paper has described current fishing activity, operational and behavioral aspects of CNMI small boat fishing, and the levels of investment and economic expenditures associated with fishing in the CNMI. The report includes details on important social and cultural linkages that the fishery provides, which undoubtedly have significant influence on the motivations and behavior of CNMI fishermen and the broader community.

Based on the average disposition of catch and landings in the CNMI, it is clear that for nearly all fishery participants the social and cultural motivations for fishing far outweigh any economic prospects. In considering fishing profitability, we find that nearly all fishermen supplement their income with other jobs and are predominantly subsistence fishermen, selling occasionally to recover trip expenses. Using reported revenues we found that 58% of fishermen reporting the sale of fish earned fishing revenues of $750 or less, which would not cover overall trip expenditures for the year. Additionally, we find that fish are an important source of food security for fishing families as 86% of survey respondents consider the pelagic fish they catch to be an important source of food for their family, with 91% and 93% affirming likewise for bottomfish and reef fish, respectively.

We find the CNMI small boat fishery participants to be a complex mix of subsistence, cultural, recreational, and quasi-commercial fishermen whose fishing behaviors provide evidence of the importance of fishing to the communities of the CNMI. This report provides important baseline information that can be used to inform future management alternatives and actions.

ACKNOWLEDGMENTS

Countless individuals were vital to the successful implementation of this research, and while we cannot list everyone that contributed here, we would like to acknowledge a handful of individuals. For one, this work could not have been accomplished without the willing participation of fishermen and the fishing community on the islands of Saipan, Tinian, and Rota, so we would like to express our appreciation for their cooperation and insights. We thank Arnold Palacios and the staff of the CNMI Division of Fish and Wildlife office for their support, logistical assistance, and for allowing promotion of the survey through their community networks. We thank Gary Sword and staff at KKMP for promoting the survey effort to the community. We thank Joe Limes and his collaborators for translating the survey instrument into Chamorro and Refaluwasch. This research could not have succeeded without the help of Ray Roberto, Richard Seman and the Pacific Islands Fisheries Group who were responsible for implementing the survey. Thanks to Jack Ogomuro and John Gourley for insights into the fisheries. We also thank members of the Western Pacific Regional Fishery Management Council Marianas Advisory Panel and Plan Team for their assistance in promoting the importance of this survey effort to the fishing community.

REFERENCES

Allen, S.D., and J. R. Amesbury.
2012. Commonwealth of the Northern Mariana Islands as a Fishing Community. U.S. Dep. Commer., NOAA Tech Memo., NOAA-TM-NMFS-PIFSC-36. 89p.

Bak, S.
2012. Evaluation of Creel Survey Programs in the Western Pacific Region (Guam, CNMI, and American Samoa). A report to the Western Pacific Regional Fishery Management Council. 59p.

Bearden, C., R. Brainard, T. de Cruz, R. Hoeke, P. Houk, S. Holzwarth, S. Kolinski, J. Miller, R. Schroeder, J. Starmer, M. Timmers, M. Trianni, and P. Vroom.
2005. The State of Coral Reef Ecosystems of the Commonwealth of the Northern Mariana Islands. pp. 399-441. In: J.E. Waddell (ed.). The State of Coral Reef Ecosystems of the United States and Pacific Freely Associated States: 2005. NOAA Technical Memorandum NOS NCCOS 11. Silver Spring, MD. 522 pp.

Brainard RE, Asher J, Blyth-Skyrme V, Coccagna EF, Dennis K, Donovan MK, Gove JM, Kenyon J, Looney EE, Miller JE, Timmers MA, Vargas-Angel B, Vroom PS, Vetter O, Zgliczynski B, Acoba T, DesRochers A, Dunlap MJ, Franklin EC, Fisher-Pool PI, Braun CL, Richards BL, Schopmeyer SA, Schroeder RE, Toperoff A, Weijerman M, Williams I, Withall RD.
2012. Coral reef ecosystem monitoring report of the Mariana Archipelago: 2003-2007. Pacific Islands Fisheries Science Center, PIFSC Special Publication, SP-12-01, 1019 p.

Hamilton, M.
1998. A system for classifying small boat fishermen in Hawaii. Marine Resource Economics 13: 289-291.

Hospital, J., and C. Beavers.
2012a. Economic and social characteristics of bottomfish fishing in the main Hawaiian Islands. Pacific Islands Fish. Sci. Cent., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96822-2396. Pacific Islands Fish. Sci. Cent. Admin. Rep. H-12-01, 44 p. + Appendix.

Hospital, J., and C. Beavers.
2012b. Economic and social characteristics of Guam's small boat fisheries. Pacific Islands Fish. Sci. Cent., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96822-2396. Pacific Islands Fish. Sci. Cent. Admin. Rep. H-12-06, 60 p. + Appendices.

Hospital, J., S. S. Bruce and M. Pan.
2011. Economic and social characteristics of the Hawaii small boat pelagic fishery. Pacific Islands Fish. Sci. Cent., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96822-2396. Pacific Islands Fish. Sci. Cent. Admin. Rep. H-11-01, 50 p. + Appendices.

Impact Assessment, Inc.
2011. Small scale and traditional fisheries in the Western Pacific. A report prepared for the Western Pacific Regional Fishery Management Council. Available from Impact Assessment Inc.

Iverson, T.
2008. The economic impact of a proposed Mariana Trench Marine National Monument: An exploratory study. Tom Iverson & Associates. 21p.

Kasaoka, Laurel D.
1989. Summary of Small Boat Economic Surveys from American Samoa, Guam, and the Northern Mariana Islands. Southwest Fisheries Science Center Administrative Report H-89-4C.

Miller, Scott A.
2001. Economic Assessment of the Domestic Fisheries Development Potential of the Commonwealth of the Northern Mariana Islands. Report prepared for the National Marine Fisheries Service. 141 pp.

Severance C.
2010. Customary exchange maintains cultural continuity. Pacific Islands Fishery News 2010; Summer: 1-2.

Starmer J, Asher J, Castro F, Gochfeld D, Gove J, Hall A, Houk P, Keenan E, Miller J, Moffit R, Nadon M, Schroeder R, Smith E, Trianni M, Vroom P, Wong K, Yuknavage K
2008. The state of coral reef ecosystems of the Commonwealth of the Northern Mariana Islands. pp. 437–463. In: J.E. Waddell and A.M. Clarke (eds), The state of coral reef ecosystems of the united states and pacific freely associated states: 2008. NOAA Technical Memorandum NOS NCCOS 73, Silver Spring, MD

United States Census Bureau.
2012. 2010 Census of Population and Housing: Northern Mariana Islands Demographic Profile Summary File.

van Beukering, P., W. Haider, E. Wolfs, Y. Liu, K. van der Leeuw, M. Longland, J. Sablan, B. Beardmore, S. di Prima, E. Massey, H. Cesar, Z. Hausfather.
2006. A report prepared under contract to NOAA by Cesar Environmental Economics Consulting. 163 pp.

Western Pacific Fishery Information Network (WPacFIN).
2012. 2000-2012 CNMI Boat Based Expansion and Boat Log Data.

APPENDIX A. SURVEY INSTRUMENT

OMB Control # 0648-0369 Expiration Date 02/28/2013

Hafa adai, help us to better understand the importance of fishing in the Mariana Archipelago. Your details of fishing experiences and expenditures are important for getting accurate results. We want to best represent Marianas fishermen and we can only do that by hearing from as many fishermen as possible. While your response is voluntary, we hope that you can help us in this research.

SECTION A. YOUR FISHING EXPERIENCES

Different fishermen in the Marianas had different fishing experiences over the past 12 months. Please tell us about yours.

1. Approximately how many boat fishing trips did you take over the past 12 months? (please check one)

- ☐ Fewer than 12 trips (about once every month or less)
- ☐ 12 – 24 trips (about once every other week)
- ☐ 25 – 49 trips (about once a week)
- ☐ 50 – 99 trips (about once or twice a week)
- ☐ 100 – 200 trips (about two to three times a week)
- ☐ more than 200 trips (about four times a week)

2. In the past 12 months, how many of your boat fishing trips were primarily: (please check one for each gear)

	Almost all of my trips (90%-100%)	Most of my trips (60%-89%)	About half (40%-59%)	Some of my trips (10%-39%)	Very few of my trips (1%-9%)	None of my trips
Trolling	☐	☐	☐	☐	☐	☐
Deep Water Bottomfish	☐	☐	☐	☐	☐	☐
Shallow Water Bottomfish	☐	☐	☐	☐	☐	☐
Atulai	☐	☐	☐	☐	☐	☐
Reef Fishing (Spear)	☐	☐	☐	☐	☐	☐
Reef Fishing (Net)	☐	☐	☐	☐	☐	☐
Other (please specify below)	☐	☐	☐	☐	☐	☐

_____

3. In the past 12 months, how many of your fishing trips were in

	Almost all of my trips (90%-100%)	Most of my trips (60%-89%)	About half (40%-59%)	Some of my trips (10%-39%)	Very few of my trips (1%-9%)	None of my trips
Local waters only (0-3nm)	☐	☐	☐	☐	☐	☐
Offshore waters only (greater than 3nm)	☐	☐	☐	☐	☐	☐
Fished in both Local and Offshore waters	☐	☐	☐	☐	☐	☐

4. In the past 12 months, how many of your fishing trips were:

	Almost all of my trips (90%-100%)	Most of my trips (60%-89%)	About half (40%-59%)	Some of my trips (10%-39%)	Very few of my trips (1%-9%)	None of my trips
Single day (or night) trips	☐	☐	☐	☐	☐	☐
Multiday trips	☐	☐	☐	☐	☐	☐

5. How long is your average fishing trip? ____ hours

5a. How many hours are you actually fishing? ____ hours

6. How many people in total, including yourself, are on board for an average fishing trip? _____ people

7. Do you always fish out of the same boat ramp or harbor?

☐ YES **If you answered yes, go to Question 8**

☐ NO → *If no:*

7a. On average, how many different boat ramps or harbors do you use in a year? _____ ramps

8. On average, how far (one-way) do you travel to fish? _____ miles

If trailered, indicate one-way distance to most common ramp; If moored, please indicate one-way distance to slip.

9. In the past 12 months, approximately how many total pounds of pelagic fish did **you** catch?

☐ None
☐ 1 – 50 pounds
☐ 51 – 100 pounds
☐ 101 – 250 pounds
☐ 251 – 500 pounds
☐ More than 500 pounds → About how much? _____ pounds

10. In the past 12 months, approximately how many total pounds of bottomfish did **you** catch?

☐ None
☐ 1 – 50 pounds
☐ 51 – 100 pounds
☐ 101 – 250 pounds
☐ 251 – 500 pounds
☐ More than 500 pounds → About how much? _____pounds

11. In the past 12 months, approximately how many total pounds of reef fish did **you** catch?

- ☐ None
- ☐ 1 – 25 pounds
- ☐ 26 – 50 pounds
- ☐ 51 – 100 pounds
- ☐ 101 – 250 pounds
- ☐ More than 250 pounds → About how much? _____pounds

12. In the past 12 months, during which months did you fish for? (check all that apply)

Pelagic Fish	Bottomfish	Reef Fish
☐ Winter (December - February)	☐ Winter (December - February)	☐ Winter (December - February)
☐ Spring (March - May)	☐ Spring (March - May)	☐ Spring (March - May)
☐ Summer (June - August)	☐ Summer (June - August)	☐ Summer (June - August)
☐ Fall (September - November)	☐ Fall (September - November)	☐ Fall (September - November)

13. In the past 12 months, how many of your fishing trips did you fish at Fish Aggregating Devices (FADs):

Almost all of my trips (90%-100%)	Most of my trips (60%-89%)	About half (40%-59%)	Some of my trips (10%-39%)	Very few of my trips (1%-9%)	None of my trips
☐	☐	☐	☐	☐	☐

SECTION B. MARKET PARTICIPATION

14. People have different opinions on the definition of commercial fishing. How would you define a fisherman as commercial? To be considered a commercial fisherman, I feel that someone must: (check all that apply)

- ☐ Sell at least one fish
- ☐ Sell 25% or more of catch
- ☐ Sell 50% or more of catch
- ☐ Sell all catch
- ☐ Make at least 25% of personal income from fishing
- ☐ Make at least 50% of personal income from fishing
- ☐ Make all personal income from fishing
- ☐ Other _____

15. How do you define yourself as a fisherman? (check all that apply)

- ☐ **Purely Recreational** (I fish only for sport or pleasure)
- ☐ **Recreational Expense** (I fish primarily for sport or pleasure, but I also sell a few fish to recover trip expenses)
- ☐ **Subsistence** (I fish primarily to catch fish to feed myself/my family)
- ☐ **Cultural** (I enjoy fishing, but I am even more concerned about keeping traditional practices alive, such as using traditional fishing gear and sharing fish with the community)
- ☐ **Part-time Commercial** (Fishing pays some of my bills, but I still have to work at another job)
- ☐ **Full-time Commercial** (Fishing brings in most or all of the money I make in a year)

16. In the past 12 months, what percentage of your catch was:

	Almost all of my fish (90%-100%)	Most of my fish (60%-89%)	About half (40%-59%)	Some of my fish (10%-39%)	Very little of my fish (1%-9%)	None of my fish
Caught and released	☐	☐	☐	☐	☐	☐
Consumed at home	☐	☐	☐	☐	☐	☐
Given to crew	☐	☐	☐	☐	☐	☐
Given to family members	☐	☐	☐	☐	☐	☐
Given to friends/neighbors	☐	☐	☐	☐	☐	☐
Caught for fiestas or other community/cultural events	☐	☐	☐	☐	☐	☐
Traded for goods and services	☐	☐	☐	☐	☐	☐
Sold	☐	☐	☐	☐	☐	☐ → **If none sold, go to Question 23, page 5**

If you sold any of your fish...

17. Where did you sell your catch?

	Almost all of my fish (90%-100%)	Most of my fish (60%-89%)	About half (40%-59%)	Some of my fish (10%-39%)	Very little of my fish (1%-9%)	None of my fish
Guam Fishermen's Coop	☐	☐	☐	☐	☐	☐
Roadside Dealer	☐	☐	☐	☐	☐	☐
Retail Markets/Stores	☐	☐	☐	☐	☐	☐
Restaurants	☐	☐	☐	☐	☐	☐
Friends/Neighbors/Coworkers	☐	☐	☐	☐	☐	☐
Wholesaler	☐	☐	☐	☐	☐	☐
Other (specify)	☐	☐	☐	☐	☐	☐

_____

If you sold any of your fish...

18. In the past 12 months, after what percentage of your fishing trips did you sell a portion of your catch?

Almost all (90%-100%)	Most (60%-89%)	About half (40%-59%)	Some (10%-39%)	Very few (1%-9%)
☐	☐	☐	☐	☐

If you sold any of your fish...

19. Can you usually sell all of the fish that you want to sell?

Pelagic Fish	Bottomfish	Reef Fish
☐ Yes	☐ Yes	☐ Yes
☐ No	☐ No	☐ No
☐ I don't sell these fish	☐ I don't sell these fish	☐ I don't sell these fish

19a. If NO - why not?

If you sold any of your fish...

20. In the past 12 months, what was the approximate value of all the fish you sold?

- ☐ $1 - $100
- ☐ $101 – $500
- ☐ $501 – $1,000
- ☐ $1,001 – $5,000
- ☐ $5,001 – $10,000
- ☐ More than $10,000 ⟶ About how much? $_____

If you sold any of your fish...

21. In the past 12 months what percent of your personal income came from the sale of fish?

Almost all (90%-100%)	Most (60%-89%)	About half (40%-59%)	Some (10%-39%)	Very little (1%-9%)
☐	☐	☐	☐	☐

If you sold any of your fish...

22. In the past 12 months, what percent of you fishing income came from the sale of:

	Almost all (90%-100%)	Most (60%-89%)	About half (40%-59%)	Some (10%-39%)	Very little (1%-9%)	None
Pelagic Fish	☐	☐	☐	☐	☐	☐
Bottomfish	☐	☐	☐	☐	☐	☐
Reef Fish	☐	☐	☐	☐	☐	☐

23. Are the fish you catch an important source of food for your family?

Pelagic Fish	Bottomfish	Reef Fish
☐ Yes	☐ Yes	☐ Yes
☐ No	☐ No	☐ No
☐ I don't catch these fish	☐ I don't catch these fish	☐ I don't catch these fish

SECTION C. VESSEL AND GEAR

In this section we want to better understand the vessel and gear characteristics of Marianas' fishing

24. Do you own the boat that you fish on?

☐ YES → **If yes, go to Question 25 on page 7**

☐ NO

24a. Do you always fish on the same boat?

☐ YES

☐ NO

24b. Do you always fish with the same captain?

☐ YES

☐ NO

24c. Are you compensated for your time as crew? (if yes, check box and estimate percentage (%), check all that apply)

☐ YES

☐ NO → **If no, go to Question 36 on page 8**

☐ I keep a percentage of total fish caught _____ % of fish caught

☐ I get a percentage of the value of the fish sold _____ % of value for trip

☐ I pay a percentage of trips costs _____ % of trip costs

☐ I keep all the fish I catch

☐ Don't know/different every time

If you have some other compensation arrangement that you could detail, please describe below:

Please continue to Question 36 on page 8 →

If you own the boat you fish on:

25. What is the length of your boat? _____ feet

26. What is the horsepower? _____ hp

27. In what year was the boat built? _____

28. Do other people use the boat without you?

Often	Sometimes	Rarely	Never
☐	☐	☐	☐

29. When you are the boat captain, how do you typically compensate your crew?

- ☐ Given a percentage of total fish caught _____%
- ☐ Given a percentage of value of fish sold _____%
- ☐ Crew pays a percentage of trips costs _____%
- ☐ Crew keeps all the fish they catch
- ☐ I always fish alone
- ☐ Don't Know/different every time

If you have some other compensation arrangement that you could detail please describe below:

30. In what year did you purchase the boat you fish on? _____
(if homebuilt – when did you complete it?)

31. How much did you pay to purchase the boat you fish on? $ _____
(if homebuilt – how much did it cost to build it?)

32. Was the boat purchased…

☐ New ☐ Used

33. How did you purchase this boat?

- ☐ cash only
- ☐ cash and loan
- ☐ loan only

If cash and loan or loan only:

33a. What was the original loan amount? $ _____

34. What is the approximate market value, in dollars (considering age and current condition), of the **electronics** you currently use to fish? $ _____

35. When did you last upgrade your fishing electronics (GPS, fishfinder/recorder)?

this past year	1 to 3 years ago	over 3 years ago
☐	☐	☐

36. What is the approximate market value, in dollars (considering age and current condition), of the **gear** you currently use to fish (not including electronics)? $ _____

If you own the boat you fish on:

37. What is the approximate market value, in dollars (considering age and current condition), of your **boat** (including motor(s) and trailer, but not including gear, equipment, or electronics mentioned above)? $ _____

SECTION D. YOUR LAST FISHING TRIP

We'd like to know how much it cost for your most recent fishing trip

38. Think about your last boat fishing trip, in what month and year was this trip made? _____ month

_____ year

39. What was the primary gear type for this trip

- ☐ Trolling
- ☐ Deep water bottomfish
- ☐ Shallow water bottomfish
- ☐ Atulai
- ☐ Spear fishing
- ☐ Scuba spear
- ☐ Reef fishing with nets
- ☐ Other _____

40. How much money was spent on your most recent fishing trip?

Type of Expenditure	Trip Expenditure (most recent trip)	What type of fuel?
Boat fuel	$ _____	☐ gas ☐ diesel
Truck fuel (round-trip)	$ _____	☐ gas ☐ diesel
Ice	$ _____	
Bait	$ _____	
Food and beverage	$ _____	
Other (specify) _____	$ _____	

40a. What percentage of these costs did you pay? _____ %

41. What is your second most common gear usage (please check one)

- ☐ Trolling
- ☐ Deep water bottomfish
- ☐ Shallow water bottomfish
- ☐ Atulai
- ☐ Spear fishing
- ☐ Scuba spear
- ☐ Reef fishing with nets
- ☐ Other _____

42. On average how much money do you spend on second most common (question 41) fishing trips?

Type of Expenditure	Trip Expenditure (most recent trip)	What type of fuel?
Boat fuel	$ _____	☐ gas ☐ diesel
Truck fuel (round-trip)	$ _____	☐ gas ☐ diesel
Ice	$ _____	
Bait	$ _____	
Food and beverage	$ _____	
Other (specify) _____	$ _____	

42a. What percentage of these costs did you pay?_____ %

SECTION E. 2010 FISHING EXPENDITURES

In an effort to better understand your economic contribution to the Marianas' economy we would like to ask about your fishing-related expenditures in 2010. In the table below please indicate how much, if any, was spent on the following items during 2010.

Enter "0" if you did not have any expenses in a category. Please do not leave blank.
Remember that all your answers are strictly confidential.

43.

Cost Category	2010 Expenditure (dollars)
Boat insurance	$_____
Loan payments	$_____
Financial services (accounting, taxes)	$_____
Moorage fees	$_____
Repair, maintenance, and improvements for vessel, engines, or trailer	$_____
Oil and lube	$_____
Gear (lines, lures, gaffs, rods, electric/hydraulic reels, spears, wetsuits, coolers, etc.)	$_____
Electronics	$_____
Fees (Registration for truck and trailer, dry dock fees, fishing club dues, Coop fees, etc.)	$_____
Safety Equipment	$_____
Other (specify) _____	$_____

44. Some fishermen purchase fishing gear, electronics, safetly equipment or other items off-island, online, or through a catalog. Approximately what percentage of these expenditures were purchased off-island?
_____ %

SECTION F. ABOUT YOU

Different people have different fishing experiences and different motivations for fishing. The following questions help us to better understand these differences.

45. What is your age?

- ☐ Less than 25 years
- ☐ 25 to 34 years
- ☐ 35 to 44 years
- ☐ 45 to 54 years
- ☐ 55 to 64 years
- ☐ more than 64 years

46. What village do you live in? _____

47. How long have you lived in the Marianas? _____ years

48. How long have you fished from a boat? _____ years

49. Are you of a member of a fishing club/association/group? (please check all that apply)

- ☐ Guam Fishermen's Cooperative Association (GFCA)
- ☐ Guam Organization of Saltwater Anglers (GOSA)
- ☐ Marianas Apnea Spearfishing Club (MASC)
- ☐ Marianas Underwater Fishing Federation (MUFF)
- ☐ Saipan Fishermen Association (SFA)
- ☐ Halum Mamati Fishing Club (HMFC)
- ☐ Other (please specify) _____
- ☐ None

50. Are you of Hispanic, Latin, or Spanish Origin?

- ☐ No
- ☐ Yes, Puerto Rican
- ☐ Yes, Mexican, Mexican American, Chicano
- ☐ Yes, another Hispanic, Latino, or Spanish Origin _____
- ☐ Yes, Cuban

51. How would you describe your race? (check all that apply)

- ☐ Guamanian or Chamorro
- ☐ Filipino
- ☐ White
- ☐ Chinese
- ☐ Japanese
- ☐ Korean
- ☐ Vietnamese
- ☐ Carolinian
- ☐ Native Hawaiian
- ☐ Samoan
- ☐ Other Pacific Islander (please specify) _____
- ☐ Asian Indian
- ☐ American Indian or Alaska Native
- ☐ Black, African American, or Negro

52. Are you currently employed?

- ☐ Employed full-time
- ☐ Employed part-time
- ☐ Retired
- ☐ Student (full-time)
- ☐ Student (part-time)
- ☐ Unemployed
- ☐ Other (specify) _____

53. How many hours per week do you work for pay? _____ hours

54. What is the highest level of education you have completed?

- ☐ Less than 9th grade
- ☐ Some high school (no diploma)
- ☐ High school graduate (including GED)
- ☐ Some college (no degree)
- ☐ Associates degree or technical school
- ☐ College graduate (bachelor degree)
- ☐ Advanced, professional, or doctoral degree

55. What was your total household income, before taxes, in 2010, including fishing income?

- ☐ Less than $10,000
- ☐ $10,000 to $14,999
- ☐ $15,000 to $24,999
- ☐ $25,000 to $34,999
- ☐ $35,000 to $49,999
- ☐ $50,000 to $74,999
- ☐ $75,000 to $99,999
- ☐ $100,000 to $149,999
- ☐ $150,000 to $199,999
- ☐ $200,000 or more

SECTION G. WHAT DO YOU THINK?

56. In the next year do you think more people will be involved in...(please check one for each)

Pelagic Fishing	Bottomfish Fishing	Reef Fishing
☐ Yes	☐ Yes	☐ Yes
☐ No	☐ No	☐ No

56a. Why do you feel this way?

57. In the last five (5) years, do you believe it has become...(please check one for each)

Pelagic Fish	Bottomfish	Reef Fish
☐ Easier to catch pelagic fish	☐ Easier to catch bottomfish	☐ Easier to catch reef fish
☐ Harder to catch pelagic fish	☐ Harder to catch bottomfish	☐ Harder to catch reef fish
☐ About the same	☐ About the same	☐ About the same
☐ I don't target these fish	☐ I don't target these fish	☐ I don't target these fish

57a. What has made it easier or harder to catch fish?

58. As a fisherman I am respected by the community

Stongly Agree	Somewhat Agree	Neutral	Somewhat Disagree	Stongly Disagree	
☐	☐	☐	☐	☐	☐ Don't Know

59. How familiar are you with the Marianas Trench Marine National Monument?

- ☐ Extremely familiar (I know what it is and where it's located)
- ☐ Somewhat familiar (I have heard of it but I don't know many details about it)
- ☐ I have not heard of it

60. Do you feel the Marianas Trench Marine National Monument will benefit the local economy?

- ☐ Yes
- ☐ No
- ☐ Don't Know

61. Do you feel the Marianas Trench Marine National Monument will help to increase your catch rates?

- ☐ Yes
- ☐ No
- ☐ Don't Know

62. How effective do you feel Marine Protected Areas (MPAs) have been in promoting sustainable nearshore fisheries in the Marianas

Extremely Effective	Somewhat Effective	Neutral	Somewhat Ineffective	Not Effective
☐	☐	☐	☐	☐

63. In the past 12 months, what percentage of your fishing trips did you have interactions with sharks?

	Almost all (90%-100%)	Most (60%-89%)	About half (40%-59%)	Some (10%-39%)	Very little (1%-9%)	None
Pelagic Fish	☐	☐	☐	☐	☐	☐
Bottomfish	☐	☐	☐	☐	☐	☐
Reef Fish	☐	☐	☐	☐	☐	☐

64. In the past 12 months, what percentage of your fishing trips were affected by military exercises?

	Almost all (90%-100%)	Most (60%-89%)	About half (40%-59%)	Some (10%-39%)	Very little (1%-9%)	None
Pelagic Fish	☐	☐	☐	☐	☐	☐
Bottomfish	☐	☐	☐	☐	☐	☐
Reef Fish	☐	☐	☐	☐	☐	☐

Thank you for participating in this survey.

Please go to next page to provide additional comments →

Do you have any suggestions for how the Marianas' fisheries should be managed or topics that you feel need further study? (please write in the space provided)

Would you like to receive a copy of the final report for this study?
(all personal information will be kept strictly confidential)

- ☐ YES
- ☐ NO

Name:

Address:

May we contact you if we have any questions about your survey responses?

- ☐ YES Phone: _____ best time to reach you: _____
- ☐ NO (your phone number will be kept strictly confidential)

Paperwork Reduction Act Statement. The information you provide will remain strictly confidential as required by section 402(b) of the Magnuson-Stevens and NOAA Administrative Order 216-100, Confidentiality of Fisheries Statistics, and will not be released for public use except in aggregate statistical form without identification as to its source. We will combine your responses with information provided by other participants, and report it in summary form so that responses for any individual vessel can not be identified. Public reporting burden for this information collection, including time for gathering data needed and completing the survey, is estimated to average 45 minutes per respondent. Please provide comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Justin Hospital, NOAA Fisheries, 1601 Kapiolani Blvd, Suite 1110., Honolulu, HI 96814, 808-944-2188, Justin.Hospital@noaa.gov. Notwithstanding any other provision of the law, no person is required to respond to, nor shall any person be subject to a penalty for failure to comply with, a collection of information subject to the requirements of the Paperwork Reduction Act, unless that collection of information displays a currently valid OMB Control Number.

APPENDIX B. COMMENTS FROM FISHERMEN

This appendix presents all comments provided by survey respondents when asked for suggestions for how the CNMI's fisheries should be managed or topics needing further study. Approximately 22% of respondents provided suggestions or comments. The comments have been organized by broad topic areas and the number of comments relating to each topic is noted in parentheses (number of comments). Some comments were split for organizational purposes (split comments are noted by "…"); however, comments were not edited for content, and no individual comment is repeated.

General Suggestions and Comments: (6)

- We need more propagation of fish, not preserves. More saltwater propagation of reef species.
- More control in anything that goes in the water.
- Just maintain the cleanliness of the ocean around us. Discipline and concern on everybody's way of fishing and disposing of things we use in catching the fish.
- We must revisit the shark management issues affecting fishermen.
- …They need to look at coop type establishment for fishermen. Also, look at fishing trap usage.
- Look into what DAWR is spending the sport fish restoration funds on.

Public Engagement and Education: (3)

- Need to see if Federal programs for fishery development to encourage for better practices. Also to educate fishermen about preserving resources and try to promote site rotation for bottomfishing. Encourage more involvement of Rota community in fishery activities.
- Need more advertisement for the whole community to understand and to participate in the meeting or event so that we can work as a team. Encourage more young ages to participate!
- Clarification on the zone of fishing for the community.

Community-Based Management: (3)

- Management strategy should be developed through a "bottom up" approach.
- Please let the locals (indigenous) people decide.
- Let the future Indigenous decide on this.

Current Regulations and Enforcement: (2)

- Enforcement of longline vessel fishing within 30 miles of Tinian.
- … Enforcement should be more active and visible.

MPAs: (3)

- Need funding for enforcement of MPAs. They have MPA but no enforcement.
- Funds and support needed for Tinian MPA development and management.
- Cultural practices are not considered in any plan including MPA uses. They should consider the cultural practice that they have been practicing for thousands of years.

Suggested Regulations: (2)

- …Do not allow fishermen from other islands to fish around Rota. May consider permit/fishing fee.
- Commercial fishing should be only for CNMI descents, like Palau.

Spearfishing/SCUBA Spear: (3)

- Overfishing by small fleet boats that spear day and night.
- Fishing with scuba gear 100% disallowed at all times; shall be closely monitored for there are still people currently doing it; shall be stiff penalty given.
- Need to make sure SCUBA Spear not allowed and enforced…

Nets: (4)

- They need to put a stop to conditional permits for Gill net fishing. I see a lot of only the "connected" can get the permits.
- Net fishing what's up with that!
- Open the reef fishing net for our local people.
- They should ban night fishing or at least put a size limit on the fish people catch. Too many people hunt for baby fish at night with nets.

FADs/Infrastructure: (3)

- 1. More buoys - channel. 2. Light tower. 3. Fish aggregation devices.
- FADs - Additional sites for deployment...
- More FADs…

Research: (3)

- …Comprehensive study should be performed to determine the negative impact of the FDM bombing exercises in terms of the environment and economics.
- 1. Mercury in fish & effects on people. 2. Ciguatera more info on current alerts - 411.
- … DLNR should develop data collection program (Creel)…