

# **Vessel Level Annual Cost-Earnings Study of the Hawaii Offshore Handline Fishery and the Hawaii Small Boat Commercial Fishery, 2014**

Hing Ling Chan and Minling Pan



**U.S. DEPARTMENT OF COMMERCE**  
**National Oceanic and Atmospheric Administration**  
National Marine Fisheries Service  
Pacific Islands Fisheries Science Center

NOAA Technical Memorandum NMFS-PIFSC-80  
<https://doi.org/10.25923/zffy-5a13>

March 2019



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NOAA Technical Memorandum NMFS-PIFSC-80

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**U.S. Department of Commerce**

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**Recommended citation:**

Chan HL, Pan M. 2019. Vessel Level Annual Cost-Earnings Study of the Hawaii Offshore Handline Fishery and the Hawaii Small Boat Commercial Fishery, 2014. NOAA Tech. Memo. NMFS-PIFSC-80, 50 p. doi:10.25923/zffy-5a13.

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## Executive Summary

This report presents an assessment of the annual economic performance of the Hawaii offshore handline fishery and the Hawaii small boat commercial fishery using data collected from the cost-earnings survey of Hawaii small boats in 2014, which was comprised of 1,796 small boat and offshore handline fishermen. Response to the survey was voluntary. Three types of fishermen are included in the analysis; offshore handline fishermen, full-time small boat commercial fishermen, and part-time small boat commercial fishermen. Offshore handline fishermen are defined based on their fishing location and gear usage as described in fishing reports submitted to the State of Hawaii Division of Aquatic Resources (HDAR). Full-time commercial and part-time commercial fishermen are defined based on their self-identified motivations as reported in the 2014 Hawaii Small Boat Economic Survey (Chan and Pan 2017).

This report presents the first vessel-level assessment of the cost-earnings status of the Hawaii offshore handline and small boat commercial fisheries. Prior to this study, the annual economic performance of these fisheries was not evaluated. The recent report on the Hawaii small boat fishery (Chan and Pan 2017) described social and economic characteristics on a per trip basis, but it did not include the offshore handline fishery due to divergent characteristics. The offshore handline fishery uses a variety of gear, including pelagic handline, troll, and other specialized gear (ika shibi and palu ahi) to target juvenile bigeye and yellowfin tuna at offshore seamounts and weather buoys. It employs a small group of relatively large vessels (~45 feet vs. ~23 feet) that travel long distances to fishing grounds (150–250 miles vs. more active vessels within state waters), operates with multi-day trips (averaging 4.9 days vs. single day) with multiple crew members (2–5 people vs. 2 people), and catches per trip range from 2,000 to 8,000 pounds for a five-day trip relative to 80 pounds for the small boats (Itano 1999; Chan and Pan 2017). The offshore handline fishing participation peaked in the 1990s, but has steadily declined to relatively few fishermen (Glazier et al. 2001).

Economic performance varies among fishermen types. One way to evaluate the economic performance is in terms of annual net return, which is defined as annual value of fish sold minus annual trip costs and annual fixed costs. Labor costs were not considered in the calculation of annual net return because most of the offshore handline and small boat fishing is owner operated, and the crew on small boat fishing vessels is mostly family or friends who do not get paid by hour. The study shows that offshore handline fishermen, on average, earned a net return of approximately \$240,000 per year per vessel. About half of their annual value of fish sold (48% of \$460,000) covered trip costs and fixed costs. Full-time small boat commercial fishermen, on average, managed to cover trip costs and fixed costs in their fishing operations, with 61% of their annual value of fish sold paying for trip costs and 29% paying for fixed costs, when only accounting the commercial value of fish actually sold. Thus, they averaged a net return of \$3,978 per year. Part-time commercial fishermen experienced a net loss, on average, of \$4,639 per year since their value of fish sold covered only trip costs but not fixed costs. However, the net returns varied greatly among small boat fishermen, and some (50% full-time and 21% part-time) were able to earn positive net returns.

Though self-identified as full-time or part-time commercial fishermen, a large portion of their catch was not sold in the market. Specifically, 21% of full-time commercial fishermen's catch and 25% of part-time commercial fishermen's catch were retained for home consumption or

given away to friends and family. Therefore, if we consider the unsold fish value as part of the “earnings” of the fisheries, there would be increased positive earnings in the small boat fishery. If we calculate the value of fish sold by assuming that all of the catch kept for home consumption or given away was also sold, and the quality, species composition, and market prices of sold and unsold fish were the same, it would increase the annual value by \$11,124, on average, for full-time commercial fishermen. Thus, their total fish value, on average, would be \$50,238 per year, and their net return would be \$15,102 per year (instead of a \$3,978 net return per year when only accounting the commercial value of fish actually sold). Under this scenario, 64% of full-time commercial fishermen would earn positive net returns of \$35,337 per year. The average value of unsold catch was \$3,648 per year per part-time commercial fisherman, so the total fish value (sold plus kept) would be \$12,237. On average, the total fish value can cover the trip costs (\$7,649), but not all the fixed costs (\$5,579). Only 36% of the part-time commercial fishermen would earn a positive net return estimated at \$9,584 per year if all fish landed were sold.

Offshore handline fishermen spent more per trip on boat fuel, bait, and food and beverage than small boat commercial fishermen due to the longer trips with more people on board and using pelagic handline gear. The average trip costs for offshore handline fishing was \$861 per trip, while the average trip costs for full-time and part-time commercial fishermen was \$395 per trip and \$266 per trip, respectively. Full-time commercial fishermen spent more on boat fuel and ice per trip relative to part-time commercial fishermen. Offshore handline fishermen also showed substantially higher annual fixed costs than the other two types of fishermen, due to higher costs on all items except loan payments, which were comparable with the average paid by full-time commercial fishermen. The average fixed cost to offshore handline fishermen was \$85,317 per year per vessel, while the average fixed cost to full-time commercial fishermen was \$11,220 per year per vessel, which was twice as high as the average of \$5,579 for part-time commercial fishermen. Also, offshore handline fishermen took more trips, all used pelagic handline gear, and they fished almost exclusively in federal waters. Full-time and part-time commercial fishermen were more active in state waters. Pelagic fish were the main target for offshore handline fishermen and represented 99.9% of their total catch, while bottomfish represented only 0.005% of the total. Full-time and part-time commercial fishermen showed more variety in fish catch, with 29% and 18% of their catches from bottomfish and reef fish respectively, and the remainder from pelagic fish catch.

Offshore handline fishermen, on average, caught over 150,000 lb of fish annually, valued at \$460,000. Full-time commercial fishermen, on average, caught almost 12,000 lb of fish annually and received almost \$40,000 from fish sales. Part-time commercial fishermen caught 3,000 lb of fish valued at \$8,600, on average. In terms of catch disposition, offshore handline fishermen sold 74% of their catches, full-time commercial fishermen sold 73%, and part-time commercial fishermen sold 70%. The rest of the catches were mostly kept at home for consumption or given away to friends. The importance of fish sales to personal income varied greatly by fisherman type. Many fishermen who self-identified as full-time or part-time commercial fishermen had other income sources. Fish sales accounted for a quarter or less of personal income for 33% of full-time commercial fishermen and 73% of part-time commercial fishermen.

Due to the large variations in net returns among full-time and part-time small boat commercial fishermen, we conducted further analysis by different fishermen groups based on their actual economic performance (i.e., positive vs. negative net return, without including the unsold catch

values). It is obvious that full-time and part-time commercial fishermen who earned positive net returns had higher catches and value of fish sold per year and per trip compared with those who did not earn positive net returns. Catch rates for full-time commercial fishermen who earned positive net returns were about 3.5 times higher per year and per trip compared with those who did not earn positive net returns. On average, full-time commercial fishermen who earned positive net returns caught 18,151 lb of fish per year and 262 lb per trip, and a lower portion of their catch from pelagic fish (69%). Those who did not earn positive net returns caught 5,156 lb per year and 78 lb per trip, and a higher portion of their catch (79%) from pelagic fish. Part-time commercial fishermen who earned positive net returns caught 5,204 lb per year and 180 lb per trip, vs. those who did not earn positive net returns, with catch of 2,459 lb per year and 103 lb per trip. The differences between the two groups (positive vs. negative net return) were two times higher catch rates per year and per trip.

Full-time commercial fishermen who earned positive net returns received \$63,375, on average, from fish sold per year and \$986 per trip, vs. those who did not earn positive net returns, with \$14,852 on average from fish sold per year and \$265 per trip. The differences were about 4 times higher sales per year and per trip for positive vs. negative net returns. Full-time commercial fishermen who earned positive net returns also derived a higher portion of sales from pelagic fish (56% vs. 50%). Although pelagic fish represented a lower portion of their catches when compared with those who did not earn positive net returns, it is possible that fishermen who earned positive net returns caught better/bigger pelagic fish (and therefore higher price per lb). Part-time commercial fishermen who earned positive net returns received \$21,156, on average, from fish sold per year and \$732 per trip vs. those who did not earn positive net returns who received \$5,268 per year and \$210 per trip. The differences between the part-time commercial fishermen with positive and negative net returns were about 4 times higher sales per year and 3.5 times higher sales per trip. Those who earned positive net returns had a higher portion of their fish sold from bottomfish sales (25% vs. 16%).

Income dependency on fish sales was also different by economic performance groups. More than half of the full-time commercial fishermen who earned positive net returns indicated that 76% to 100% of their personal income came from fish sales, whereas 48% of full-time commercial fishermen who did not earn positive net returns indicated that 1% to 25% of their personal income came from fish sales. Part-time commercial fishermen who earned positive net returns received 35% of their income from fish sales, on average, vs. those who performed negatively and received 19% of their income from fish sales.

Full-time commercial fishermen who earned positive net returns, tend to have larger, more powerful, newer, more highly valued vessels, with longer ownership. Fishing activity characteristics were similar across full-time commercial fishermen with different economic performances, but those who used bottomfish handline gear, were more active in federal waters, and had two or more fishermen on board were more likely to earn positive net returns. In addition, those who earned positive net returns tended to sell a higher portion of their catch and utilized more market outlets.

Part-time commercial fishermen with varying economic performances showed similar vessel characteristics. However, those who earned positive net returns took more boat fishing trips in the past 12 months, were more likely to use troll and pelagic handline gear, and fished alone.

Similar to the pattern for full-time commercial fishermen, part-time commercial fishermen who earned positive net returns sold a higher portion of their catch. Additionally, they tended to use more market outlets including wholesalers, auctions, restaurants, and stores more often than those who did not earn positive net returns.

All the offshore handline fishermen who responded to the survey (3 out of 11 fishermen) earned positive net returns. Two important things to keep in mind are (1) the population size of the offshore handline fishermen is very small, and the response of survey is voluntary and (2) there are great variations in catches and revenue among the offshore handline fishermen. Therefore, it is important to interpret results for offshore handline fishermen with caution because of potential sampling bias. Although the survey response values may be subject to large variations, as demonstrated in the comparison of the catch and revenue data between population and sample, the sample data nevertheless provide some directional comparison of the socioeconomic profiles between the offshore handline and other small boat commercial (full-time and part-time) fishermen in Hawaii.

This study provides a first time examination of the economic performance of the offshore handline fishery and the Hawaii small boat commercial fishery in terms of annual operations, taking into account the annual trip costs and fixed costs. It is evident that fishermen have their distinct fishing characteristics, motivations, spending and harvest patterns, market participation, and ensuing variations in economic performance. This study provides important information on the economic and social characteristics of the offshore handline fishery and the Hawaii small boat commercial fishery. Having the best scientific information available will allow fishery managers to make timely and better-informed decisions affecting these fisheries, their many different participants, and the communities that depend on them.



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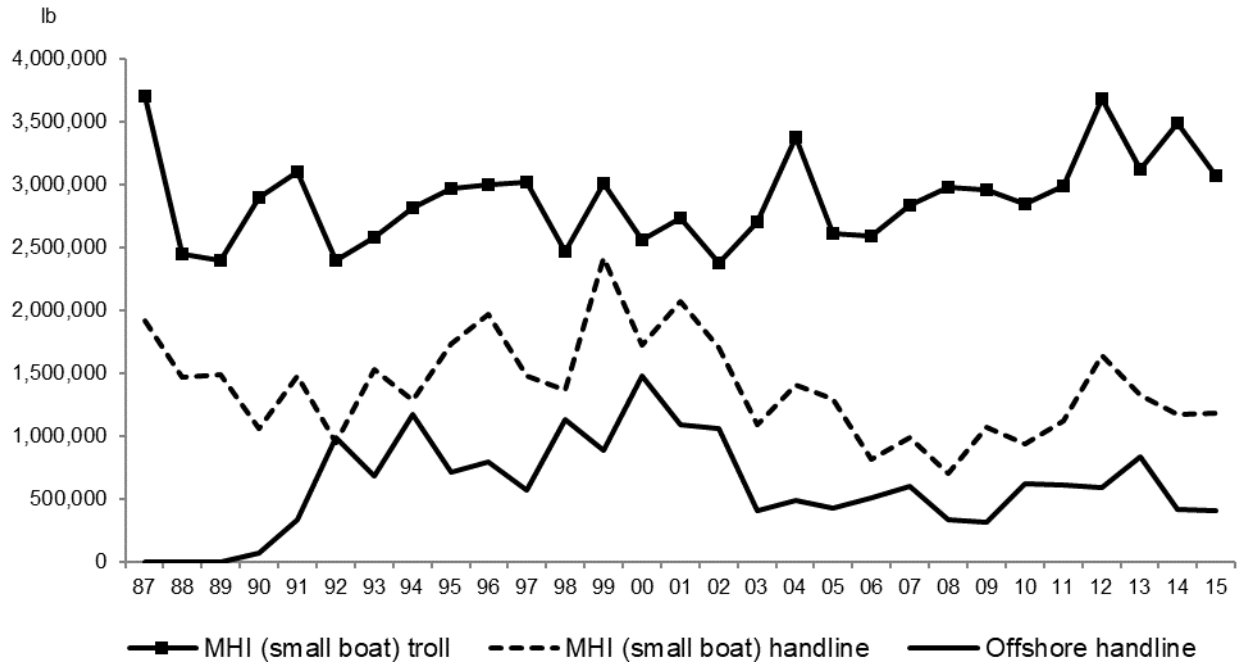
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## Introduction

This study examines the economic performance of the offshore handline fishery and the Hawaii small boat commercial fishery in terms of annual net revenues and annual net returns. The offshore handline fishery includes a small group of large vessels that used a variety of gear, including pelagic handline, troll, and other specialized gear, to target juvenile bigeye and yellowfin tuna at offshore seamounts and weather buoys (Itano 1999). Three segments of fishermen are included in this analysis, including offshore handline fishermen, and those who self-identified in the 2014 Hawaii Small Boat Economic Survey as full-time commercial fishermen or part-time commercial fishermen. Although not all of the offshore handline fishermen are full-time, hereafter the full-time and part-time commercial fishermen discussed in this report only refer to the small boat fishermen. We did not perform an economic analysis for fishermen whose self-identified motivations were not commercial, including recreational expense, purely recreational, subsistence, and cultural, because their main purpose for fishing was not for commercial sales. Instead, large portions of their catches were for home consumption or given away (Chan and Pan 2017). Economic data used in this study were collected from the 2014 Hawaii Small Boat Economic Survey, and the summaries were documented in a 2017 NOAA Technical Memorandum (Chan and Pan 2017). However, the data summaries in Chan and Pan (2017) did not include the offshore handline fishery because of its unique characteristics that differ from the typical Hawaii small boat fishery. Offshore handline fishermen's fishing vessels are larger (~45 feet vs. ~23 feet) and better equipped because of the long travel distances to fishing grounds (150–250 miles vs. more active within state waters), multi-day trip lengths (4.9 days vs. single day), multiple crew members (2–5 people vs. 2 people), and large catches per trip of 2,000 to 8,000 pounds for a five-day trip relative to 80 pounds per trip for the small boats (Itano 1999; Chan and Pan 2017).

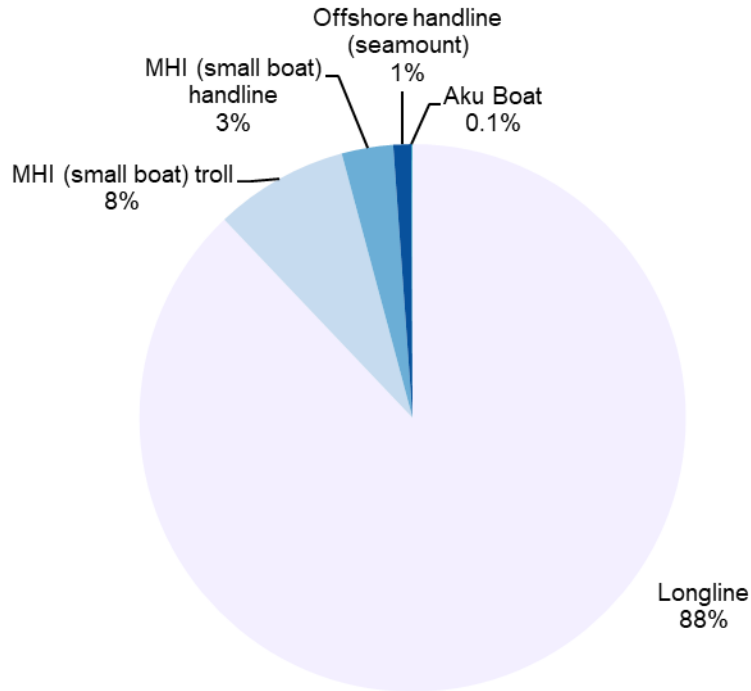
The Cross Seamount near the Big Island is the main fishing ground of the offshore handline fishery, which was developed in the early 1970s. The participation peaked in the 1990s but relatively few fishermen now fish in that area regularly (Glazier et al. 2001). The changes in offshore handline fishing are reflected in the pelagic landing trends by the offshore handline fishery. To illustrate the relative scale of the fisheries discussed in the study, Figure 1 shows the commercial pelagic landings by the small-scale fisheries including main Hawaiian Islands troll, the main Hawaiian Islands handline, and the offshore handline fisheries from 1987 to 2015. The main Hawaiian Islands troll and the main Hawaiian Islands handline fisheries represented both full-time and part-time small boat fishermen included in the study. Reported landings by the offshore handline fishery peaked in the 1990s and early 2000s, with average landings of close to one million pounds per year between 1992 and 2002, but started to decrease in 2003. The average landings between 2003 and 2015 were about 0.5 million pounds.



**Figure 1. Pelagic landings for the small-scale commercial fisheries in Hawaii: 1987–2015**

Source: Pacific Island Fisheries Science Center (2017).

Figure 2 illustrates the scale of the three fisheries discussed in this study relative to the total pelagic landings by all Hawaii-based commercial fleets in 2015. Although the three fisheries represented 12% of the total commercial pelagic landings in Hawaii in 2015, their contributions of the non-commercial aspects of fishing, such as providing food to extended families and communities, and serving as “a means for enacting a locally valued way of life,” are very important (Glazier et al. 2001). The distributions of the catch allocated for family consumption and to give away to friends and family are presented in Table 14. Chan and Pan (2017) also discussed the details of the non-commercial aspect of the small boat fisheries. As previous research pointed out, the full value of the three fisheries should be expressed as a “composite of economic, dietary, and cultural dimensions” (Glazier et al. 2001).



**Figure 2. Pelagic landings by the Hawaii-based commercial fleet: 2015**

Source: Pacific Island Fisheries Science Center (2017).

Excluding charter, aquarium, and precious coral fisheries (State of Hawaii 2013), there were 1,843 small boat-based commercial marine license holders in 2013. Collectively, they produced 6.2 million pounds of fish in 2013, valued at \$16 million. Most of the small boat CML holders are owners and operators (Chan and Pan 2017). Commercial fishermen constitute a large portion of fishermen in the Hawaii small boat fleet. According to Chan and Pan (2017), 7% of respondents self-identified as full-time commercial fishermen, and 51% of them self-identified as part-time commercial fishermen. Together, these two groups represented 81% of the total catch of pelagic fish, bottomfish, and reef fish, while generating 90% of the total value of fish sold. Despite the economic importance of the commercial fishermen within the Hawaii small boat-based fishery, no study has examined their economic performance on an annual basis. Previous studies related to the Hawaii small boat fishery reported costs and revenues separately (Hamilton and Huffman 1997; Hospital, Bruce, and Pan 2011; and Hospital and Beavers 2012), but no attempt was made to compare the costs relative to revenues on an annual basis.

This study establishes baseline economic performance information for both the offshore handline fishery and the Hawaii small boat commercial fleet. Since 60% of the full-time commercial fishermen and almost all (97%) of the part-time fishermen indicated that 75% or less of their personal income is from fish sales, this study not only sheds some light on the economic contribution of the fisheries, but also the cultural value of small boat fishing to the community.

## **Materials and Methods**

### **Population**

The 2014 Hawaii Small Boat Economic Survey was comprised of 1,796 fishermen who held a State of Hawaii Commercial Marine License (CML) and met the following criteria characterizing the small boat fishery: fishermen who caught, landed, and sold at least one fish using small vessels during 2013 and had a valid mailing address, but did not participate in the charter, longline, aquarium, and precious coral fisheries. The detailed description of the survey (including the survey population and methodology) is given in Chan and Pan (2017). In this study, we used data from surveys of three types of fishermen: offshore handline, full-time commercial, and part-time commercial. Full-time and part-time commercial fishermen were self-identified in the survey; therefore, we do not know the population breakdown of these two types of fishermen. However, we can identify the offshore handline fishing population by fishing location and gear usage reported to the State of Hawaii Division of Aquatic Resources (HDAR) from July 2013 to June 2014 that matches the 12-month recall in our surveys (first sent out in early July 2014). If a fisherman fished at seamount during July 2013 to June 2014, and used gear associated with the offshore handline fishery, including tuna handline, troll, ika shibi, and palu ahi, they are classified as offshore handline fishermen. During the period of July 2013 to June 2014, there were 11 offshore handline fishermen among the 1,796 in the survey population. Note that among all 11 offshore handline fishermen, 4 of them are from Oahu, 6 are from Big Island, and 1 is from Kauai. They all fished in both seamount and non-seamount areas during July 2013 to June 2014; 25% of their trips were in seamount only, 51% of their trips were mixed seamount and non-seamount trips, and 24% of their trips were non-seamount. A large portion (76%) of catch came from the seamount area, where the majority of the trips occurred.

### **Response Rates**

The response to the 2014 Hawaii Small Boat Economic Survey was voluntary; 824 surveys were completed statewide for an overall response rate of 47%. Among the 11 offshore handline fishermen that received the survey, 3 of them responded by mail, yielding a 27% response rate for this segment. Because we do not have the breakdown which differentiates full-time and part-time commercial fishermen, we cannot calculate the specific response rate for those two types of fishermen. A copy of the survey questionnaire is shown in Appendix A. The metadata for this report can be found at: <https://inport.nmfs.noaa.gov/inport/item/29820>.

For evaluation of the economic performance of offshore handline and commercial fishermen, we included surveys with valid answers for costs and revenue in the 2014 Hawaii Small Boat Economic Survey. Table 1 shows the total number of respondents to the survey and the number of respondents included in this report analysis, by fisherman type. Survey responses are separated by three fisherman types; offshore handline, full-time commercial, and part-time commercial fishermen.



**Table 1. Respondents for economic performance analysis**

|                      | Survey respondents in 2014 Hawaii Small Boat Economic Survey | Survey respondents in this study |
|----------------------|--|----------------------------------|
| Offshore handline    | 3  | 3                                |
| Full-time commercial | 57   | 44                               |
| Part-time commercial | 407  | 311                              |

## Methodology

The economic performance of the fishing operations is evaluated in terms of both net revenues and net returns, on an annual basis. They are defined as:

**Annual net revenue** = Annual value of fish sold – annual trip costs.

**Annual net return** = Annual value of fish sold – annual trip costs – annual fixed costs.

The survey did not inquire about labor cost since small boat fishing is mostly owner operated and, on average, only two people are on board: the operator and one crew member who is usually a friend or family member of the operator. These two people often share the net revenue or net return. The 2014 Hawaii Small Boat Economic Survey only collected trip costs for the two most common gear type trips a fisherman used in a year. If a fisherman used more than two gear types in a year, we do not have the trip cost information for more than the two types of gear he used most. To calculate the annual trip costs for respondents that used more than two gear types, we replaced the lacking trip costs with the average trip costs for that gear type. For example, if a spear fishing trip is the third most common trip type for a full-time commercial fisherman, we used the average spear fishing trip costs for all full-time commercial fishermen in the calculation of this fisherman’s annual trip costs, in addition to the trip costs this fisherman reported in the survey for the first and second most common trip types. The formula for annual trip costs is:

**Annual trip costs** = (number of trolling trips × trolling trip cost) +  
(number of pelagic handline trips × pelagic handline trip cost) +  
(number of bottomfish handline trips × bottomfish handline trip cost) +  
(number of spearfishing trips × spearfishing trip cost) +  
(number of netting trips × netting trip cost).

Please note that the number of trips by gear type is estimated from two survey questions. It is derived based on the total number of boat fishing trips and the percent of each gear type used in the past 12 months. The survey question asked for fishermen’s total number of trips in the past 12 months in six response bins. The range of the upper and lower bound of each bin is quite broad. Therefore, we compared the number of trips generated using medians of survey response bins with the number of trips reported to the HDAR for the same time period (between July 1, 2013 and June 30, 2014). We find that the number of trips generated using medians of survey response bins were generally higher than the number of trips reported to HDAR. To avoid overestimating the number of trips and the associated annual fishing costs, we adjusted the estimated number of trips based on a set of rules using the number of trips reported to HDAR as reference. Specifically, when the reported number of trips to HDAR was lower than the lower bound of the survey response bin, we used the lower bound of that response bin as the estimation of the number of trips for the fisherman. When the reported number of trips to HDAR was higher

than the upper bound of the response rate, we used the upper bound of that response bin as the estimation of the number of trips for the fisherman. If the reported number of trips to HDAR was within the response bin, we used the HDAR number as the estimation of the number of trips for the fisherman. Using this set of rules, the average estimated number of trips falls between the high estimates when using the survey response bins and the low number of trips reported to HDAR. The average number of trips reported to HDAR was 49 for full-time commercial fishermen vs. 93 trips if using the median of survey response bin, and 72 trips when using this set of rules. For part-time commercial fishermen, the average number of trips reported to HDAR was 21 vs. 42 trips if using the median of survey response bin, and 32 trips when using this set of rules. We find the estimated annual number of trips using this set of rules that incorporated both survey responses and HDAR records produced reasonable estimations of annual trip costs and annual net return, and because the average CPUE per trip was in reasonable ranges, we adopted this method to estimate the number of trips in this report.

To estimate the value of the unsold catch that was retained for home consumption or given away, we used the annual value of fish sold, the percent of the catch that was sold, and the percent of the catch that was consumed at home or given away. The estimated value of unsold catch was calculated as follows:

$$\text{Estimated value of unsold catch} = \text{Annual value of fish sold} \div \text{percent of catch that was sold} \times \text{percent of catch that was consumed at home or given away.}$$

Note that this assumes the quality of the fish that was retained for home consumption or given away was the same quality as the catch that was sold, and the market price was not affected by an increased supply of fish in the market (as the small boats only harvested about 10% of the total pelagic landings in the Hawaii). Therefore, the market prices for the sold and unsold fish are the same. This calculation also assumes the species composition of sold and unsold catch are the same so that their price and value are proportional to the catch.

The estimated value of fish landed includes the actual commercial value of fish sold and the estimated value of the unsold catch:

$$\text{Estimated value of fish landed} = \text{Annual value of fish sold} + \text{estimated value of unsold catch.}$$

We also derived the “estimated” annual net revenue and “estimated” annual net return by incorporating the “estimated” value of the unsold catch:

$$\text{Estimated annual net revenue} = \text{Estimated value of fish landed} - \text{annual trip costs.}$$

$$\text{Estimated annual net return} = \text{Estimated value of fish landed} - \text{annual trip costs} - \text{annual fixed costs.}$$

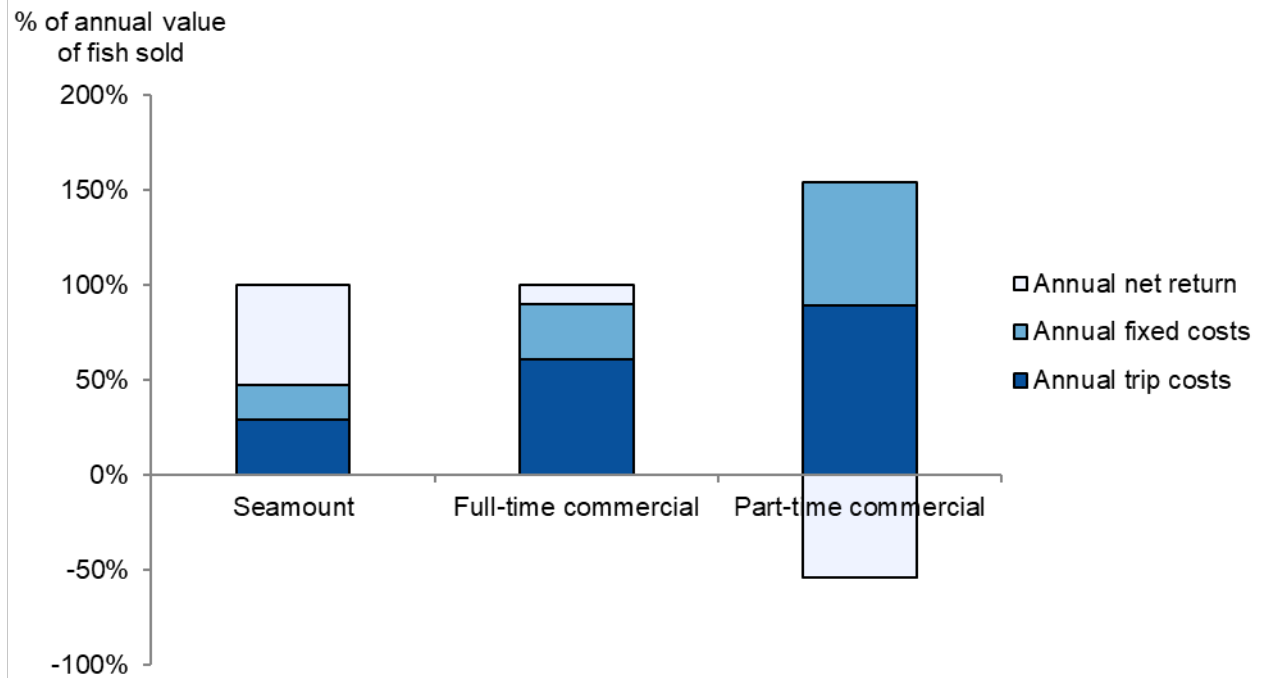
Value of fish sold and trip costs are in 2013 and 2014 dollars as our first surveys were sent out in early July 2014, and the survey asked for the fish sales and fishing trip costs in the past 12 months to avoid recall bias. However, fixed costs are in 2013 dollar values since fixed costs, such as loan payments, are usually recorded in calendar year for accounting and tax purposes.

## Results

In this report, survey responses are separated by three fisherman types; offshore handline, full-time commercial, and part-time commercial. Results with less than three respondents are not displayed due to confidentiality concerns. We also divided fishermen by their economic performance, i.e., those who earned positive net returns vs. those who earned negative net returns. In addition, we compared the survey responses with HDAR's fishing reports and dealer reports to analyze the representativeness of the survey responses for landings and sale values, respectively.

### **Economic Performance Analysis without Inclusion of Unsold Fish Value**

This section provides the economic performance analysis for offshore handline, full-time, and part-time commercial fishermen. According to Chan and Pan (2017), full-time and part-time commercial fishermen sold 73% and 68% of their catch, respectively, with most of the balance distributed between home consumption or given away to friends and family. In this section, we compare the fishermen's annual value of fish sold with their annual trip costs and annual fixed costs, and evaluate the overall annual economic performance by each fisherman type. Figure 3 shows that for offshore handline fishermen, 29% of the revenue from fish sold covered their trip costs, 19% of the revenue covered fixed costs, resulting in 52% of the value of fish sold being retained as a positive net return. For full-time commercial fishermen, the value of fish sold covered all trip costs and fixed costs, with 61% of the annual value of fish sold paying for trip costs and 29% paying for fixed costs, resulting in a 10% net return. For part-time commercial fishermen, the value of fish sold covered their trip costs but not fixed costs. Annual trip costs and fixed costs amounted to 89% and 65% of their value of fish sold, respectively. On average, part-time commercial fishermen experienced a -54% net return on the value of their fish sold.



**Figure 3. Proportion of annual trip costs, fixed costs, and net returns relative to annual value of fish sold, by fisherman type**

Table 2 shows the annual average trip costs, fixed costs, value of fish sold, net revenue, and net return, along with their respective standard errors and median values. On average, offshore handline fishermen received \$460,000 per year from selling their catch and earned approximately \$326,000 net revenue and \$241,000 net return per year. Full-time commercial fishermen received \$39,114 from fish sales and earned net revenue of \$15,198 annually, and after subtracting their fixed costs, they experienced a net return of \$3,978 per year. Part-time commercial fishermen received \$8,588 annually from fish sales which covered trip costs but not fixed costs, and their net loss averaged \$4,639 per year. Note that almost all medians in Table 2 are lower than the means, which indicates that some high values skew the means, especially for offshore handline fishermen, due to the small sample size.

**Table 2. Annual average trip costs, fixed costs, value of fish sold, net revenue, and net return by fisherman type (mean, standard error, and median)**

|                           |                                  | <b>Offshore<br/>handline</b> | <b>Full-time<br/>commercial</b> | <b>Part-time<br/>commercial</b> |
|---------------------------|----------------------------------|------------------------------|---------------------------------|---------------------------------|
|                           | <i>Number of respondents (n)</i> | <i>3</i>                     | <i>44</i>                       | <i>311</i>                      |
| Annual trip costs         | <b>Mean</b>                      | <b>134,165</b>               | <b>23,915</b>                   | <b>7,649</b>                    |
|                           | Standard error                   | 115,375                      | 3,290                           | 431                             |
|                           | Median                           | 34,200                       | 17,620                          | 5,400                           |
| Annual fixed costs        | <b>Mean</b>                      | <b>85,317</b>                | <b>11,220</b>                   | <b>5,579</b>                    |
|                           | Standard error                   | 68,828                       | 1,594                           | 363                             |
|                           | Median                           | 21,568                       | 6,905                           | 3,375                           |
| Annual value of fish sold | <b>Mean</b>                      | <b>460,000</b>               | <b>39,114</b>                   | <b>8,588</b>                    |
|                           | Standard error                   | 370,045                      | 5,982                           | 705                             |
|                           | Median                           | 100,000                      | 35,000                          | 3,500                           |
| Annual net revenue        | <b>Mean</b>                      | <b>325,835</b>               | <b>15,198</b>                   | <b>940</b>                      |
|                           | Standard error                   | 254,971                      | 4,633                           | 525                             |
|                           | Median                           | 75,962                       | 7,432                           | (540)                           |
| Annual net return         | <b>Mean</b>                      | <b>240,518</b>               | <b>3,978</b>                    | <b>(4,639)</b>                  |
|                           | Standard error                   | 186,279                      | 4,517                           | 556                             |
|                           | Median                           | 64,430                       | (18)                            | (3,812)                         |

Table 3 divides the full-time commercial fishermen by their economic performance: those with negative annual net revenues vs. those with positive annual net revenues, and those with negative annual net returns vs. those with positive annual net returns. We do not show the offshore handline fishermen by economic performance due to the small sample size, plus all offshore handline fishermen had positive net returns. Table 3 shows that 66% of full-time commercial fishermen's trip costs were covered by the fish they sold commercially, and they also received positive net revenues, whereas 34% of them did not have their trip costs covered. Between these two groups, their average trip costs and fixed costs were similar, but the value of fish sold for those with positive net revenues was 5 times higher than those with negative net revenues. After taking into account the fixed costs, 50% of full-time commercial fishermen could cover both trip costs and fixed costs and received an average \$25,675 net return. The average net loss for those who did not receive positive net returns was \$17,720. The differences between the two groups were their value of fish sold and trip costs. Although the average trip costs for fishermen with positive net returns was 20% higher than those with negative net returns, their value of fish sold was 4 times higher than those with negative net returns.

**Table 3. Annual average trip costs, fixed costs, value of fish sold, net revenue, and net return by negative and positive annual net revenue and annual net return for full-time commercial fishermen (mean, standard error, and median)**

|                           |                                  | Annual net revenue |               | Annual net return |               |
|---------------------------|----------------------------------|--------------------|---------------|-------------------|---------------|
|                           |                                  | Negative           | Positive      | Negative          | Positive      |
|                           | <i>Number of respondents (n)</i> | 15                 | 29            | 22                | 22            |
| Annual trip costs         | <b>Mean</b>                      | <b>23,548</b>      | <b>24,106</b> | <b>21,541</b>     | <b>26,290</b> |
|                           | Standard error                   | 6,593              | 3,738         | 4,910             | 4,437         |
|                           | Median                           | 17,820             | 17,540        | 14,767            | 21,319        |
| Annual fixed costs        | <b>Mean</b>                      | <b>11,295</b>      | <b>11,182</b> | <b>11,031</b>     | <b>11,409</b> |
|                           | Standard error                   | 3,031              | 1,883         | 2,394             | 2,161         |
|                           | Median                           | 6,126              | 7,200         | 6,213             | 10,530        |
| Annual value of fish sold | <b>Mean</b>                      | <b>10,550</b>      | <b>53,888</b> | <b>14,852</b>     | <b>63,375</b> |
|                           | Standard error                   | 3,665              | 7,552         | 4,059             | 8,602         |
|                           | Median                           | 3,500              | 35,000        | 5,500             | 44,000        |
| Annual net revenue        | <b>Mean</b>                      | <b>(12,998)</b>    | <b>29,782</b> | <b>(6,688)</b>    | <b>37,084</b> |
|                           | Standard error                   | 3,703              | 4,918         | 3,443             | 5,517         |
|                           | Median                           | (8,374)            | 25,685        | (2,653)           | 28,142        |
| Annual net return         | <b>Mean</b>                      | <b>(24,293)</b>    | <b>18,600</b> | <b>(17,720)</b>   | <b>25,675</b> |
|                           | Standard error                   | 5,652              | 4,110         | 4,377             | 4,425         |
|                           | Median                           | (12,584)           | 16,909        | (9,890)           | 19,839        |

Table 4 shows the same information as Table 3 for part-time commercial fishermen. Table 4 shows that 41% of part-time commercial fishermen had their trip costs covered and received positive net revenues, whereas 59% of them did not have their trip costs covered. Between these two groups, their average trip costs were similar, but those with positive net revenues had fixed costs that were 34% higher and their value of fish sold was about 4 times higher than those with negative net revenues. After taking into account both trip costs and fixed costs, only 21% of part-time commercial fishermen had positive net returns, and the average amount was \$7,628. For the other 79% of part-time commercial fishermen who did not receive positive net returns, their average net loss was \$7,880. The costs and revenues between these two groups were different. For those with positive net returns, their average trip costs were 22% higher, but their average fixed costs were 21% lower, and their value of fish sold was 4 times higher, when compared with those with negative net returns.

**Table 4. Annual average trip costs, fixed costs, value of fish sold, net revenue, and net return by negative and positive annual net revenue and annual net return for part-time commercial fishermen (mean, standard error, and median)**

|                           |                                  | Annual net revenue |               | Annual net return |               |
|---------------------------|----------------------------------|--------------------|---------------|-------------------|---------------|
|                           |                                  | Negative           | Positive      | Negative          | Positive      |
|                           | <i>Number of respondents (n)</i> | 182                | 129           | 246               | 65            |
| Annual trip costs         | <b>Mean</b>                      | <b>7,517</b>       | <b>7,834</b>  | <b>7,313</b>      | <b>8,921</b>  |
|                           | Standard error                   | 560                | 679           | 481               | 964           |
|                           | Median                           | 5,346              | 5,572         | 5,216             | 6,710         |
| Annual fixed costs        | <b>Mean</b>                      | <b>4,894</b>       | <b>6,545</b>  | <b>5,836</b>      | <b>4,607</b>  |
|                           | Standard error                   | 379                | 685           | 400               | 843           |
|                           | Median                           | 3,088              | 4,065         | 3,600             | 3,010         |
| Annual value of fish sold | <b>Mean</b>                      | <b>3,568</b>       | <b>15,671</b> | <b>5,268</b>      | <b>21,156</b> |
|                           | Standard error                   | 428                | 1,366         | 500               | 2,186         |
|                           | Median                           | 1,500              | 7,500         | 3,500             | 15,000        |
| Annual net revenue        | <b>Mean</b>                      | <b>(3,949)</b>     | <b>7,837</b>  | <b>(2,045)</b>    | <b>12,235</b> |
|                           | Standard error                   | 310                | 885           | 342               | 1,474         |
|                           | Median                           | (2,697)            | 4,267         | (1,499)           | 7,563         |
| Annual net return         | <b>Mean</b>                      | <b>(8,843)</b>     | <b>1,292</b>  | <b>(7,880)</b>    | <b>7,628</b>  |
|                           | Standard error                   | 535                | 875           | 468               | 1,010         |
|                           | Median                           | (7,377)            | 87            | (5,793)           | 4,024         |

Table 5 shows fishing trip costs by fisherman type. The offshore handline fishermen showed the highest average trip costs (\$861) due to the high costs of boat fuel, bait, and food and beverage. They generally took longer trips and had more people on board relative to full-time and part-time commercial fishermen. The use of pelagic handline gear requires more bait than other gear types. The average trip costs for full-time commercial and part-time commercial fishermen were \$395 and \$266, respectively. Compared with part-time commercial fishermen, full-time commercial fishermen tended to spend more on boat fuel and ice. The median cost of oil for full-time and part-time commercial fishermen was low when compared with the median cost of oil for offshore handline fishermen. Small boat fishing trips were not generally multi-day trips, and as a result, many of the small boat trips did not require oil use.

**Table 5. Fishing trip costs by fisherman type (mean, standard error, median, and percentage of total trip cost)**

| Variable cost              | <i>Number of respondents (n)</i> | Offshore handline |                      | Full-time commercial |                      | Part-time commercial |                      |
|----------------------------|----------------------------------|-------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
|                            |                                  | \$ per trip       | % of total trip cost | \$ per trip          | % of total trip cost | \$ per trip          | % of total trip cost |
|                            | 3                                |                   |                      | 36                   |                      | 259                  |                      |
| Boat fuel                  | <b>Mean</b>                      | <b>351.67</b>     | 40.8                 | <b>195.90</b>        | 49.6                 | <b>128.38</b>        | 48.2                 |
|                            | Standard error                   | 42.85             |                      | 22.44                |                      | 3.97                 |                      |
|                            | Median                           | 400.00            |                      | 150.00               |                      | 100.00               |                      |
| Truck fuel                 | <b>Mean</b>                      | <b>33.33</b>      | 3.9                  | <b>30.27</b>         | 7.7                  | <b>24.33</b>         | 9.1                  |
|                            | Standard error                   | 6.97              |                      | 3.78                 |                      | 0.97                 |                      |
|                            | Median                           | 25.00             |                      | 20.00                |                      | 20.00                |                      |
| Oil                        | <b>Mean</b>                      | <b>27.17</b>      | 3.2                  | <b>14.37</b>         | 3.6                  | <b>6.97</b>          | 2.6                  |
|                            | Standard error                   | 11.39             |                      | 4.33                 |                      | 0.57                 |                      |
|                            | Median                           | 35.83             |                      | 1.00                 |                      | 0.50                 |                      |
| Ice                        | <b>Mean</b>                      | <b>82.87</b>      | 9.6                  | <b>58.83</b>         | 14.9                 | <b>32.91</b>         | 12.3                 |
|                            | Standard error                   | 10.87             |                      | 5.89                 |                      | 1.27                 |                      |
|                            | Median                           | 100.00            |                      | 50.00                |                      | 30.00                |                      |
| Bait                       | <b>Mean</b>                      | <b>119.30</b>     | 13.9                 | <b>38.76</b>         | 9.8                  | <b>26.57</b>         | 10.0                 |
|                            | Standard error                   | 29.54             |                      | 5.07                 |                      | 1.78                 |                      |
|                            | Median                           | 150.00            |                      | 21.00                |                      | 20.00                |                      |
| Food and beverage          | <b>Mean</b>                      | <b>125.00</b>     | 14.5                 | <b>26.39</b>         | 6.7                  | <b>24.48</b>         | 9.2                  |
|                            | Standard error                   | 20.92             |                      | 2.71                 |                      | 1.04                 |                      |
|                            | Median                           | 150.00            |                      | 20.00                |                      | 20.00                |                      |
| Daily maintenance & repair | <b>Mean</b>                      | <b>35.00</b>      | 4.1                  | <b>29.03</b>         | 7.4                  | <b>21.99</b>         | 8.3                  |
|                            | Standard error                   | 9.19              |                      | 5.05                 |                      | 1.68                 |                      |
|                            | Median                           | 50.00             |                      | 10.00                |                      | 10.00                |                      |
| Other trip cost            | <b>Mean</b>                      | <b>86.67</b>      | 10.1                 | <b>1.11</b>          | 0.3                  | <b>0.85</b>          | 0.3                  |
|                            | Standard error                   | 59.25             |                      | 0.75                 |                      | 0.33                 |                      |
|                            | Median                           | 0.00              |                      | 0.00                 |                      | 0.00                 |                      |
| <b>Total trip cost</b>     | <b>Mean</b>                      | <b>861.00</b>     |                      | <b>394.66</b>        |                      | <b>266.48</b>        |                      |
|                            | Standard error                   | 116.65            |                      | 38.10                |                      | 7.85                 |                      |
|                            | Median                           | 950.00            |                      | 304.50               |                      | 235.00               |                      |

Table 6 shows the annual fixed costs in 2013 by fisherman type. On average, fixed costs for offshore handline fishing totaled \$85,317, while the average fixed costs of full-time and part-time commercial fishermen were \$11,220 and \$5,579, respectively. Offshore handline fishermen indicated substantially higher annual fixed costs than the other two types of fishermen on all items except loan payments, which were comparable to those of full-time commercial fishermen. Fixed costs paid by full-time commercial fishermen were generally twice as high as the amounts paid by part-time commercial fishermen, mainly due to higher costs for gear replacement and repair, boat and trailer repair, maintenance and improvements, and loan payments.

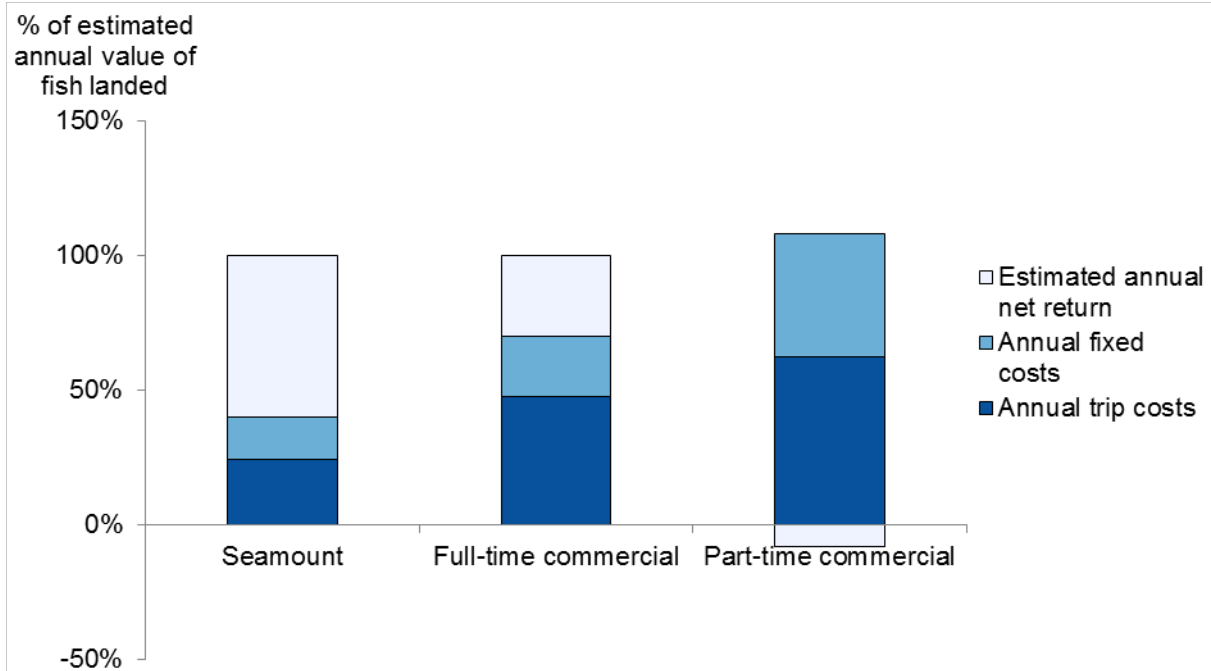


**Table 6. Annual fishing fixed costs in 2013 by fisherman type (mean, standard error, median, and percentage of fleet with expenditure)**

| Fixed cost                                       | Number of respondents (n) | % of fleet with expenditure | Offshore handline | % of fleet with expenditure | Full-time commercial | % of fleet with expenditure | Part-time commercial |
|--|---------------------------|-----------------------------|-------------------|-----------------------------|----------------------|-----------------------------|----------------------|
|  |                           |                             | 3                 |                             | 44                   |                             | 311                  |
| Gear replacement/Repair                          | <b>Mean</b>               | 5.4                         | <b>4,583</b>      | 34.9                        | <b>3,914</b>         | 31.6                        | <b>1,763</b>         |
|  | Standard error            |                             | 2,917             |                             | 761                  |                             | 143                  |
|  | Median                    |                             | 3,750             |                             | 2,050                |                             | 1,000                |
| Boat and trailer repair/maintenance/improvements | <b>Mean</b>               | 69.0                        | <b>58,833</b>     | 30.4                        | <b>3,413</b>         | 26.3                        | <b>1,468</b>         |
|  | Standard error            |                             | 58,085            |                             | 777                  |                             | 123                  |
|  | Median                    |                             | 1,500             |                             | 1,600                |                             | 800                  |
| Loan payments                                    | <b>Mean</b>               | 2.3                         | <b>2,000</b>      | 18.6                        | <b>2,090</b>         | 18.7                        | <b>1,041</b>         |
|  | Standard error            |                             | 2,000             |                             | 858                  |                             | 185                  |
|  | Median                    |                             | 0                 |                             | 0                    |                             | 0                    |
| Boat insurance                                   | <b>Mean</b>               | 8.5                         | <b>7,267</b>      | 4.6                         | <b>518</b>           | 8.6                         | <b>482</b>           |
|  | Standard error            |                             | 3,060             |                             | 140                  |                             | 60                   |
|  | Median                    |                             | 7,200             |                             | 0                    |                             | 0                    |
| Mooring fees                                     | <b>Mean</b>               | 4.3                         | <b>3,640</b>      | 5.3                         | <b>600</b>           | 6.8                         | <b>379</b>           |
|  | Standard error            |                             | 1,428             |                             | 220                  |                             | 77                   |
|  | Median                    |                             | 3,852             |                             | 0                    |                             | 0                    |
| Fees   | <b>Mean</b>               | 6.4                         | <b>5,493</b>      | 5.3                         | <b>593</b>           | 6.9                         | <b>385</b>           |
|  | Standard error            |                             | 4,756             |                             | 94                   |                             | 24                   |
|  | Median                    |                             | 1,000             |                             | 500                  |                             | 250                  |
| Financial services                               | <b>Mean</b>               | 3.9                         | <b>3,333</b>      | 0.8                         | <b>91</b>            | 0.7                         | <b>39</b>            |
|  | Standard error            |                             | 3,333             |                             | 51                   |                             | 12                   |
|  | Median                    |                             | 0                 |                             | 0                    |                             | 0                    |
| Other  | <b>Mean</b>               | 0.2                         | <b>167</b>        | 0.0                         | <b>0</b>             | 0.4                         | <b>23</b>            |
|  | Standard error            |                             | 167               |                             | 0                    |                             | 11                   |
|  | Median                    |                             | 0                 |                             | 0                    |                             | 0                    |
| Annual fixed costs                               | <b>Mean</b>               |                             | <b>85,317</b>     |                             | <b>11,220</b>        |                             | <b>5,579</b>         |
|  | Standard error            |                             | 68,828            |                             | 1,594                |                             | 363                  |
|  | Median                    |                             | 21,568            |                             | 6,905                |                             | 3,375                |

### Economic Performance Analysis with Inclusion of Unsold Fish Value

We explored the effect of including the estimated value of the unsold fish catch on economic performance by assuming that all kept catch (excluding portions caught and released) retained for home consumption or given away was, instead, sold. Inclusion of the estimated value of unsold retained catch changes the economic performance of fishermen dramatically. Figure 4 shows the proportion of annual trip costs, fixed costs, and the new estimated net return relative to the estimated annual value of fish landed by the three fisherman types. If all of the kept catches were sold, the offshore handline fishermen could realize 60% of their estimated value of fish landed as a net return, while the full-time commercial fishermen could retain 30% of their estimated value of fish landed as a net return. Even in this scenario, however, the part-time commercial fishermen would remain unable to cover their total fixed costs. On average, their new estimated net loss equals 8% of the estimated value of all the fish landed.



**Figure 4. Proportion of annual trip costs, fixed costs, and estimated net return to the estimated annual value if all fish were sold, by fisherman type**

Under the assumptions that all the kept catches were sold, had the same quality and species composition as sold catch, and no effect on market price, both the offshore handline and full-time commercial fishermen would earn positive annual net returns, on average. Full-time commercial fishermen would receive \$50,238 per year from all the fish they landed, including \$11,124 per year from sale of the catch they would normally retain for home consumption and to give away, thus realizing \$15,102 in net return per year. For the part-time commercial fishermen, the average value of their retained catch would be \$3,648 per year, in addition to the \$8,589 per year they actually received from the catch they sold. However, that combined amount would only cover trip costs and part of their fixed costs, still leaving a net loss of \$991 per year. Table 7 shows the estimated value of unsold catch, estimated value of fish landed, estimated net revenue, and estimated net return annually, and the respective standard error and median.

**Table 7. Estimated values of unsold catch, fish landed, net revenue, and net return, by fisherman type (mean, standard error, and median)**

|                                  |                | <b>Offshore<br/>handline</b> | <b>Full-time<br/>commercial</b> | <b>Part-time<br/>commercial</b> |
|----------------------------------|----------------|------------------------------|---------------------------------|---------------------------------|
| <i>Number of respondents (n)</i> |                | 3                            | 44                              | 311                             |
| Estimated value of unsold catch  | <b>Mean</b>    | <b>89,601</b>                | <b>11,124</b>                   | <b>3,648</b>                    |
|                                  | Standard error | 42,748                       | 2,000                           | 282                             |
|                                  | Median         | 100,000                      | 8,097                           | 1,974                           |
| Estimated value of fish landed   | <b>Mean</b>    | <b>549,601</b>               | <b>50,238</b>                   | <b>12,237</b>                   |
|                                  | Standard error | 405,372                      | 7,727                           | 872                             |
|                                  | Median         | 200,000                      | 42,147                          | 5,706                           |
| Estimated net revenue            | <b>Mean</b>    | <b>415,436</b>               | <b>26,322</b>                   | <b>4,588</b>                    |
|                                  | Standard error | 289,997                      | 6,169                           | 667                             |
|                                  | Median         | 165,800                      | 15,077                          | 1,275                           |
| Estimated net return             | <b>Mean</b>    | <b>330,120</b>               | <b>15,102</b>                   | <b>(991)</b>                    |
|                                  | Standard error | 221,230                      | 5,873                           | 651                             |
|                                  | Median         | 144,232                      | 7,822                           | (1,789)                         |

Table 8 shows descriptive statistics for the estimated value of unsold catch, estimated value of fish landed, estimated net revenue, and estimated net return for full-time and part-time commercial fishermen who earned both positive and negative estimated net returns. Assuming all catches for home consumption or given away were sold, 64% of full-time commercial fishermen would be able to cover trip costs and fixed costs and earn positive net returns. On average, they would receive a total of \$70,964 per year from selling all of their fish, including \$15,562 fish value per year from the portion normally kept for home consumption or given away, and thereby earn \$35,337 estimated net return per year. For the 36% of full-time commercial fishermen who did not earn positive net returns, even assuming all their kept catches were sold for an average of \$3,358 per year, they would still have \$20,308 net loss, on average.

Under the assumption that part-time commercial fishermen sold all of their kept catches, 36% would be able to cover both trip costs and fixed costs and thereby earn positive net returns. They would receive a total of \$22,955 per year, on average, including \$6,394 from selling the portion kept for home consumption or given away. On average, this group would earn \$9,584 estimated net return per year. For the 64% of part-time commercial fishermen who did not earn positive net returns, even assuming that all their kept catches could be sold for an average of \$2,081 per year, their estimated average annual loss would be \$7,026.

**Table 8. Estimated values of unsold catch, fish landed, net revenue, and net return by negative and positive estimated annual net return for full-time commercial and part-time commercial fishermen (mean, standard error, and median)**

|                                 |                                  | Full-time commercial                 |                                      | Part-time commercial                 |                                      |
|---------------------------------|----------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
|                                 |                                  | Negative estimated annual net return | Positive estimated annual net return | Negative estimated annual net return | Positive estimated annual net return |
|                                 | <i>Number of respondents (n)</i> | 16                                   | 28                                   | 198                                  | 113                                  |
| Estimated value of unsold catch | <b>Mean</b>                      | <b>3,358</b>                         | <b>15,562</b>                        | <b>2,081</b>                         | <b>6,394</b>                         |
|                                 | Standard error                   | 1,094                                | 2,761                                | 195                                  | 619                                  |
|                                 | Median                           | 1,361                                | 9,563                                | 1,274                                | 4,099                                |
| Estimated value of fish landed  | <b>Mean</b>                      | <b>13,967</b>                        | <b>70,964</b>                        | <b>6,120</b>                         | <b>22,955</b>                        |
|                                 | Standard error                   | 4,412                                | 9,975                                | 589                                  | 1,765                                |
|                                 | Median                           | 6,603                                | 48,782                               | 3,500                                | 17,045                               |
| Estimated net revenue           | <b>Mean</b>                      | <b>(8,374)</b>                       | <b>46,149</b>                        | <b>(1,013)</b>                       | <b>14,401</b>                        |
|                                 | Standard error                   | 2,831                                | 7,256                                | 375                                  | 1,267                                |
|                                 | Median                           | (3,177)                              | 37,164                               | (486)                                | 8,666                                |
| Estimated net return            | <b>Mean</b>                      | <b>(20,308)</b>                      | <b>35,337</b>                        | <b>(7,026)</b>                       | <b>9,584</b>                         |
|                                 | Standard error                   | 4,591                                | 6,158                                | 488                                  | 964                                  |
|                                 | Median                           | (11,840)                             | 27,781                               | (4,707)                              | 5,181                                |

### Characteristics by Fisherman Type

This section presents the characteristics of offshore handline, full-time commercial, and part-time commercial fishermen, including demographics, vessel characteristics, fishing activity, landings, catch disposition, market participation, and the value of fish sold.

Table 9 shows the demographics of the three fisherman types. Offshore handline fishermen tended to be younger, with relatively higher household incomes than full- and part-time commercial fishermen. Relative to full-time fishermen, the part-time commercial fishermen were more likely to be Asian and white, had higher household incomes, more education, and tended to be younger.

**Table 9. Fishermen demographics by fisherman type (percentage of responses)**

| Percentage of responses |                                    | Offshore handline | Full-time commercial | Part-time commercial |
|-------------------------|------------------------------------|-------------------|----------------------|----------------------|
|                         | <i>Number of respondents (n)</i>   | <i>3</i>          | <i>44</i>            | <i>311</i>           |
| Island                  | Oahu                               | 0.0               | 27.3                 | 32.2                 |
|                         | Hawaii                             | 66.7              | 38.6                 | 39.9                 |
|                         | Maui                               | 0.0               | 15.9                 | 16.1                 |
|                         | Kauai                              | 33.3              | 15.9                 | 10.9                 |
| Race                    | American Indian/Alaska Native      | 0.0               | 0.0                  | 0.3                  |
|                         | Asian                              | 33.3              | 34.9                 | 38.4                 |
|                         | Hispanic or Latino                 | 0.0               | 0.0                  | 1.3                  |
|                         | Native Hawaiian                    | 0.0               | 18.6                 | 16.7                 |
|                         | Other Pacific Islander             | 0.0               | 9.3                  | 3.3                  |
|                         | White                              | 66.7              | 18.6                 | 25.2                 |
|                         | Mixed                              | 0.0               | 18.6                 | 14.8                 |
| Age                     | Less than 25 years                 | 0.0               | 0.0                  | 0.3                  |
|                         | 25 - 34 years                      | 66.7              | 2.3                  | 10.9                 |
|                         | 35 - 44 years                      | 0.0               | 18.2                 | 11.6                 |
|                         | 45 - 54 years                      | 0.0               | 20.5                 | 22.8                 |
|                         | 55 - 64 years                      | 33.3              | 34.1                 | 32.2                 |
|                         | More than 64 years                 | 0.0               | 25.0                 | 22.2                 |
| Household income        | Less than \$10,000                 | 0.0               | 2.3                  | 2.6                  |
|                         | \$10,000 - \$24,999                | 0.0               | 14.0                 | 10.2                 |
|                         | \$25,000 - \$49,999                | 0.0               | 27.9                 | 19.8                 |
|                         | \$50,000 - \$99,999                | 0.0               | 32.6                 | 41.3                 |
|                         | \$100,000 or more                  | 100.0             | 23.3                 | 26.1                 |
| Education               | Less than high school              | 0.0               | 6.8                  | 5.1                  |
|                         | High school graduate               | 33.3              | 34.1                 | 26.7                 |
|                         | Some college or associate's degree | 33.3              | 50.0                 | 45.4                 |
|                         | Bachelor's degree or higher        | 33.3              | 9.1                  | 22.8                 |

Table 10 shows the vessel characteristics by fisherman type. Because only two offshore handline fishermen reported their vessel characteristics, we cannot display the average values due to confidentiality concerns. One thing we can verify is that the boat lengths of the two offshore handline fishermen were both over 40 feet, which matches the profile described in Itano (1999) and Hamilton and Huffman (1997). When comparing full-time and part-time commercial fishermen, full-time commercial fishermen's vessels tended to be larger, more powerful, a little older, more expensive, with longer ownership of the vessel. Full-time commercial fishermen never had non-family members use their boat without being present themselves, whereas 12% of part-time commercial fishermen had non-family members use their boat.

**Table 10. Vessel characteristics by fisherman type (mean, standard error, median, and percentage of responses)**

|   |                                  | <b>Offshore<br/>handline</b> | <b>Full-time<br/>commercial</b> | <b>Part-time<br/>commercial</b> |
|---|----------------------------------|------------------------------|---------------------------------|---------------------------------|
| Boat length   | <i>Number of respondents (n)</i> | *                            | 43                              | 296                             |
|   | <b>Mean</b>                      | *                            | <b>26.1</b>                     | <b>22.8</b>                     |
|   | Standard error                   | *                            | 1.2                             | 0.3                             |
|   | Median                           | *                            | 25.0                            | 22.0                            |
| Boat horsepower                                       | <i>Number of respondents (n)</i> | *                            | 43                              | 291                             |
|   | <b>Mean</b>                      | *                            | <b>298.3</b>                    | <b>211.1</b>                    |
|   | Standard error                   | *                            | 32.1                            | 9.0                             |
|   | Median                           | *                            | 230.0                           | 190.0                           |
| Age of boat (years)                                   | <i>Number of respondents (n)</i> | *                            | 42                              | 274                             |
|   | <b>Mean</b>                      | *                            | <b>25.9</b>                     | <b>23.5</b>                     |
|   | Standard error                   | *                            | 2.4                             | 0.7                             |
|   | Median                           | *                            | 27.0                            | 24.0                            |
| Current boat ownership (years)                        | <i>Number of respondents (n)</i> | *                            | 40                              | 283                             |
|   | <b>Mean</b>                      | *                            | <b>15.3</b>                     | <b>12.2</b>                     |
|   | Standard error                   | *                            | 1.9                             | 0.6                             |
|   | Median                           | *                            | 13.5                            | 9.0                             |
| Boat purchase price (\$)                              | <i>Number of respondents (n)</i> | *                            | 38                              | 287                             |
|   | <b>Mean</b>                      | *                            | <b>61,863</b>                   | <b>38,213</b>                   |
|   | Standard error                   | *                            | 11,021                          | 2,532                           |
|   | Median                           | *                            | 40,000                          | 25,000                          |
| Boat current market value (\$)                        | <i>Number of respondents (n)</i> | *                            | 39                              | 274                             |
|   | <b>Mean</b>                      | *                            | <b>65,744</b>                   | <b>42,096</b>                   |
|   | Standard error                   | *                            | 9,460                           | 2,754                           |
|   | Median                           | *                            | 40,000                          | 30,000                          |
| Own boat that fish on                                 | <i>Number of respondents (n)</i> | 3                            | 44                              | 311                             |
|   | % Yes                            | 100%                         | 98%                             | 95%                             |
| Others used boat without you<br>in the past 12 months | <i>Number of respondents (n)</i> | 3                            | 43                              | 296                             |
|   | % of time                        |                              |                                 |                                 |
|   | 0%                               | 33.3                         | 100.0                           | 88.2                            |
|   | 1%-25%                           | 33.3                         | 0.0                             | 9.1                             |
|   | 26%-100%                         | 33.3                         | 0.0                             | 2.7                             |

\* The number of respondents is less than 3; due to confidentiality concerns, responses are not presented.

Fishing activity characteristics differ greatly by fisherman type (Table 11). Offshore handline fishermen were the most active of the three groups over the past 12 months. Full-time commercial fishermen averaged one trip every 5 days, and part-time commercial fishermen averaged one trip every 11 days. All offshore handline fishermen used pelagic handline gear, whereas troll was used by the majority of full-time and part-time commercial fishermen. The full-time and part-time commercial fishermen also used pelagic handline and bottomfish handline gear, with heavier use of these gears by the full-time commercial fishermen. Offshore handline fishermen fished almost exclusively in federal waters. Full-time and part-time commercial fishermen were more active within state waters, but still spent more than 40% of their time in federal waters. Full-time commercial fishermen tended to use more gear types than offshore handline fishermen. Part-time commercial fishermen relied more heavily on Fish Aggregating Devices (FADs) than the other two groups, and offshore handline fishermen had more people on board.

**Table 11. Fishing activity characteristics by fisherman type (percentage of responses and mean)**

|  | <b>Offshore<br/>handline</b> | <b>Full-time<br/>commercial</b> | <b>Part-time<br/>commercial</b> |
|--|------------------------------|---------------------------------|---------------------------------|
| Number of BOAT fishing trips in the past 12 months (%)                       |                              |                                 |                                 |
| <i>Number of respondents (n)</i>   | 3                            | 44                              | 311                             |
| Fewer than 25 trips  | 33.3                         | 18.2                            | 43.1                            |
| 25-49 trips  | 33.3                         | 13.6                            | 31.5                            |
| 50-99 trips  | 0.0                          | 36.4                            | 17.4                            |
| 100-200 trips  | 0.0                          | 22.7                            | 7.7                             |
| More than 200 trips  | 33.3                         | 9.1                             | 0.3                             |
| <b>Mean</b>  | <b>119</b>                   | <b>72</b>                       | <b>32</b>                       |
| Number of gear used in BOAT fishing trips in the past 12 months (%)          |                              |                                 |                                 |
| <i>Number of respondents (n)</i>   | 3                            | 44                              | 311                             |
| One  | 33.3                         | 22.7                            | 19.0                            |
| Two  | 66.7                         | 34.1                            | 51.8                            |
| Three  | 0.0                          | 29.5                            | 20.6                            |
| Four   | 0.0                          | 6.8                             | 7.1                             |
| Five or more   | 0.0                          | 6.8                             | 1.6                             |
| <b>Mean</b>  | <b>1.7</b>                   | <b>2.4</b>                      | <b>2.2</b>                      |
| Gear usage in BOAT fishing trips in the past 12 months (%)                   |                              |                                 |                                 |
| <i>Number of respondents (n)</i>   | 3                            | 44                              | 311                             |
| Troll  | 33.3                         | 70.5                            | 82.6                            |
| Pelagic handline   | 100.0                        | 50.0                            | 37.6                            |
| Bottomfish handline  | 0.0                          | 47.7                            | 41.2                            |
| Spear  | 0.0                          | 13.6                            | 15.4                            |
| Net  | 0.0                          | 18.2                            | 6.4                             |
| Other  | 33.3                         | 15.9                            | 12.9                            |
| Percent of your fishing trips occurred in state and federal jurisdiction (%) |                              |                                 |                                 |
| <i>Number of respondents</i>   | 3                            | 42                              | 297                             |
| State waters <sup>1</sup>  | 8.3                          | 54.5                            | 58.2                            |
| Federal waters <sup>1</sup>  | 91.7                         | 45.5                            | 41.8                            |
| Percent of fishing trips fished at Fish Aggregating Devices (%)              |                              |                                 |                                 |
| <i>Number of respondents (n)</i>   | 3                            | 44                              | 309                             |
| 0%   | 33.3                         | 25.0                            | 16.8                            |
| 1%-25%   | 33.3                         | 36.4                            | 32.4                            |
| 26%-50%  | 0.0                          | 13.6                            | 21.4                            |
| 51%-75%  | 33.3                         | 13.6                            | 19.1                            |
| 76%-100%   | 0.0                          | 11.4                            | 10.4                            |
| <b>Mean percentage, exclude 0<sup>1</sup></b>                                | <b>37.0</b>                  | <b>37.3</b>                     | <b>39.6</b>                     |
| Number of people (including yourself) on board for an average trip (%)       |                              |                                 |                                 |
| <i>Number of respondents (n)</i>   | 3                            | 39                              | 283                             |
| One  | 0.0                          | 56.4                            | 20.5                            |
| Two  | 0.0                          | 33.3                            | 49.5                            |
| Three  | 66.7                         | 7.7                             | 20.8                            |
| Four   | 33.3                         | 0.0                             | 6.7                             |
| Five or more   | 0.0                          | 2.6                             | 2.5                             |
| <b>Mean</b>  | <b>3.3</b>                   | <b>1.6</b>                      | <b>2.2</b>                      |

<sup>1</sup> Calculated using the medians of the response bins.

### ***Fish Landings***

To evaluate the representativeness of the offshore handline fishermen's survey responses, we compared the total landings reported to HDAR by all offshore handline fishermen in the survey population (11) with the landings of pelagic fish, bottomfish, and reef fish reported in the survey

by our three offshore handline survey respondents. All three offshore handline respondents reported the highest category of landing bin (>1,000 lb) and stated their actual landings. The State of Hawaii landings data are available in HDAR’s Fishermen Reporting System (FRS). We used FRS data from July 2013 to June 2014 to match the 12 months recall in our surveys (first sent out in early July 2014). Table 12 shows the overall distribution of landings reported to HDAR by the entire offshore handline population and the landings reported by our three survey respondents. The average landings reported by the three offshore handline respondents was substantially higher than the population (153,008 lb vs. 68,382 lb), meaning our survey captured the highliner. The standard error of mean for these three offshore handline respondents was also substantially higher than the population (115,721 lb vs. 23,017 lb), meaning our survey captured both the highliner and non-highliners. Due to the low number of respondents, it is inevitable that the survey data are subject to sampling bias; but the comparison in Table 12 does show that our survey data captured both highliner and non-highliners.

**Table 12. Total landings for offshore handline fishermen in survey population from State of Hawaii DAR’s Fishermen Reporting System vs. survey respondents**

| Total landings kept per fisherman (lb) | Offshore handline Population (%) | Survey Respondents (%) |
|--|----------------------------------|------------------------|
| 0                                      | 0.0                              | 0.0                    |
| 1–20,000                               | 36.4                             | 0.0                    |
| 20,001–100,000                         | 36.4                             | 66.7                   |
| More than 100,000                      | 27.3                             | 33.3                   |
| Mean                                   | 68,382                           | 153,008                |
| Standard error                         | 23,017                           | 115,721                |
| Median                                 | 32,046                           | 50,000                 |
| <i>Number of fishermen</i>             | <i>11</i>                        | <i>3</i>               |

Note: The offshore handline population included all species landings from boat trips in the State of Hawaii DAR’s fishermen reporting system from July 2013 to June 2014. Survey responses only included landings for pelagic fish, bottomfish, and reef fish reported in the survey.

Table 13 shows the survey reported landings of pelagic fish, bottomfish, and reef fish by fisherman type. Please note that due to the small sample size and large discrepancies in landings between the offshore handline population and the sample as shown in Table 12, the actual landings by offshore handline fishermen were subject to large variations. Nevertheless, their landings were substantially larger than full-time and part-time commercial fishermen, on both an annual and per trip basis. Offshore handline fishermen caught over 150,000 lb of fish a year and averaged 1,900 lb per trip. Full-time commercial fishermen, on average, landed almost 12,000 lb of fish annually, vs. 3,000 lb by part-time commercial fishermen. Per trip, full-time commercial fishermen landed about 160 lb vs. 100 lb by part-time commercial fishermen. Almost all offshore handline fishermen’s landings were pelagic fish (99.9%), with bottomfish representing only 0.005% of total catch. Full-time and part-time commercial fishermen’s landings showed more variety of fish types. Pelagic fish were still the major target for both full-time and part-time commercial fishermen, but bottomfish and reef fish comprised 29% of full-time commercial fishermen’s catch and 18% of part-time commercial fishermen’s catch.



**Table 13. Landings by total weight and species group under each fisherman type (percentage of responses, mean, and median)**

|  | <b>Offshore<br/>handline</b> | <b>Full-time<br/>commercial</b> | <b>Part-time<br/>commercial</b> |
|--|------------------------------|---------------------------------|---------------------------------|
| <i>Number of respondents (n)</i>                                     | 3                            | 44                              | 311                             |
| Annual landings of pelagic fish, bottomfish, and reef fish           |                              |                                 |                                 |
| None (%)   | 0.0                          | 0.0                             | 1.3                             |
| 1-50 lb (%)  | 0.0                          | 2.3                             | 1.9                             |
| 51-100 lb (%)  | 0.0                          | 0.0                             | 3.2                             |
| 101-500 lb (%)   | 0.0                          | 13.6                            | 20.6                            |
| 501-1,000 lb (%)   | 0.0                          | 0.0                             | 26.4                            |
| More than 1,000 lb (%)   | 100.0                        | 84.1                            | 46.6                            |
| <b>Mean (lb)<sup>1</sup></b>   | <b>153,008</b>               | <b>11,653</b>                   | <b>3,032</b>                    |
| Median (lb)  | 50,000                       | 5,588                           | 850                             |
| Average per trip landings of pelagic fish, bottomfish, and reef fish |                              |                                 |                                 |
| None (%)   | 0.0                          | 0.0                             | 1.3                             |
| 1-20 lb (%)  | 0.0                          | 13.6                            | 21.5                            |
| 21-50 lb (%)   | 0.0                          | 25.0                            | 33.1                            |
| 51-100 lb (%)  | 0.0                          | 20.5                            | 21.9                            |
| More than 100 lb (%)   | 100.0                        | 40.9                            | 22.2                            |
| <b>Mean (lb)<sup>1</sup></b>   | <b>1,916</b>                 | <b>161</b>                      | <b>98</b>                       |
| Median (lb)  | 1,389                        | 84                              | 40                              |
| Annual landings of pelagic fish                                      | <b>Mean (lb)<sup>1</sup></b> | <b>153,000</b>                  | <b>8,260</b>                    |
|  | Median (lb)                  | 50,000                          | 2,350                           |
| Annual landings of bottomfish  | <b>Mean (lb)<sup>1</sup></b> | <b>8</b>                        | <b>1,596</b>                    |
|  | Median (lb)                  | 0                               | 300                             |
| Annual landings of reef fish   | <b>Mean (lb)<sup>1</sup></b> | <b>0</b>                        | <b>1,797</b>                    |
|  | Median (lb)                  | 0                               | 188                             |
| Percentage of landings from pelagic, bottomfish, reef fish           |                              |                                 |                                 |
| Pelagic fish (%)   | 99.9                         | 70.9                            | 82.3                            |
| Bottomfish (%)   | 0.005                        | 13.7                            | 9.9                             |
| Reef fish (%)  | 0.0                          | 15.4                            | 7.8                             |

<sup>1</sup> Calculated using the medians of the response bins.

Table 14 shows the catch disposition by fisherman type. The catch disposition of the fisheries is the best demonstration of the value of the fisheries as a “composite of economic, dietary, and cultural dimensions” (Glazier et al. 2001). For all fisherman types, a substantial amount of catch was kept for home consumption or given away to friends and family, although major portions of the catch (74% for offshore handline fishermen, 73% for full-time commercial fishermen, and 70% for part-time commercial fishermen) were sold in the market. Offshore handline fishermen consumed 7% of their catches at home, and 8% were given away to friends and family; full-time commercial fishermen consumed 12% of their catches at home, and 9% were given away to friends and family; and part-time commercial fishermen consumed 14% of their catches at home, and 12% were given away to friends and family.

**Table 14. Catch disposition by fisherman type (percentage of responses)**

| <b>Percentage of response</b> |   | <b>Offshore<br/>handline</b> | <b>Full-time<br/>commercial</b> | <b>Part-time<br/>commercial</b> |
|-------------------------------|---|------------------------------|---------------------------------|---------------------------------|
| Catch distribution            | <i>Number of respondents (n)</i>                | 3                            | 35                              | 269                             |
|                               | I kept all the fish I caught (%)                | 0.0                          | 34.3                            | 14.5                            |
|                               | I kept/received some % of total fish caught (%) | 33.3                         | 8.6                             | 25.7                            |
|                               | I kept/ received some % of trip revenue (%)     | 0.0                          | 8.6                             | 10.8                            |
|                               | Don't know/different every time (%)             | 33.3                         | 48.6                            | 48.3                            |
|                               | Other (%)                                       | 33.3                         | 0.0                             | 0.7                             |
| <b>Percentage of catch</b>    |   |                              |                                 |                                 |
| Catch disposition             | <i>Number of respondents (n)</i>                | 3                            | 43                              | 293                             |
|                               | Caught and released (%)                         | 11.7                         | 5.9                             | 5.3                             |
|                               | Given away (%)                                  | 7.6                          | 9.0                             | 11.8                            |
|                               | Consumed at home (%)                            | 6.9                          | 11.7                            | 13.5                            |
|                               | Sold (%)  | 73.8                         | 73.4                            | 69.5                            |

### *Market Participation*

Wholesalers and auctions were the most commonly used market outlets for the offshore handline and the commercial fishermen. Full-time and part-time commercial fishermen were also reliant on restaurants or stores. Table 15 shows the market participation by fisherman type.

**Table 15. Market participation by fisherman type (percentage of responses)**

|               |                                  | <b>Offshore<br/>handline</b> | <b>Full-time<br/>commercial</b> | <b>Part-time<br/>commercial</b> |
|---------------|----------------------------------|------------------------------|---------------------------------|---------------------------------|
| Sold fish     | <i>Number of respondents (n)</i> | 3                            | 44                              | 311                             |
|               | Yes (%)                          | 100.0                        | 100.0                           | 100.0                           |
| Market outlet | <i>Number of respondents (n)</i> | 3                            | 44                              | 310                             |
|               | Wholesaler/auction (%)           | 100.0                        | 86.4                            | 69.4                            |
|               | Restaurants/stores (%)           | 66.7                         | 50.0                            | 45.2                            |
|               | Roadside/farmers' market (%)     | 100.0                        | 11.4                            | 9.0                             |
|               | Friends/neighbors/coworkers (%)  | 66.7                         | 27.3                            | 30.0                            |
|               | Other (%)                        | 33.3                         | 2.3                             | 0.0                             |

### *Value of Fish Sold*

To determine whether the fish sold values reported in our survey are representative of all offshore handline fishermen, we compared the survey responses vs. the survey population (HDAR dealer reports).<sup>1</sup> Table 16 shows the revenue distributions (in three groups) for the survey responses vs. the survey population of offshore handline fishermen. None of the three offshore handline fishermen who responded to the survey categorized their sales in the lowest category ( $\leq$ \$50,000), whereas 46% of the entire offshore handline population are in this category according to the HDAR dealer report. The average value of fish sold reported by the three offshore handline respondents was \$460,000, vs. \$133,619 for the population. The standard error of mean for the three offshore handline respondents was also substantially higher than the

<sup>1</sup> Marine fish dealers (which include any business that purchases fish directly from fishermen) are required to report data on seafood purchased from fishermen, including the fisherman from whom the dealer purchased the fish. These reports are submitted to HDAR monthly. The dealer data are compiled in HDAR's Dealer Reporting System (DRS).

population (\$370,045 vs. \$42,684). This implies that the survey sample skewed to the high revenue distribution.

**Table 16. Revenue from fish sold for offshore handline fishermen in survey population from State of Hawaii DAR’s Dealer Reporting System vs. survey respondents**

| Revenue from fish sold per fisherman (\$) | Offshore handline Population (%) | Survey Respondents (%) |
|---|----------------------------------|------------------------|
| \$1-\$50,000                              | 45.5                             | 0.0                    |
| \$50,001-\$200,000                        | 27.3                             | 66.7                   |
| Over \$200,000                            | 27.3                             | 33.3                   |
| Mean (\$)                                 | 133,619                          | 460,000                |
| Standard error (\$)                       | 42,684                           | 370,045                |
| Median (\$)                               | 58,105                           | 100,000                |
| <i>Number of fishermen</i>                | <i>11</i>                        | <i>3</i>               |

Table 17 shows the value of fish sold by fisherman type in our PIFSC survey. Due to the small sample size of the offshore handline fishermen, caution is required in interpreting the results. Regardless of using the survey results or the dealer report data, offshore handline fishermen reported substantially higher values of fish sold per year (\$460,000) and per trip (\$5,541) compared with full-time and part-time commercial fishermen, and over 90% of their fish sold was from pelagic fish sales. Full-time commercial fishermen received almost \$40,000 in fish sales annually and \$600 per trip, vs. \$8,600 annually and \$250 per trip for part-time commercial fishermen. Pelagic fish also accounted for the highest portion (55% and over) of fish sales for both full-time and part-time commercial fishermen. In addition, full-time and part-time commercial fishermen received 27% and 21% of fish revenue from bottomfish sales, respectively. Despite the high revenue derived from their fish sales, two of the three offshore handline fishermen in the sample reported that fishing contributed only 1% to 25% of their personal income. Fish sales accounted for a quarter or less of personal income for 33% of the full-time commercial fishermen and 73% of the part-time commercial fishermen.

**Table 17. Value of fish sold by fisherman type (percentage of responses, mean, and median)**

|   |                                  | <b>Offshore<br/>handline</b> | <b>Full-time<br/>commercial</b> | <b>Part-time<br/>commercial</b> |
|---|----------------------------------|------------------------------|---------------------------------|---------------------------------|
| Value of fish sold  | <i>Number of respondents (n)</i> | 3                            | 44                              | 311                             |
|   | Percentage of responses          |                              |                                 |                                 |
|   | \$1-\$100                        | 0.0                          | 0.0                             | 1.0                             |
|   | \$101-\$500                      | 0.0                          | 0.0                             | 12.9                            |
|   | \$501-\$1,000                    | 0.0                          | 2.3                             | 12.5                            |
|   | \$1,001-\$2,000                  | 0.0                          | 4.5                             | 10.0                            |
|   | \$2,001-\$5,000                  | 0.0                          | 18.2                            | 24.4                            |
|   | \$5,001-\$10,000                 | 0.0                          | 6.8                             | 16.7                            |
|   | \$10,001-\$20,000                | 0.0                          | 11.4                            | 10.3                            |
|   | \$20,001-\$50,000                | 0.0                          | 25.0                            | 11.3                            |
|   | Over \$50,000                    | 100.0                        | 31.8                            | 1.0                             |
|   | <b>Mean (\$)¹</b>                | <b>460,000</b>               | <b>39,114</b>                   | <b>8,588</b>                    |
|   | Median (\$)                      | 100,000                      | 35,000                          | 3,500                           |
| Value of fish sold per trip   | Percentage of responses          |                              |                                 |                                 |
|   | <=\$50                           | 0.0                          | 13.6                            | 26.7                            |
|   | \$51-\$100                       | 0.0                          | 9.1                             | 24.1                            |
|   | \$101-\$500                      | 0.0                          | 40.9                            | 37.9                            |
|   | Over \$500                       | 100.0                        | 36.4                            | 11.3                            |
|   | <b>Mean (\$)¹</b>                | <b>5,541</b>                 | <b>600</b>                      | <b>252</b>                      |
|   | Median (\$)                      | 3,846                        | 313                             | 100                             |
| Percentage of value of fish sold from pelagic, bottomfish, reef fish, and other | <i>Number of respondents (n)</i> | 3                            | 43                              | 294                             |
|   | Pelagic fish (%)                 | 94.2                         | 55.1                            | 68.2                            |
|   | Bottomfish (%)                   | 0.7                          | 27.3                            | 20.7                            |
|   | Reef fish (%)                    | 0.0                          | 8.0                             | 7.7                             |
|   | Other (%)                        | 5.1                          | 9.6                             | 3.4                             |
| Percentage of personal income came from the sale of fish                        | <i>Number of respondents (n)</i> | 3                            | 43                              | 308                             |
|   | 1%-25% (%)                       | 66.7                         | 32.6                            | 72.7                            |
|   | 26%-50% (%)                      | 0.0                          | 9.3                             | 16.2                            |
|   | 51%-75% (%)                      | 0.0                          | 18.6                            | 8.1                             |
|   | 76%-100% (%)                     | 33.3                         | 39.5                            | 2.9                             |
|   | <b>Mean percentage¹</b>          | <b>37.3</b>                  | <b>53.8</b>                     | <b>22.5</b>                     |

¹ Calculated using the medians of the response bins.

## Characteristics by Annual Net Return

To examine whether the characteristics of fishermen differ by their economic performance, fishermen were divided into two groups; those who earned negative annual net returns and those who earned positive annual net returns. There is not much difference in demographics between the two groups for either full-time or part-time commercial fishermen. Table 18 shows the details.

**Table 18. Fishermen demographics for full-time commercial fishermen and part-time commercial fishermen, by negative and positive annual net return (percentage of responses)**

| Percentage of responses          |                                    | Full-time commercial       |                            | Part-time commercial       |                            |
|----------------------------------|------------------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
|                                  |                                    | Negative annual net return | Positive annual net return | Negative annual net return | Positive annual net return |
| <i>Number of respondents (n)</i> |                                    | 22                         | 22                         | 246                        | 65                         |
| Island                           | Oahu                               | 31.8                       | 22.7                       | 35.0                       | 21.5                       |
|                                  | Hawaii                             | 40.9                       | 36.4                       | 37.0                       | 50.8                       |
|                                  | Maui                               | 9.1                        | 22.7                       | 15.4                       | 18.5                       |
|                                  | Kauai                              | 13.6                       | 18.2                       | 11.8                       | 7.7                        |
| Race                             | American Indian/Alaska Native      | 0.0                        | 0.0                        | .4                         | 0.0                        |
|                                  | Asian                              | 45.5                       | 22.7                       | 35.8                       | 44.6                       |
|                                  | Hispanic or Latino                 | 0.0                        | 0.0                        | 1.2                        | 1.5                        |
|                                  | Native Hawaiian                    | 9.1                        | 27.3                       | 17.1                       | 13.8                       |
|                                  | Other Pacific Islander             | 9.1                        | 9.1                        | 2.4                        | 6.2                        |
|                                  | White                              | 18.2                       | 18.2                       | 26.4                       | 18.5                       |
|                                  | Mixed                              | 18.2                       | 18.2                       | 14.6                       | 13.8                       |
| Age                              | Less than 25 years                 | 0.0                        | 0.0                        | .4                         | 0.0                        |
|                                  | 25 - 34 years                      | 0.0                        | 4.5                        | 9.3                        | 16.9                       |
|                                  | 35 - 44 years                      | 13.6                       | 22.7                       | 11.4                       | 12.3                       |
|                                  | 45 - 54 years                      | 22.7                       | 18.2                       | 22.0                       | 26.2                       |
|                                  | 55 - 64 years                      | 31.8                       | 36.4                       | 33.3                       | 27.7                       |
|                                  | More than 64 years                 | 31.8                       | 18.2                       | 23.6                       | 16.9                       |
| Income                           | Less than \$10,000                 | 4.5                        | 0.0                        | 2.8                        | 1.5                        |
|                                  | \$10,000 - \$24,999                | 22.7                       | 4.5                        | 9.8                        | 10.8                       |
|                                  | \$25,000 - \$49,999                | 27.3                       | 27.3                       | 18.3                       | 23.1                       |
|                                  | \$50,000 - \$99,999                | 27.3                       | 36.4                       | 40.7                       | 38.5                       |
|                                  | \$100,000 or more                  | 13.6                       | 31.8                       | 26.1                       | 23.0                       |
| Education                        | Less than high school              | 0.0                        | 13.6                       | 5.7                        | 3.1                        |
|                                  | High school graduate               | 27.3                       | 40.9                       | 26.0                       | 29.2                       |
|                                  | Some college or associate's degree | 59.1                       | 40.9                       | 45.9                       | 43.1                       |
|                                  | Bachelor's degree or higher        | 13.6                       | 4.5                        | 22.3                       | 24.6                       |

Table 19 shows the vessel characteristics for full-time and part-time commercial fishermen by their economic performance. The full-time commercial fishermen who earned positive net returns had larger, newer, more powerful vessels, with longer ownership and much higher value. However, the vessel characteristics were similar for part-time commercial fishermen with negative annual net returns and those with positive annual net returns.

**Table 19. Vessel characteristics for full-time commercial fishermen and part-time commercial fishermen by negative and positive annual net returns (mean, standard error, median)**

|                                |                                  | Full-time commercial       |                            | Part-time commercial       |                            |
|--------------------------------|----------------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
|                                |                                  | Negative annual net return | Positive annual net return | Negative annual net return | Positive annual net return |
| Boat length                    | <i>Number of respondents (n)</i> | 21                         | 22                         | 238                        | 58                         |
|                                | <b>Mean</b>                      | <b>24.6</b>                | <b>27.5</b>                | <b>22.9</b>                | <b>22.7</b>                |
|                                | Standard error                   | 1.4                        | 1.9                        | 0.4                        | 0.6                        |
|                                | Median                           | 23.0                       | 26.0                       | 22.0                       | 22.4                       |
| Boat horsepower                | <i>Number of respondents (n)</i> | 21                         | 22                         | 234                        | 57                         |
|                                | <b>Mean</b>                      | <b>245.0</b>               | <b>349.1</b>               | <b>213.1</b>               | <b>202.9</b>               |
|                                | Standard error                   | 42.0                       | 46.5                       | 10.4                       | 16.4                       |
|                                | Median                           | 188.0                      | 280.0                      | 190.0                      | 180.0                      |
| Age of boat (years)            | <i>Number of respondents (n)</i> | 21                         | 21                         | 221                        | 53                         |
|                                | <b>Mean</b>                      | <b>28.6</b>                | <b>23.1</b>                | <b>23.6</b>                | <b>22.8</b>                |
|                                | Standard error                   | 3.7                        | 3.0                        | 0.8                        | 1.7                        |
|                                | Median                           | 29.0                       | 25.0                       | 25.0                       | 21.0                       |
| Current boat ownership (years) | <i>Number of respondents (n)</i> | 19                         | 21                         | 228                        | 55                         |
|                                | <b>Mean</b>                      | <b>14.0</b>                | <b>16.5</b>                | <b>12.1</b>                | <b>12.9</b>                |
|                                | Standard error                   | 2.6                        | 2.7                        | 0.7                        | 1.7                        |
|                                | Median                           | 10.0                       | 18.0                       | 9.0                        | 9.0                        |
| Boat purchase price (\$)       | <i>Number of respondents (n)</i> | 18                         | 20                         | 230                        | 57                         |
|                                | <b>Mean</b>                      | <b>52,917</b>              | <b>69,915</b>              | <b>38,577</b>              | <b>36,742</b>              |
|                                | Standard error                   | 18,868                     | 12,470                     | 2,937                      | 4,741                      |
|                                | Median                           | 36,000                     | 56,000                     | 25,000                     | 20,000                     |
| Boat current market value (\$) | <i>Number of respondents (n)</i> | 19                         | 20                         | 221                        | 53                         |
|                                | <b>Mean</b>                      | <b>59,842</b>              | <b>71,350</b>              | <b>41,225</b>              | <b>45,726</b>              |
|                                | Standard error                   | 14,273                     | 12,739                     | 3,215                      | 4,808                      |
|                                | Median                           | 40,000                     | 50,000                     | 26,000                     | 40,000                     |

Table 20 shows the fishing activity characteristics for full-time and part-time commercial fishermen by their economic performance. Fishing activity was similar between the groups, except that full-time commercial fishermen who used bottomfish handline gear, were more active in federal waters, and had two or more fishermen on board were more likely to earn positive net returns. Part-time commercial fishermen who had more boat fishing trips in the past 12 months, used troll and pelagic handline gear, and fished alone were more likely to earn positive net returns.

**Table 20. Fishing activity characteristics for full-time commercial fishermen and part-time commercial fishermen by negative and positive annual net returns (percentage of responses and mean)**

|  | Full-time commercial       |                            | Part-time commercial       |                            |
|--|----------------------------|----------------------------|----------------------------|----------------------------|
|  | Negative annual net return | Positive annual net return | Negative annual net return | Positive annual net return |
| Number of BOAT fishing trips in the past 12 months (%)                       |                            |                            |                            |                            |
| <i>Number of respondents (n)</i>   | 22                         | 22                         | 246                        | 65                         |
| Fewer than 25 trips  | 22.7                       | 13.6                       | 45.9                       | 32.3                       |
| 25-49 trips  | 18.2                       | 9.1                        | 32.1                       | 29.2                       |
| 50-99 trips  | 27.3                       | 45.5                       | 15.4                       | 24.6                       |
| 100-200 trips  | 22.7                       | 22.7                       | 6.1                        | 13.8                       |
| More than 200 trips  | 9.1                        | 9.1                        | .4                         | 0.0                        |
| <b>Mean<sup>1</sup></b>  | <b>67</b>                  | <b>76</b>                  | <b>29</b>                  | <b>40</b>                  |
| Number of gear used in BOAT fishing trips in the past 12 months (%)          |                            |                            |                            |                            |
| <i>Number of respondents (n)</i>   | 22                         | 22                         | 246                        | 65                         |
| One  | 36.4                       | 9.1                        | 19.9                       | 15.4                       |
| Two  | 18.2                       | 50.0                       | 51.6                       | 52.3                       |
| Three  | 27.3                       | 31.8                       | 18.7                       | 27.7                       |
| Four   | 13.6                       | 0.0                        | 8.5                        | 1.5                        |
| Five or more   | 4.5                        | 9.1                        | 1.2                        | 3.1                        |
| <b>Mean</b>  | <b>2.4</b>                 | <b>2.5</b>                 | <b>2.2</b>                 | <b>2.2</b>                 |
| Gear usage in BOAT fishing trips in the past 12 months (%)                   |                            |                            |                            |                            |
| <i>Number of respondents (n)</i>   | 22                         | 22                         | 246                        | 65                         |
| Troll  | 68.2                       | 72.7                       | 81.3                       | 87.7                       |
| Pelagic handline   | 54.5                       | 45.5                       | 36.2                       | 43.1                       |
| Bottomfish handline  | 40.9                       | 54.5                       | 40.7                       | 43.1                       |
| Spear  | 9.1                        | 18.2                       | 15.4                       | 15.4                       |
| Net  | 13.6                       | 22.7                       | 6.5                        | 6.2                        |
| Other  | 13.6                       | 18.2                       | 11.8                       | 16.9                       |
| Percent of your fishing trips occurred in state and federal jurisdiction (%) |                            |                            |                            |                            |
| <i>Number of respondents</i>   | 20                         | 20                         | 232                        | 65                         |
| State waters <sup>1</sup>  | 63.1                       | 46.6                       | 58.1                       | 58.5                       |
| Federal waters <sup>1</sup>  | 36.9                       | 53.4                       | 41.9                       | 41.5                       |
| Percent of fishing trips fished at Fish Aggregating Devices (%)              |                            |                            |                            |                            |
| <i>Number of respondents (n)</i>   | 22                         | 22                         | 244                        | 65                         |
| 0%   | 31.8                       | 18.2                       | 16.0                       | 20.0                       |
| 1%-25%   | 40.9                       | 31.8                       | 32.8                       | 30.8                       |
| 26%-50%  | 4.5                        | 22.7                       | 21.3                       | 21.5                       |
| 51%-75%  | 13.6                       | 13.6                       | 19.7                       | 16.9                       |
| 76%-100%   | 9.1                        | 13.6                       | 10.2                       | 10.8                       |
| <b>Mean percentage, exclude 0<sup>1</sup></b>                                | <b>33.9</b>                | <b>40.2</b>                | <b>39.6</b>                | <b>39.8</b>                |
| Number of people (including yourself) on board for an average trip (%)       |                            |                            |                            |                            |
| <i>Number of respondents (n)</i>   | 18                         | 21                         | 222                        | 61                         |
| One  | 72.2                       | 42.9                       | 14.9                       | 41.0                       |
| Two  | 22.2                       | 42.9                       | 51.8                       | 41.0                       |
| Three  | 0.0                        | 14.3                       | 22.5                       | 14.8                       |
| Four   | 0.0                        | 0.0                        | 7.7                        | 3.3                        |
| Five or more   | 5.6                        | 0.0                        | 3.1                        | 0.0                        |
| <b>Mean</b>  | <b>1.5</b>                 | <b>1.7</b>                 | <b>2.3</b>                 | <b>1.8</b>                 |

Catch rates for full-time commercial fishermen who earned positive net returns were about 3.5 times higher per year and per trip when compared with those who did not earn positive net returns. On average, full-time commercial fishermen who earned positive net returns caught 18,151 lb of fish per year and 262 lb per trip vs. those who did not earn positive net returns who caught 5,156 lb per year and 78 lb per trip. Pelagic fish were the major landings for fishermen with different economic performances, but full-time commercial fishermen who earned positive net returns tended to have a higher portion of catch from bottomfish and reef fish. Part-time commercial fishermen who earned positive net returns caught an average of 5,204 lb per year and 180 lb per trip, vs. those who did not earn positive net returns who caught 2,459 lb per year and 103 lb per trip. The differences between those part-time commercial fishermen who earned positive net returns and those who did not were about two times higher catch per year and per trip. Table 21 shows the details of landings for full-time and part-time commercial fishermen by positive and negative economic performances.

**Table 21. Landings by total weight and species group for full-time commercial fishermen and part-time commercial fishermen, and by negative and positive annual net return (percentage of responses, mean, and median)**

|  | Full-time commercial         |                            | Part-time commercial       |                            |
|--|------------------------------|----------------------------|----------------------------|----------------------------|
|  | Negative annual net return   | Positive annual net return | Negative annual net return | Positive annual net return |
| <i>Number of respondents (n)</i>                                     | 22                           | 22                         | 246                        | 65                         |
| Annual landings of pelagic fish, bottomfish, and reef fish           |                              |                            |                            |                            |
| None (%)   | 0.0                          | 0.0                        | 1.2                        | 1.5                        |
| 1-50 lb (%)  | 4.5                          | 0.0                        | 2.4                        | 0.0                        |
| 51-100 lb (%)  | 0.0                          | 0.0                        | 4.1                        | 0.0                        |
| 101-500 lb (%)   | 27.3                         | 0.0                        | 22.8                       | 12.3                       |
| 501-1,000 lb (%)   | 0.0                          | 0.0                        | 28.0                       | 20.0                       |
| More than 1,000 lb (%)   | 68.2                         | 100.0                      | 41.5                       | 66.2                       |
| <b>Mean (lb)<sup>1</sup></b>   | <b>5,156</b>                 | <b>18,151</b>              | <b>2,459</b>               | <b>5,204</b>               |
| Median (lb)  | 2,538                        | 11,688                     | 775                        | 2,600                      |
| Average per trip landings of pelagic fish, bottomfish, and reef fish |                              |                            |                            |                            |
| None (%)   | 0.0                          | 0.0                        | 1.2                        | 1.5                        |
| 1-20 lb (%)  | 27.3                         | 0.0                        | 24.0                       | 12.3                       |
| 21-50 lb (%)   | 31.8                         | 18.2                       | 35.0                       | 26.2                       |
| 51-100 lb (%)  | 27.3                         | 13.6                       | 22.0                       | 21.5                       |
| More than 100 lb (%)   | 13.6                         | 68.2                       | 17.9                       | 38.5                       |
| <b>Mean (lb)<sup>1</sup></b>   | <b>77.6</b>                  | <b>261.5</b>               | <b>102.6</b>               | <b>179.7</b>               |
| Median (lb)  | 43.3                         | 239.5                      | 55.8                       | 87.5                       |
| Annual landings of pelagic fish                                      | <b>Mean (lb)<sup>1</sup></b> | <b>4,066</b>               | <b>12,455</b>              | <b>2,067</b>               |
|  | Median (lb)                  | 1,025                      | 7,250                      | 750                        |
| Annual landings of bottomfish  | <b>Mean (lb)<sup>1</sup></b> | <b>588</b>                 | <b>2,605</b>               | <b>212</b>                 |
|  | Median (lb)                  | 50                         | 750                        | 0                          |
| Annual landings of reef fish   | <b>Mean (lb)<sup>1</sup></b> | <b>502</b>                 | <b>3,092</b>               | <b>198</b>                 |
|  | Median (lb)                  | 75                         | 300                        | 0                          |
| Percentage of landings from pelagic, bottomfish, reef fish           |                              |                            |                            |                            |
|  | Pelagic fish (%)             | 78.9                       | 68.6                       | 83.4                       |
|  | Bottomfish (%)               | 11.4                       | 14.3                       | 8.6                        |
|  | Reef fish (%)                | 9.7                        | 17.0                       | 8.0                        |

<sup>1</sup> Calculated using the medians of the response bins.



Regarding catch disposition, full-time commercial fishermen who earned positive net returns tended to sell a higher portion of their catch than those who earned negative net returns. Portions retained for home consumption or to be given away were similar for both groups. Part-time commercial fishermen who earned positive net returns sold higher portions of their catch, while those who did not earn positive net returns tended to retain higher portions of their catch for home consumption or to be given away (Table 22).

**Table 22. Catch disposition for full-time commercial fishermen and part-time commercial fishermen, by negative and positive annual net return (percentage of catch)**

|                   |                                  | Full-time commercial       |                            | Part-time commercial       |                            |
|-------------------|----------------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
|                   |                                  | Negative annual net return | Positive annual net return | Negative annual net return | Positive annual net return |
| Catch disposition | <i>Number of respondents (n)</i> | 22                         | 22                         | 230                        | 63                         |
|                   | Caught and released (%)          | 7.3                        | 5.5                        | 5.2                        | 5.4                        |
|                   | Given away (%)                   | 8.7                        | 9.1                        | 12.9                       | 9.6                        |
|                   | Consumed at home (%)             | 12.9                       | 11.4                       | 15.7                       | 9.5                        |
|                   | Sold (%)                         | 71.1                       | 74.0                       | 66.1                       | 75.4                       |

Market participation tended to differ somewhat between those who earned positive net returns and those who did not. Table 23 shows the market participation for full-time and part-time commercial fishermen by economic performance. Full-time commercial fishermen who earned positive net returns tended to use a larger variety market outlets more than those who did not. Part-time commercial fishermen who earned positive net return tended to use wholesalers, auctions, restaurants, and stores more often.

**Table 23. Catch disposition for full-time commercial fishermen and part-time commercial fishermen, by negative and positive annual net return (percentage of catch)**

|               |                                  | Full-time commercial       |                            | Part-time commercial       |                            |
|---------------|----------------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
|               |                                  | Negative annual net return | Positive annual net return | Negative annual net return | Positive annual net return |
| Sold fish     | <i>Number of respondents (n)</i> | 22                         | 22                         | 246                        | 65                         |
|               | Yes (%)                          | 100.0                      | 100.0                      | 100.0                      | 100.0                      |
| Market outlet | <i>Number of respondents (n)</i> | 22                         | 22                         | 245                        | 65                         |
|               | Wholesaler/auction (%)           | 77.3                       | 95.5                       | 68.6                       | 72.3                       |
|               | Restaurants/stores (%)           | 31.8                       | 68.2                       | 44.1                       | 49.2                       |
|               | Roadside/farmers' market (%)     | 9.1                        | 13.6                       | 9.4                        | 7.7                        |
|               | Friends/neighbors/coworkers (%)  | 31.8                       | 22.7                       | 31.4                       | 24.6                       |
|               | Other (%)                        | 0.0                        | 4.5                        | 0.0                        | 0.0                        |

The value of fish sold by full-time and part-time commercial fishermen as analyzed by their economic performance is shown in Table 24. Full-time commercial fishermen who earned positive net returns had higher catch rates and, therefore, higher values of fish sold than those who did not earn positive net returns. The differences in values between the two groups were about 4 times higher per year and per trip. Full-time commercial fishermen who earned positive net returns received \$63,375, on average, from fish sold per year and \$986 per trip, vs. those who did not earn positive net returns who received \$14,852 per year and \$265 per trip. The positive net return group also tended to receive more revenue from pelagic fish and species other than bottomfish and reef fish. More than half of those who earned positive net returns had 76% to

100% of their personal income from fish sales, whereas 48% of those who did not earn positive net returns received only 1% to 25% of their personal income from fish sales. The value of fish sold by part-time commercial fishermen earning positive net returns was about 4 times higher per year and 3.5 times higher per trip than those of part-time commercial fishermen who did not earn positive net returns. The positive net return part-time fishermen received \$21,156, on average, from fish sales per year and \$732 per trip, vs. those who did not earn positive net revenue, with fish sales of \$5,268 per year and \$210 per trip. Those who earned positive net returns had a higher portion of their fish sold from bottomfish sales. Part-time commercial fishermen with positive net returns also had a higher portion of their personal income from fish sales (average 35%) than those who did not earn positive net returns (average 19%).

**Table 24. Value of fish sold for full-time commercial fishermen and part-time commercial fishermen, by negative and positive annual net returns (percentage of responses, mean, and median)**

|   |                                  | Full-time commercial       |                            | Part-time commercial       |                            |
|---|----------------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
|   |                                  | Negative annual net return | Positive annual net return | Negative annual net return | Positive annual net return |
| Value of fish sold  | <i>Number of respondents (n)</i> | 22                         | 22                         | 246                        | 65                         |
|   | Percentage of responses          |                            |                            |                            |                            |
|   | \$1-\$100                        | 0.0                        | 0.0                        | 1.2                        | 0.0                        |
|   | \$101-\$500                      | 0.0                        | 0.0                        | 16.3                       | 0.0                        |
|   | \$501-\$1,000                    | 4.5                        | 0.0                        | 15.9                       | 0.0                        |
|   | \$1,001-\$2,000                  | 9.1                        | 0.0                        | 11.4                       | 4.6                        |
|   | \$2,001-\$5,000                  | 36.4                       | 0.0                        | 28.5                       | 9.2                        |
|   | \$5,001-\$10,000                 | 9.1                        | 4.5                        | 14.2                       | 26.2                       |
|   | \$10,001-\$20,000                | 22.7                       | 0.0                        | 7.7                        | 20.0                       |
|   | \$20,001-\$50,000                | 4.5                        | 45.5                       | 4.9                        | 35.4                       |
|   | Over \$50,000                    | 13.6                       | 50.0                       | 0.0                        | 4.6                        |
|   | <b>Mean (\$)¹</b>                | <b>14,852</b>              | <b>63,375</b>              | <b>5,268</b>               | <b>21,156</b>              |
| Median (\$)   | 5,500                            | 44,000                     | 3,500                      | 15,000                     |                            |
| Value of fish sold per trip   | Percentage of responses          |                            |                            |                            |                            |
|   | <=\$50                           | 27.3                       | 0.0                        | 32.9                       | 3.1                        |
|   | \$51-\$100                       | 18.2                       | 0.0                        | 29.3                       | 4.6                        |
|   | \$101-\$500                      | 45.5                       | 36.4                       | 32.1                       | 60.0                       |
|   | Over \$500                       | 9.1                        | 63.6                       | 5.7                        | 32.3                       |
|   | <b>Mean (\$)¹</b>                | <b>265</b>                 | <b>986</b>                 | <b>210</b>                 | <b>732</b>                 |
|   | Median (\$)                      | 196                        | 919                        | 140                        | 517                        |
| Percentage of value of fish sold from pelagic, bottomfish, reef fish, and other | <i>Number of respondents (n)</i> | 21                         | 22                         | 230                        | 64                         |
|   | Pelagic fish (%)                 | 50.3                       | 56.2                       | 72.4                       | 64.3                       |
|   | Bottomfish (%)                   | 42.7                       | 23.8                       | 15.9                       | 25.1                       |
|   | Reef fish (%)                    | 6.2                        | 8.4                        | 8.5                        | 6.9                        |
|   | Other (%)                        | 0.8                        | 11.6                       | 3.3                        | 3.6                        |
| Percentage of personal income came from the sale of fish                        | <i>Number of respondents (n)</i> | 21                         | 22                         | 243                        | 65                         |
|   | 1%-25% (%)                       | 47.6                       | 18.2                       | 80.2                       | 44.6                       |
|   | 26%-50% (%)                      | 9.5                        | 9.1                        | 13.2                       | 27.7                       |
|   | 51%-75% (%)                      | 19.0                       | 18.2                       | 4.5                        | 21.5                       |
|   | 76%-100% (%)                     | 23.8                       | 54.5                       | 2.1                        | 6.2                        |
|   | <b>Mean percentage¹</b>          | <b>42.1</b>                | <b>64.9</b>                | <b>19.3</b>                | <b>34.6</b>                |

¹ Calculated using the medians of the response bins.

## Conclusion and Discussion

This is the first comprehensive report that assesses vessel level economic performance of the offshore handline fishery and the Hawaii small boat commercial fishery on an annual basis, using the Hawaii small boat survey data collected in 2014. Three types of fishermen were examined, including offshore handline, full-time commercial, and part-time commercial. Each type of fisherman performed differently in terms of net returns. On average, offshore handline fishermen and full-time commercial fishermen had profitable operations on an annual basis. Two-thirds of full-time commercial fishermen received positive net revenues, and half of them achieved positive net returns per year. The numbers were lower for part-time commercial fishermen, with 41% of them receiving positive net revenues and 21% achieving positive net returns. A large portion of fishermen who self-identified as commercial fishermen did not receive any net income from fish sales after taking into account both trip costs and fixed costs. This could be partially explained by their disposition patterns, as 21% and 25%, respectively, of full-time and part-time commercial fishermen's catches were for home consumption or given away. These non-commercial purposes for catching fish are important motivations for small boat fishing in Hawaii. There may be other reasons for commercial small boat fishermen operating at a loss but we do not have the information, and this warrants further study. If we assumed that these non-commercial catches retained for home consumption or given away had been sold commercially, the economic performance of the Hawaii small boat fishery would improve, with 64% of full-time commercial fishermen and 36% of part-time commercial fishermen earning positive net returns.

It is important to note that response to the survey was voluntary, and the definition of full-time and part-time commercial fishermen was self-defined. From the results of the study, it is notable that the net returns to the Hawaii small boat commercial fishery were relatively low. For those who did not earn positive net returns, monetary rewards may not be their main purpose of fishing, and further study is needed to examine the contribution of non-commercial aspects of fishing.

The survey did not ask the exact number of boat fishing trips taken in the past 12 months; instead, six broad response bins were given. Therefore, the total annual number of trips are estimated which may affect the accuracy of the annual net return estimation. The number of trips by gear type is estimated from two survey questions; the total number of boat fishing trips and the percent of each gear type used in the past 12 months. The number of trips directly affects the annual trip costs and the net return estimation. When we compared the number of trips generated using medians of survey response bins with the number of trips reported to the HDAR, we found that the number of trips generated from medians of survey response bins were often higher. Therefore, instead of using the medians, we compared the number of trips using medians of survey response bins with fishermen's reported number of trips to HDAR between July 1, 2013 and June 30, 2014, and adjusted the number of trips based on a set of rules as discussed in the Methodology section. We found the estimated annual number of trips using this set of rules that incorporated both survey responses and HDAR records produced reasonable estimations of annual trip costs and annual net return; therefore, we adopted this estimation of number of trips in this report.

Since no studies were previously conducted to evaluate the economic performance of the offshore handline fishery and the Hawaii small boat commercial fishery on an annual basis, this report provides an important baseline economic indicator for those fisheries. This information is crucial for fishery managers in order to evaluate potential economic impacts from regulatory alternatives in these fisheries.

## **Acknowledgements**



We want to thank many people who contributed to the success of this study. First and most importantly, we would like to thank all the fishermen who participated in this study and contributed valuable information regarding their fishing activities, income, and fishing costs. Without their participation, we could not provide an accurate description of the Hawaii small boat commercial fishery. We also want to thank Ed Watamura and Roy Morioka of the Waialua Boat Club who allowed us to introduce the survey during their club meeting. Moreover, we wish to thank Reginald Kokubun and Alton Miyasaka from the State of Hawaii Division of Aquatic Resources who helped us at the planning stage of the study and provided the mailing list of the fishermen. Thank you also to Justin Hospital and Christopher Hawkins for reviewing and providing feedback on the survey instruments and brochure, and to Kathleen Uno who designed the beautiful survey cover. Last, but not least, we wish to thank our graduate research assistant, Jonathan Sweeney, for his hard work in survey distribution, database development, and data entry.

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# Appendices

## Appendix A. Survey Questionnaire

Questions? contact Dr. Minling Pan  
1-844-234-7444 (toll free)  
Minling.Pan@noaa.gov  
Pacific Islands Fisheries Science Center

OMB Control No. 0648-0081

Expiration Date 3/31/2017

Hello, please help us (NOAA) to better understand the importance of small boat fishing in Hawaii. Your details of fishing experiences and expenditures are important to ensure accurate results. We want to best represent Hawaii fishermen and we can only do that by hearing from as many fishermen as possible. While your response is voluntary, we hope that you will help us with this research.

### SECTION A. YOUR FISHING EXPERIENCES

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

1. What type of fishing trips did you take in the past 12 months?

- I went fishing using a boat only → Go to Q2
- I went fishing sometimes using a boat and sometimes not using a boat → Go to Q2
- I went fishing not using a boat → Go to Q5

2. Approximately how many BOAT fishing trips did you take in the past 12 months?

- 0
- Fewer than 25 trips
- 25-49 trips
- 50-99 trips
- 100-200 trips
- More than 200 trips

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3. In the past 12 months, what percent of your BOAT fishing trips were: (please check one for each gear type)

|                                   | 0%                       | 1%-25%                   | 26%-50%                  | 51%-75%                  | 76%-100%                 |
|-----------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Trotting                          | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Handline for pelagic species      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Handline for bottomfish species   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Spearfishing                      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Nets                              | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Other gear, please specify: _____ | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

4. In the past 12 months, did you use a green-stick as one of the gear types?

- YES
- NO

5. Approximately how many NON-BOAT fishing (shoreline) trips did you take in the past 12 months?

- 0
- Fewer than 25 trips
- 25-49 trips
- 50-99 trips
- 100-200 trips
- More than 200 trips

6. In the past 12 months, what percent of your NON-BOAT fishing (shoreline) trips were: (please check one for each gear type)

|                                   | 0%                       | 1%-25%                   | 26%-50%                  | 51%-75%                  | 76%-100%                 |
|-----------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Rod and reel (pole)               | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Spearfishing                      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Cast/throw net                    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Other gear, please specify: _____ | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

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7. If you went spearfishing in the past 12 months, what percent of the time did you use scuba gear? And what percent of the time did you not use scuba gear?

|                                  | 0%                       | 1%-25%                   | 26%-50%                  | 51%-75%                  | 76%-100%                 |
|----------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Fishing trips with scuba gear    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Fishing trips without scuba gear | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

8. In the past 12 months, what percent of your fishing trips occurred in state and federal jurisdiction?

|                                   | 0%                       | 1%-25%                   | 26%-50%                  | 51%-75%                  | 76%-100%                 |
|-----------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| State waters (0-3nm)              | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Federal waters (greater than 3nm) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

9. How many people in total, including yourself, are on board for an average fishing trip? \_\_\_\_\_ people

10. In the past 12 months, approximately how many total pounds of pelagic fish (tuna, marlin, mahimahi, ono, etc., here excluding akule and opelu) did you catch?

- None
- 1 - 50 pounds
- 51 - 100 pounds
- 101 - 500 pounds
- 501 - 1000 pounds
- More than 1000 pounds → About how much? \_\_\_\_\_ pounds

11. In the past 12 months, approximately how many total pounds of bottomfish (opakapaka, onaga, uku, taape, etc.) did you catch?

- None
- 1 - 50 pounds
- 51 - 100 pounds
- 101 - 500 pounds
- 501 - 1000 pounds
- More than 1000 pounds → About how much? \_\_\_\_\_ pounds

12. In the past 12 months, approximately how many total pounds of reef fish (manini, uhu, weke ula, etc., here including akule and opelu) did you catch?

- None
- 1 - 50 pounds
- 51 - 100 pounds
- 101 - 500 pounds
- 501 - 1000 pounds
- More than 1000 pounds → About how much? \_\_\_\_\_ pounds

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

|  | 0%                       | 1%-25%                   | 26%-50%                  | 51%-75%                  | 76%-100%                 |
|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
|  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

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**SECTION B. MARKET PARTICIPATION**

14. How do you define yourself as a fisherman? (check one that applies)
- |   |  |
|---|--|
| <input type="checkbox"/> Full-time commercial | <input type="checkbox"/> Purely recreational         |
| <input type="checkbox"/> Part-time commercial | <input type="checkbox"/> Subsistence                 |
| <input type="checkbox"/> Recreational expense | <input type="checkbox"/> Culture                     |
|   | <input type="checkbox"/> Other, please specify _____ |
15. In the past 12 months, how were the catches distributed? (please check one and estimate percentage)
- |  |  |
|--|--|
| <input type="checkbox"/> I kept all the fish I caught                | <input type="checkbox"/> Don't know/different every time |
| <input type="checkbox"/> I kept/received _____% of total fish caught | <input type="checkbox"/> Other, please describe: _____   |
| <input type="checkbox"/> I kept/received _____% of trip revenue      |  |
16. In the past 12 months, what percent of your catch was:
- |                     |                          |                          |                          |                          |                          |
|---------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
|                     | 0%                       | 1%-25%                   | 26%-50%                  | 51%-75%                  | 76%-100%                 |
| Consumed at home    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Given away          | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Caught and released | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Sold                | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
17. In the past 12 months, did you ever sell any of the fish you caught?
- YES → Go to Q18
- NO → Go to Q22

If you sold any of your fish...

18. In the past 12 months, where did you sell your fish?
- Wholesaler/auction
- Restaurants/stores
- Roadside/farmers' market
- Friends/neighbors/coworkers
- Other, please specify \_\_\_\_\_

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If you sold any of your fish...

19. In the past 12 months, what was the approximate value of all the fish you sold?
- |  |   |
|--|---|
| <input type="checkbox"/> \$1 - \$100       | <input type="checkbox"/> \$5,001 - \$10,000                   |
| <input type="checkbox"/> \$101 - \$500     | <input type="checkbox"/> \$10,001 - \$20,000                  |
| <input type="checkbox"/> \$501 - \$1,000   | <input type="checkbox"/> \$20,001 - \$50,000                  |
| <input type="checkbox"/> \$1,001 - \$2,000 | <input type="checkbox"/> More than \$50,000, specify \$ _____ |
| <input type="checkbox"/> \$2,001 - \$5,000 |   |

If you sold any of your fish...

20. In the past 12 months, what percent of the value of fish sold (question 19) came from the sale of pelagic fish, bottomfish, and reef fish?
- |              |                          |                          |                          |                          |                          |
|--------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
|              | 0%                       | 1%-25%                   | 26%-50%                  | 51%-75%                  | 76%-100%                 |
| Pelagic Fish | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Bottomfish   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Reef Fish    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

If you sold any of your fish...

21. In the past 12 months, after expenses, what percent of your personal income came from the sale of fish?
- |  |                          |                          |                          |                          |
|--|--------------------------|--------------------------|--------------------------|--------------------------|
|  | 1%-25%                   | 26%-50%                  | 51%-75%                  | 76%-100%                 |
|  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

**SECTION C. YOUR VESSEL**

In this section, we want to better understand the vessel and gear characteristics of the boat based fishery in Hawaii.

22. Do you own the boat that you fish on?
- YES → Go to Q23
- NO → Go to Q30
- If you own the boat that you fish on...
23. In the past 12 months, what percent of time did other people (other than family members) use the boat without you?
- |  |                          |                          |                          |                          |                          |
|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
|  | 0%                       | 1%-25%                   | 26%-50%                  | 51%-75%                  | 76%-100%                 |
|  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

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24. What is the length of your boat? \_\_\_\_\_ feet
25. What is the total horsepower? \_\_\_\_\_ hp
26. In what year was the boat built? \_\_\_\_\_
27. In what year did you purchase the boat you fish on? \_\_\_\_\_  
(if homebuilt - when did you complete it?)
28. How much did you pay to purchase the boat you fish on? \$ \_\_\_\_\_  
(if homebuilt - how much did it cost to build it?)
29. What is the approximate market value of your boat?  
(considering age and current condition and including motor(s) and trailer) \$ \_\_\_\_\_

**SECTION D. YOUR FISHING TRIP COSTS**

We now want to understand your per trip costs for fishing.  
Please remember that all your answers are strictly confidential.

30. In the past 12 months, what was the primary gear usage for your most common trip (please check one)?
- |  |  |
|--|--|
| <input type="checkbox"/> Trolling                        | <input type="checkbox"/> Spearfishing              |
| <input type="checkbox"/> Handline for pelagic species    | <input type="checkbox"/> Nets                      |
| <input type="checkbox"/> Handline for bottomfish species | <input type="checkbox"/> Other gear, specify _____ |
- 30a. On average, how much money did you spend on your most common (question 30) gear type trip?
- |                              |                         |
|------------------------------|-------------------------|
| <u>Type of Expenditure</u>   | <u>Trip Expenditure</u> |
| Boat fuel                    | \$ _____                |
| Truck fuel (round-trip)      | \$ _____                |
| Oil                          | \$ _____                |
| Ice                          | \$ _____                |
| Bait                         | \$ _____                |
| Food and beverage            | \$ _____                |
| Daily maintenance and repair | \$ _____                |
| Other, please specify:       | \$ _____                |

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- 30b. How were the trip costs distributed among your most common gear type (question 30)? (please check one and estimate percentage)
- I paid all trip costs
- I paid a fixed amount of \$ \_\_\_\_\_
- I paid \_\_\_\_\_% of the total trip costs
- Other, please describe: \_\_\_\_\_
31. In the past 12 months, what was your second most common gear usage (please check one)?
- |  |  |
|--|--|
| <input type="checkbox"/> Trolling                        | <input type="checkbox"/> Spearfishing              |
| <input type="checkbox"/> Handline for pelagic species    | <input type="checkbox"/> Nets                      |
| <input type="checkbox"/> Handline for bottomfish species | <input type="checkbox"/> Other gear, specify _____ |

- 31a. On average, how much money did you spend on your second most common (question 31) gear type trip?
- |                              |                         |
|------------------------------|-------------------------|
| <u>Type of Expenditure</u>   | <u>Trip Expenditure</u> |
| Boat fuel                    | \$ _____                |
| Truck fuel (round-trip)      | \$ _____                |
| Oil                          | \$ _____                |
| Ice                          | \$ _____                |
| Bait                         | \$ _____                |
| Food and beverage            | \$ _____                |
| Daily maintenance and repair | \$ _____                |
| Other, please specify:       | \$ _____                |

- 31b. How were the trip costs distributed among your second most common gear type (question 31)? (please check one and estimate percentage)
- I paid all trip costs
- I paid a fixed amount of \$ \_\_\_\_\_
- I paid \_\_\_\_\_% of the total trip costs
- Other, please describe: \_\_\_\_\_

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SECTION E. 2013 FISHING EXPENDITURES

In an effort to better understand your economic contribution to the State of Hawaii's economy, we would like to ask about your fishing-related expenditures in 2013. In the table below please indicate how much, if any, was spent on the following items during 2013.

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.

Table with 3 columns: Cost Category, 2013 Expenditure (dollars), and frequency (per month/year). Rows include Boat insurance, Loan payments, Mooring fees, Gear replacement/repair, Annual boat and trailer repair, Fees (CML, non-commercial permit), Financial services, and Other.

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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.

- 33. What is your gender? (Male/Female)
34. What is your age? (Less than 25 years to More than 64 years)
35. What is the zip code where you live?
36. Are you Hispanic or Latino? (Yes/No)
37. How would you describe your race? (American Indian, Native Hawaiian, Asian, Black, White)
38. What is the highest level of education you have completed? (Less than 9th grade to Advanced, professional, or doctoral degree)
39. What was your total household income, before taxes, in 2013, including fishing income? (Less than \$10,000 to \$250,000 or more)

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SECTION G. WHAT DO YOU THINK?

40. Do you have any suggestions for how Hawaii's fisheries should be managed or topics that you feel need further study?

Lined area for handwritten suggestions and responses.

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Mahalo for participating in this survey.

Please use the enclosed postage paid return envelope to mail back your survey. The information you have provided will improve our understanding of the importance of fishing in Hawaii.

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

Form with checkboxes for YES/NO and fields for Name, Address, and Email address.

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

Form with checkboxes for YES/NO and a field for Phone number.

Participant Release Statement: Public reporting burden for this collection of information is estimated to average 30 minutes per response... (small print regarding data collection and confidentiality)

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