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Results of a Pilot Study to Improve Intercept Surveys in the Hawaii Marine Recreational Fishery

Hongguang Ma

David Hamm (retired)

Pacific Islands Fisheries Science Center
NOAA Inouye Regional Center
1845 Wasp Boulevard, Building 176
Honolulu, Hawaii 96818

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EXECUTIVE SUMMARY

The Hawaii Marine Recreational Fishing Survey (HMRFS, which is part of Marine Recreational Fisheries Statistics Survey, MRFSS) is conducted by the Hawaii Division of Aquatic Resources. Alternative estimation procedures for MRFSS intercept data developed by Marine Recreational Information Program (MRIP) nationally did not include HMRFS. The main objective of this project study was to evaluate the HMRFS protocol and data to determine whether the new national MRIP methods for catch rate estimation could be directly applied to HMRFS. This pilot project was used to contract a data analyst mainly for data/program review, and it was anticipated that results from this project would benefit future and other ongoing studies.

It was found early during the review that many data files essential for the new estimation procedures were not adequate for this purpose. The traditional MRFSS estimation method did not require these data sources (including sample draw files, site fishing pressure files, site registers, and assignment summary forms) so quality control and data entry of these data were not a priority at the time of data collection. During this project, a site register file was created/updated to contain site information and data on fishing pressure. The site register input file for the updated sample draw program now contains the most updated and complete information about sites from five of the Hawaiian Islands and their site fishing pressures. The updated sample draw program provided by NMFS for HMRFS is now more efficient at providing island-based samples and it uses an improved weighting scheme for site-sample selection. The draw program was also modified to produce output data files needed for the new MRIP estimation program.

Although the main intention of this project was to improve intercept survey, the Coastal Household Telephone Survey (CHTS) data were also explored for improving catch estimation. The county level effort estimates were used to estimate catch by county. In addition, Hawaii-specific questions regarding fishing methods and fishermen categories in the onsite survey and the telephone survey were analyzed for possible catch estimation use.

The HMRFS sampling and data management procedures are now more similar to those used in the Atlantic and Gulf Coast states. The new MRIP estimation method should be applicable to HMRFS data collected after the course of the project. However due to the incomplete status of the historic files and the outdated draw program used for a previous sample selection, the new estimation method cannot be used for historic HMRFS data. NMFS is working on modifying the estimation procedure to accommodate an early draw program used in MRFSS before 2004 (and used in HMRFS before 2011). The modified estimation program has the potential to be used for HMRFS data prior to 2011. It is recommended that additional estimation methods also be explored to improve *historic* HMRFS catch estimates.

1) The current MRIP estimation program may be modified to use the correct weighting scheme for the site-sample draw program used by HMRFS prior to 2011. Substantial

efforts may be needed to compile the existing historic files and to generate proxies (if appropriate) for missing data that are needed for the MRIP estimation program.

2) The historic HMRFS catch estimates were based on statewide catch rate estimates (from onsite intercept surveys) multiplied by statewide fishing trip estimates (from telephone surveys). By first estimating catch for each county (stratum) and then summing up county estimates to get a total state-level catch estimate, potential biases resulting from disproportional intercept sampling allocations among different counties (relative to the proportions of actual fishing trips from various counties) would be corrected. This approach would also generate county-level catch estimates, which are more spatially explicit and thus more useful for fisheries management.

3) Hawaii-specific information in HMRFS (e.g., fishing methods and fishermen types) could be used to improve catch estimation. Post-stratification by fishing method (for catch estimation) would accommodate for the disparities in the proportions of different fishing methods recorded between the onsite intercept survey data (for catch rate estimation) and the telephone survey data (for fishing trip estimation). Estimating catch by fishing method would be able to correct for the biases in catch estimates when the proportions of various fishing methods differ between intercept and telephone surveys.

INTRODUCTION AND OBJECTIVES

The NMFS Marine Recreational Information Program (MRIP) is a non-commercial angler-driven initiative to gather information on marine recreational fisheries to support fisheries management and conservation. Established in 2007, MRIP replaced the NMFS Marine Recreational Fisheries Statistics Survey (MRFSS) which began in the 1970s. MRIP collects data through in-person, onsite, intercept surveys of anglers in the field and through telephone surveys of the general population. The surveys are conducted to estimate what species fisherman catch, how much they catch, how much fishing effort they expend, and when, where and how they fish. Surveys are based on formal statistical designs and random sampling protocols.

In 2006 the National Research Council (NRC) published recommendations to improve data collection for marine recreational fisheries based on an evaluation of MRFSS (NRC 2006).The MRIP's Design and Analysis Workgroup (DAWG) was partially charged with designing improvements identified by NRC for the Access Point Angler Intercept Survey, including minimizing sources of bias, testing assumptions, and improving the accuracy and precision of the recreational fishing estimates. The sampling and estimation team under DAWG documented sampling and estimation methodologies for MRFSS and developed alternative estimation procedures for MRFSS intercept surveys (Breidt et al., 2011). The team also developed and tested new data collection methodologies for the intercept survey through a pilot study in North Carolina that could be applicable to other coastal regions (Opsomer et al., 2011).

In the NMFS Western Pacific Region, Hawaii is the only island area to fall under MRIP/MRFSS. Onsite intercept surveys for the Hawaii Marine Recreational Fishing Survey (HMRFS) are conducted by the Hawaii Division of Aquatic Resources (HDAR), while the surveys for the Atlantic and Gulf Coast states are conducted by a private contractor (for the Atlantic states), the Gulf States Marine Fisheries Commission (for Florida, Alabama, Mississippi, and Louisiana), and the state natural resources agencies. The alternative estimation procedures developed by MRIP did not include HMRFS data. Historical survey protocols and data management may have been varied among the different contractors.

We proposed a pilot project to evaluate the HMRFS protocols and data to determine whether the new estimation methodology of MRIP could be directly applied to HMRFS. The focus was to assess the sampling design for HMRFS, including a review of the survey sampling frame (site register, with information on fishing pressure), sample draw, and other files which are essential for the alternative estimation methods developed by the DAWG estimation team. At the beginning of the project course, an initial review revealed that some essential data files needed for the new estimation methods were unavailable or missing. It was decided that the focus should be on ensuring that, moving forward, all necessary information will be gathered and supplied to NMFS to support the new sampling and estimation programs.

In principle, HMRFS was similar to MRFSS in sampling design and estimation (HMRFS was part of MRFSS). However, there are some Hawaii-specific questions in HMRFS including those related to fishing methods and fishermen types. As a secondary part of the project study, the information on fishing methods and fishermen types was explored for improving HMRFS

estimation. Hawaii will likely require modified survey and estimation methodologies which may differ from the standard MRFSS/MRIP approach. Hawaii state law does not require licensing or registration of recreational fishermen by the state, except for fishers engaged in bottomfishing. Accordingly, Hawaii is the only state where recreational fishermen are required to register with the NMFS National Saltwater Angler Registry (NSAR). But shoreline anglers and boat fishermen only fishing within 3 miles from the shore are exempted from NSAR. Therefore, the NSAR from Hawaii is an incomplete sampling frame for fishing surveys. In addition to the need for an improved sampling frame, there is increasing demand to have more spatially explicit data on recreational fishing (e.g., at island level rather than at state level) for resource management in Hawaii.

Specific objectives of the pilot study were to evaluate the HMRFS sampling design, review the data files necessary for the new estimation methods, and explore additional estimation methods incorporating Hawaii-specific information in HMRFS. This report provides details of the study and summarizes results and recommendations.

METHODS

A data analyst was contracted to review and compile the data files necessary for the new estimation methods. These files included site register/fishing pressure files, sample draw files, and assignment summary forms (ASF). During initial review, it was noted that some historical files (for onsite intercept surveys) were incomplete. Rather than focusing on compiling historical data, the data analyst identified problems in the current files (at the time of the review) needed for sample drawing. The input files for the sample drawing and the draw program were updated to ensure that the future files would be sufficient for the new estimation methods (see the contract report in Appendix B for more details).

In MRIP surveys, data are collected within 2-month temporal strata called “waves”. Prior to wave 3 (May-June) in 2009, the Coastal Household Telephone Survey (CHTS) in Hawaii was conducted by the same contractor as in the Atlantic and Gulf Coast States. The survey protocol and data collecting/archiving for the telephone survey in Hawaii were the same as in other MRFSS regions. Starting in wave 3 in 2009, a local company in Hawaii was subcontracted to conduct the telephone interviews, although the survey is still managed by the original contractor on the mainland for data quality control, data compilation, and data reporting to NMFS. The historical telephone surveys were compiled and queried to examine county-level fishing effort, composition of fishing methods, and potential changes incurred by the local contractor.

The onsite intercept survey data in 2008 (combined with the telephone survey data) were used to examine fishing method proportions, catch estimates by county, and catch from different fishermen types. The fishing method proportion (for intercept data in 2008 and CHTS data in 2001-2010) was only analyzed for boat fishing (private/rental boats). The telephone survey data in 2002 were corrected for wrong county coding (the county codes were mixed with island codes occasionally in 2002). There were some telephone interviews from Kalawao County (a small

county with 90 people in 2010) in the data from 2001 to 2010. Kalawao is on the island of Molokai which is included in Maui County. The small number of trips from Kalawao County was merged with Maui County for the analysis. Only trips within Hawaii by Hawaii residents were included (> 99% of the trips by Hawaii residents were within the state) in the CHTS dataset for the fishing method and fishermen-type analyses.

The choices for fishing methods in CHTS include trolling, handlining, bottomfishing, casting, netting, spearfishing, other, do-not-know, and refusal. The CHTS follow-up questions classify handlining as tuna handlining, deepwater bottomfishing, shallow-water bottomfishing, and other. Under handlining, deepwater and shallow-water bottomfishing were regrouped as bottomfishing for the analysis in the report. After regrouping, handlining covers mainly tuna handlining. The same approach was used to group fishing methods for bottomfishing and handlining for the onsite intercept survey.

RESULTS

a) Intercept survey data review

The available sample draw files, site register/site fishing pressure files, and assignment summary forms (ASF) were not adequate for the new estimation method at the time of the review. Most of these files were not required for the MRFSS estimation procedures. The ASFs were not always complete and the ASF data were not entered into a database. The ASF forms have been a required element in data collection protocols for HMRFS since its inception, but data from the forms had not been entered into a database. The fishing pressure/site register files were also not maintained systematically. The draw files (for sample scheduling) were mostly complete. The draw program used in HMRFS was not the most updated and had some deficiencies in terms of efficiency and applicability to Hawaii's needs.

During this study, the site register file was created/updated to contain current site information and data on fishing pressures. The site register input file for the updated sample draw program now contains the most updated and complete information about sites from five Hawaiian Islands and the site fishing pressures. The updated sample draw program (provided by the Fisheries Statistics Division, Office of Science and Technology, NMFS) is now the same computer program that has been in use on the Atlantic and Gulf Coasts. It is more efficient at providing island-based samples and uses an improved weighting scheme for site-sample selection. The draw program was also modified to produce output data files needed for the new MRIP estimation program (see the draw program documentation in the contract report, Appendix C).

A new data entry program was provided (by the Fisheries Statistics Division, Office of Science and Technology, NMFS) to HMRFS in 2011 and it has some built-in functions that alert the data manager to various errors (including logical errors and some typos) during data entry. The ASF files are now entered into the new program as well and can be extracted from the data entry program file. Even though the data files generated from the updated draw program and

from the new data entry program were not officially reviewed (they became available after the project period), the new estimation methods should be applicable to HMRFS data collected after the course of this project.

b) Hawaii Costal Household Telephone Survey

Coastal Household Telephone Survey data from 2001 to 2010 were compiled by the project contractor. The county-level fishing trip estimates from 2004 to 2010 were also generated during the project study with the assistance of NMFS staff from the Fisheries Statistics Division, Office of Science and Technology (NMFS). The county-level trip estimates and fishing method results in the CHTS data were analyzed to enhance the presentation of other results and the discussions and recommendations in this report. The analyses of the CHTS data are detailed in Appendix A.

c) Hawaii-specific information in onsite survey and CHTS data

The Hawaii onsite and telephone survey forms contain questions regarding fishing methods and fishermen categories. Such Hawaii-specific information was not used in previous HMRFS estimations. Fishing methods recorded in the 2008 onsite survey and telephone survey forms were presented and compared. The data for fishermen types were also analyzed to investigate the extent of overlap between HMRFS catch estimates and catch information from Hawaii commercial fishing reports.

The proportions of different fishing methods from the 2008 onsite and telephone surveys are presented in Figure 1. Consistent with the telephone survey data from 2001 to 2010, trolling is the major fishing method recorded in both telephone survey and onsite survey data in 2008 for all four counties. The cumulative percentages of trolling (computed over six waves) were slightly higher in the onsite survey data than in the telephone survey data (Figs. 1a and 1b). Bottomfishing appeared more popular on Maui than on other islands. According to CHTS data, a significant proportion of bottomfishing occurred in waves 5 and 6 in Maui and in wave 6 in Hawaii. In the onsite survey data, percentages ~ 20% or higher appeared in wave 5 on Oahu; waves 1, 2, 5, and 6 in Maui; and wave 6 on Kauai. Spear fishing had the highest percentage on Maui based on onsite intercept data and the cumulative percentages were highest in Hawaii in the CHTS data. Hawaii had the highest cumulative percentage for handlining in both CHTS and onsite intercept data (consistent with Figure A-2e in Appendix A). The CHTS data showed some net fishing on both Oahu and Maui, but the intercept data showed very little in Maui.

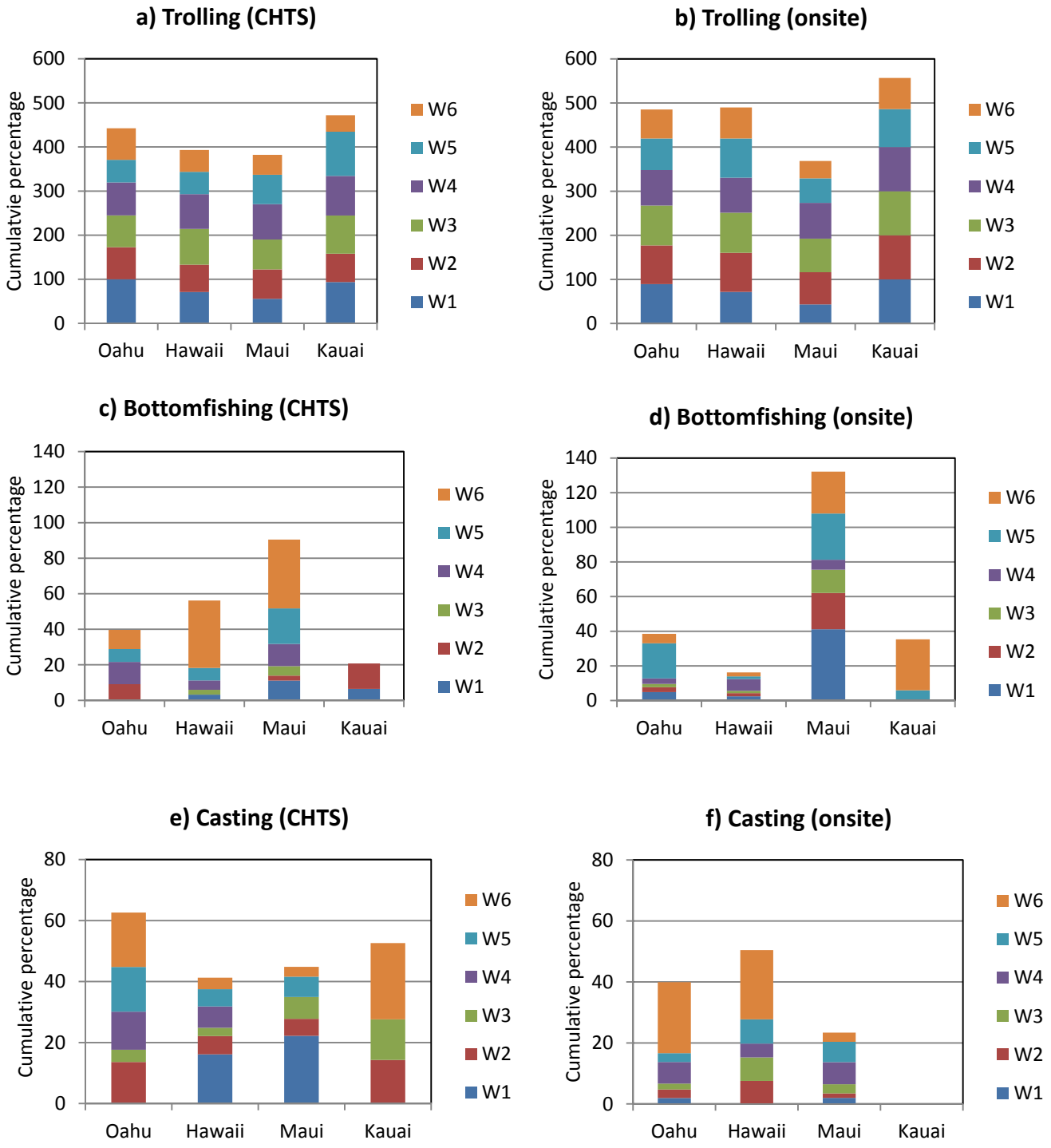

Figure 1. The cumulative percentages of different fishing methods over waves 1-6 (thus maximum value of 600%) by county in 2008 based on telephone surveys (on the left) and onsite intercept surveys (on the right).

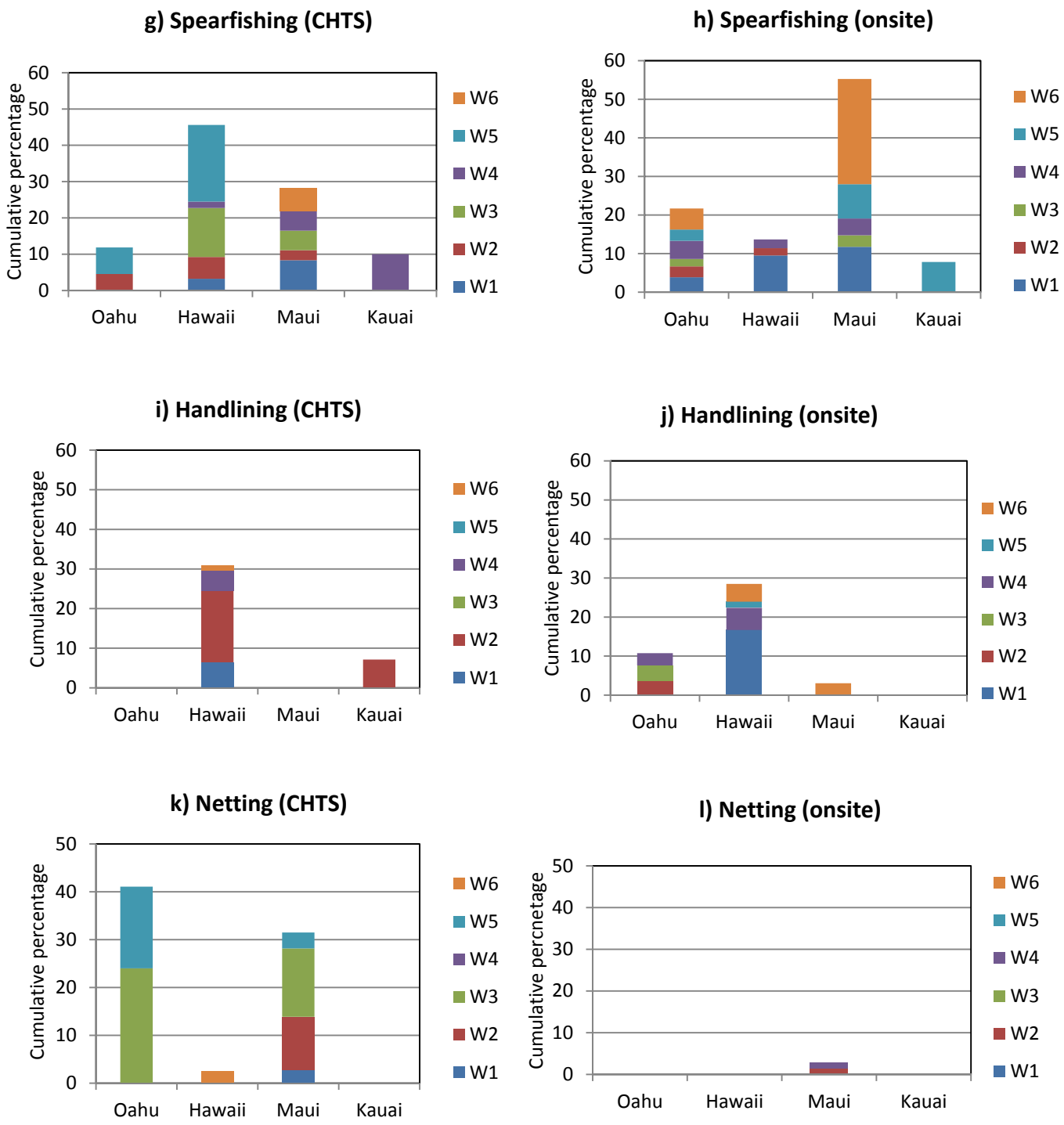

Figure 1. Continued.

Another Hawaii-specific question was on fishermen types, differentiating between fishers who sell their catch for some portion of their catch) and those who don't. For onsite boat interviews in 2008, overall 17% of fishermen answered "YES" to the question "Do you ever sell any of the fish you catch?" For yellowfin tuna, one of the most important pelagic species in

Hawaii recreational fisheries, catch records (including both observed (examined by the surveyors) and reported (reported by fishers and not looked at by the surveyors) catch), 50% of the catch of yellowfin tuna (number of fish) came from fishermen who answered 'YES'. The catch rate for yellowfin tuna would be several times higher for the fishermen who sell their catch than for those not selling their catch; 17% of the fishermen accounted for half of the yellowfin tuna observed and reported during the onsite interviews. On a state-wide basis, based on CHTS interviews in 2008, 76% of boat fishermen profiled were purely recreational (never sell any of the catch), 21% expense recreational (sometimes sell fish to help cover fishing expenses), and 2% commercial (sell fish for profit to pay living expenses). Seventy-four percent of profiled boat fishing trips were by recreational fishermen, 24% were by expense recreational fishermen, and 1% were by commercial fishermen. The CTHS sampling allocations were not proportional to number of households or estimated number of fishing trips (Table A-1 in Appendix A). The state-wide proportions of trips by different kinds of fishermen were adjusted by the proportional distribution of boat trips among different counties. The percentage of pure recreational trips was higher on Oahu (80%) and lower in Hawaii County (69%). State-wide, the adjusted trip proportions were 76% by pure recreational fishermen, 20% by expense recreational fishermen, and 2% by commercial fishermen.

DISCUSSION AND RECOMMENDATIONS

a) Application of new estimation procedures to HMRFS data

As a joint effort by NMFS and HDAR staff, the HMRFS sampling and data collection protocols were modified to become more consistent with those in other MRFSS states. The new MRIP estimation methods should be applicable to *current* HMRFS data. MRIP is also revising the new estimation procedure to be applied for MRFSS data prior to 2004 when a different version of the sample draw program was used. The previous draw program used by HMRFS prior to 2011 was similar to the MRFSS version used prior to 2004. The revised estimation procedures could potentially be used on historical HMRFS data. Substantial efforts will be needed to compile historic files, especially the files which were not used and were not complete. If feasible, some proxies will need to be generated for incomplete/missing data. In addition to the revised new MRIP estimation procedure, other additional methods should also be explored to use the information (especially Hawaii specific information) that is not utilized by the national MRIP methods.

b) Stratification by counties

For both onsite surveys and telephone surveys, sampling by HMRFS was stratified/blocked by counties. Even though the estimates of catch rate and fishing effort (number of fishing trips) were calculated at a state-wide level for HMRFS, it is possible to estimate catch rate and fishing effort at a county level. More spatially-explicit estimations are desirable for fisheries management. In addition, estimating catch for each county separately and then summing up county estimates to calculate state-level catch would result in more accurate state-wide estimates. If the onsite intercept surveys (for catch rate) were not proportionally allocated

to different counties according to the fishing trip profiles, the average catch rate estimates for the entire state could be biased when fishing methods and/or catch rates were different among various counties. Estimating the catch rate and catch separately for each stratum (i.e., county) would correct such biases introduced by disproportional sampling allocations.

Since the county-level trip estimation was made available during the project study, county-level catch was explored using yellowfin tuna catch data from 2008 boat fishing as an example. The catch rates for yellowfin tuna appeared to be lower for Oahu than for other counties (Fig. 2). The number of contributors (close to the number of interviews) was 368, 657, 365, and 335 for Hawaii, Oahu, Kauai, and Maui, respectively. Compared with the proportions of trips estimated by county (Fig A-1 in Appendix A), Kauai and Maui could be overrepresented in the onsite surveys while Oahu could be underrepresented. The estimate of overall state-wide catch of yellowfin tuna derived by summing catch estimates over county strata was 11% less than the estimate based on aggregate state-wide data. In this example the catch rates for different areas (inland, ocean within 3 miles from shore, and ocean > 3 miles) were not separately estimated for each county.

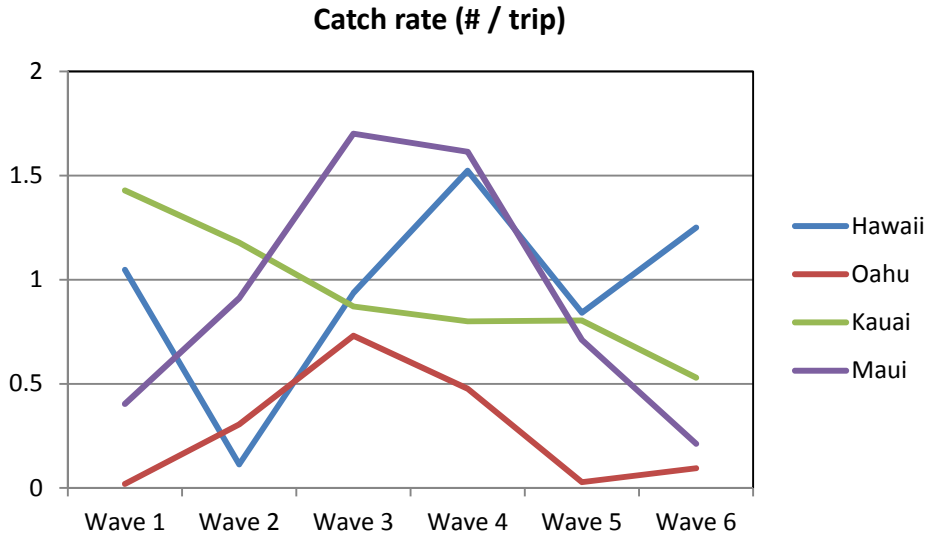

Figure 2. The county-level catch rate (number of fish caught per angler trip) for yellowfin tuna in different waves in 2008.

The proportions of estimated fishing effort (number of trips) among different counties based on all data collected to date, may be used to adjust sampling allocations for both telephone and intercept surveys. If the sampling is allocated proportionally, biases in estimates computed without stratification by county can be minimized.

c) Stratification by fishing methods

Since the HMRFS intercept surveys are conducted during daylight hours and at public-access sites, the proportions of different fishing methods recorded from onsite interviews can be different from the actual proportions of fishing methods employed in the fishery. In theory, the proportions of fishing methods recorded in the telephone survey would be more representative

because the sampled households are randomly selected and the fishing trips profiled in the survey include trips occurring at night and associated with private access sites. Figure A-2 in Appendix A summarizes percentages of different fishing methods for each wave/county combination based on the CHTS data. In some cases, the sample size may be too small at the wave/county level (especially for Oahu, see Table 1, and Table A-1 in Appendix A) to obtain robust estimates. Small sample size may also account for the large variation in estimates of the proportions by fishing method within each wave among different years (especially for non-trolling methods in Figure A-2 in Appendix A). Given the uncertainties in estimates from the telephone survey (because of small sample size), inferences about the proportions of different fishing methods derived from the onsite survey were inconclusive (Fig. 1). The proportions of different fishing methods recorded in the CHTS data were based on trips in Hawaii by Hawaii residents. In the onsite surveys, fishing trips were recorded by people from Hawaii as well as visitors from other states. However, based on the boat fishing data in 2008, only a small proportion of the interviewed trips (8 out of 1717) came from out-of-state fishermen.

Table 1. Number of boat trips sampled on Oahu during 2007-2010 CHTS interviews, by fishing method.

	Wave 1	Wave 2	Wave 3	Wave 4	Wave 5	Wave 6
	2007					
Trolling	5	3	4	16	7	7
Bottomfishing		2	3		2	1
Casting				4	6	4
Handlining	4					
Spearfishing	1			1	10	
Netting						
	2008					
Trolling	9	16	18	6	21	20
Bottomfishing		2		1	3	3
Casting		3	1	1	6	5
Handlining						
Spearfishing		1			3	
Netting			6		7	
	2009					
Trolling	7	14	13	8	18	12
Bottomfishing	2	5	3		8	4
Casting		1	5	1	1	3
Handlining						
Spearfishing		4	1	1		
Netting		1				
	2010					
Trolling	4	22	20	13	5	19
Bottomfishing	2	4		1		7
Casting					7	2
Handlining					1	
Spearfishing	2			3	1	
Netting						

As evident in Table 2, at the wave/county level, the number of interviews was relatively low for estimating catch rate for all fishing methods (except for trolling). To enable estimation of catch rates by fishing method, it will be necessary to pool data possibly by grouping data over two waves, by averaging percentages over multiple years for each wave, or by grouping data from less common fishing methods.

Table 2. Number of onsite boat fishing interviews by county and different fishing methods for the 6 waves in 2008.

	Wave 1	Wave 2	Wave 3	Wave 4	Wave 5	Wave 6
	Hawaii (county)					
Trolling	30	47	71	70	56	31
Bottomfishing	1	1	1	6	1	1
Casting		4	6	4	5	10
Handlining	7			5	1	2
Spearfishing	4	1		2		
Netting						
	Oahu					
Trolling	92	94	94	102	99	48
Bottomfishing	5	3	2	4	28	4
Casting	2	3	2	9	4	17
Handlining		4	4	4		
Spearfishing	4	3	2	6	4	4
Netting						
	Kauai					
Trolling	84	73	70	70	44	12
Bottomfishing					3	5
Casting						
Handlining						
Spearfishing					4	
Netting						
	Maui					
Trolling	22	49	51	56	25	13
Bottomfishing	21	14	9	4	12	8
Casting	1	1	2	5	3	1
Handlining						1
Spearfishing	6		2	3	4	9
Netting		1		1		

d) Fishermen categorization

Again using yellowfin tuna as an example, based on the onsite survey data in 2008, 50% of yellowfin recorded were caught by 17% of the boat fishermen who sometimes sell fish (including expense recreational fishermen who sometimes sell fish to help cover fishing expense and commercial fishermen who sell fish for income). Since the 17% of the fishermen who sometimes sell fish and the 83% who are purely recreational fishermen caught about equal numbers of yellowfin, the catch rate by the former group could be several times higher than by the latter group. The CHTS data in 2008 indicated a lower proportion of purely recreational fishing trips (76% vs. 83% in onsite survey data). Therefore, the catch by purely recreational fishermen might account for less than 50% of the total estimated yellowfin tuna catch in the HMRFS. This example suggests that significant overlaps may occur between HMRFS recreational catch estimates and Hawaii commercial marine license (CML) fishing reports for yellowfin tuna and similar species. In Hawaii, fishermen are required to possess a CML and to submit monthly fishing reports if they sell any catch. The fishing reports require participants to report all catch whether or not it is sold. The catch by expense recreational fishermen and the catch on recreational trips by part-time commercial fishermen would (when properly reported) be covered by both HMRFS estimations and CML fishing reports. Since it is unlikely that monthly CML reports are properly submitted by all fishermen who sometimes sell their catch, the HMRFS estimations may include significant quantities of sold catch that was never reported. However it is not known what proportion of the catch was sold by fishermen who responded "YES" when asked if they ever sell their catch.

In Hawaii it is illegal not to report sales of fish. During onsite and telephone interviews, the fishermen are not asked if they possess Hawaii commercial marine license. The fishermen are also assured that their responses will be treated as confidential records and used only for statistical purposes. These measures may help onsite intercept surveyors obtain accurate information about fishermen categories and catch disposition (e.g., whether fishers plan to eat, sell, throw away or otherwise dispose of their catch.

e*) Target species*

Most of the interviews from onsite surveys indicated fishermen were not targeting any particular species (For example, in 2008, 93% of boat fishing interviews and 89% of shoreline fishing interviews indicated no targeting). Similarly, telephone surveys generally indicated that most fishers were not targeting (62%-68% for shoreline fishing trips and 49%-62% for boat fishing trips in 2007-2009 CHTS data). In 2008, onsite surveys revealed that some boat fishers targeted including yellowfin tuna (2% of the interviews), dolphinfish (1%), peacock razorfish (<0.5%), and mackerel scad (<0.5%), which occurred > 1 interviews/wave. In interviews with shoreline fisher, targeting was reported for ulua (3% of the interviews), giant trevally (1%), bigeye scad (1%), yellowstripe goatfish (1%), island jack (1%), and bluefin trevally (1%), and other species at lower frequency. For most species, the data were insufficient to individually estimate the catch rates for the trips with a particular target species (<2 times/wave).

In the telephone survey data, the percentage of trips targeting a particular species was somewhat higher, but based on CHTS data, 65% of shoreline trips in 2008 had no particular

target species. Species indicated as target species by shoreline fishermen included papio (small jacks, 7% of the shoreline trips), ulua (large jacks, 4%), oama (juvenile goat fish, 2%), menpachi (soldierfish, 2%), aholehole (flagtails, 2%), hahalalu (juvenile bigeye scad, 2%), and moi (threadfin, 1%). In 2008, 49% of boat trips had no particular target species. Species indicated as target species by boat fishermen included mahimahi (8% of the boat trips), ahi (7%), ono/wahoo (7%), yellowfin tuna (3%), tunas (3%), marlin (3%), opakapaka (pink snapper, 2%), papio (2%), onaga (longtail red snapper, 2%), aku/skipjack tuna (2%), akule (bigeye scad, 1%) , manini (convict surgeonfish, 1%), bigeye tuna (1%), and palani (eyestripe surgeonfish, 1%). For some target species, Compiling summary statistics involved combining results across multiple common names (e.g., ono/wahoo, aku/skipjack). In other cases, there was uncertainty about the species targeted as only general names were given, e.g., marlin, tuna or ahi (which could mean yellowfin tuna or bigeye tuna).Thus, the exact percentage of trips with a specific target species can be complicated to estimate from CHTS data. For instance, in 2008, 3% of boat trips reported yellowfin tuna as the target species, 1% reported bigeye tuna, and 7% reported ahi; so the actual percentage of trips targeting yellowfin tuna would be > 3%. Allen and Bartlett (2008) also noted that target species data were difficult to analyze. Currently, the target species data are not used for catch or fishing effort expansion. The species naming issue will need to be resolved if such information is used for estimation.

f) Conclusions

The review of intercept survey data indicated that the available historical HMRFS files were not adequate for the new estimation procedures because of missing/incomplete files and the outdated sample draw program. The revised sampling procedures and data management practices employed in the HMFRS are now more similar to those used in the Atlantic and Gulf Coast states survey. The new estimation methods should be applicable to current HMRFS data in 2011. However, the new estimation methods in their current form cannot be used for the *historic* HMRFS data. Although MRIP is revising the estimation procedure to accommodate the draw program used in MRFSS prior to 2004 (and the draw program used in HMRFS prior to 2011), much work is needed to adapt the procedure to cope with incomplete or missing data. Along with the revised new estimation methods, alternative methods such as catch estimates stratified by county or post-stratification by fishing methods should continually be explored to further improve the estimates for historic HMRFS data.

g) Acknowledgements

The authors of this report were project proposal authors of a Marine Recreational Information Program project. Other project team members included Laura Johansen (OAK Management, Inc. / Office of Science and Technology, NOAA Fisheries), Tom Sminkey (Office of Science and Technology, NOAA Fisheries), and Tom Ogawa (Hawaii Division of Aquatic Resources). Laura Johansen was contracted to work with the project and prepared the contract report. Rob Andrews (Office of Science and Technology) helped generate county-level fishing trip estimations. Han-Lin Lai (Office of Science and Technology) provided information and discussion regarding the new estimation methods. The analysis of fishermen types in HMRFS was initiated by discussion with Roy Morioka. Justin Hospital read the early draft and provided

comments. Chris Boggs, Sam Pooley, and Jerry Wetherall reviewed the manuscript and provided review comments. Audrey Rivero helped edit and prepare the final version of the report.

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Appendix A: County-level trip estimates and fishing methods in CHTS

The CHTD data indicated that fishing trips (for both boat fishing and shoreline fishing) from Oahu accounted for close to 50% of the total trips in the state, whereas Hawaii accounted for ~ 25%, Maui County 15%, and Kauai ~ 10% (Fig A-1).

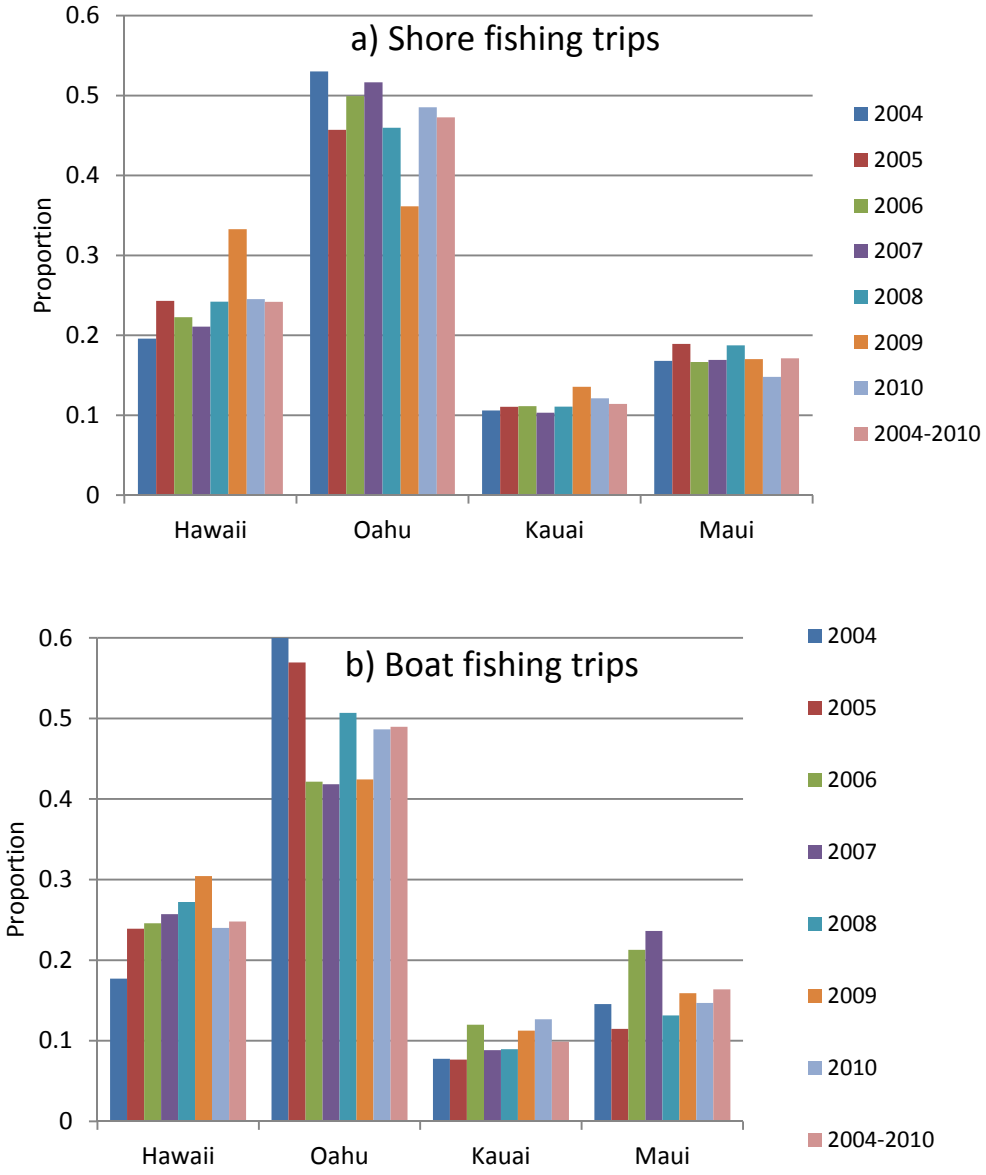

Figure A-1. The proportion of estimated fishing trips taken in different counties from 2004 to 2010. The data for 2010 were derived from only 4 waves 1-4, January to August). In other years, 6 waves were completed spanning the entire year.

The Hawaii CHTS was conducted on approximately equal numbers of households in Hawaii, Oahu, Kauai, and Maui Counties (Table A-1). Due to lower prevalence of fishing

households on Oahu (i.e., lower percentage of households on Oahu with house members going fishing), the proportion of fishing trips surveyed in the CHTS from Oahu (< 15% in 2008) was even lower than the proportion of contacted households from Oahu (27% in 2008, Table A-1). By increasing the proportion of telephone interviews on Oahu, where ~ 70% of the total households in the state are located, the precision of the state-level trip estimates would likely be increased.

Table A-1. Survey statistics for the 2008 by county; total households, contacted households, contacted fishing trips, estimated boat trips, and estimates of shore trips.

	Hawaii	**Oahu**	**Kauai**	**Maui**
Households in 2008 (U.S. Census data)	65100 (15%)	304600 (69%)	23100 (5%)	49400 (11%)
Contacted households	3142 (27%)	3149 (27%)	1783 (16%)	3456 (30%)
Contacted trips	1613 (38%)	561 (13%)	728 (17%)	1313 (31%)
Estimated boat trips (proportion)	27%	51%	9%	13%
Estimated shore trips (proportion)	24%	46%	11%	19%

During wave 3 in 2009, the telephone survey in Hawaii was subcontracted to a local company. To determine the effect of this transition, the number of fishing houses with at least one angler profiled, and the number of fishing households with at least one fishing trip by one angler profiled were compared for the nine waves before and after the transition. The proportion of fishing households with at least one angler profiled and the proportion with fishing households with at least one trip profiled were also compared. No significant differences were found in key statistics before and after the transition. For instance, the average number of 2-month fishing households contacted in each wave was 206 after wave 3 in 2009, and 208 prior to that. The number of fishing households with at least one angler profiled was 196 after and 195 before the transition. The proportion of fishing households with at least one angler profiled was 95% after wave 3 in 2009 and 94% prior to that the transition. The proportions of fishing households with at least one trip profiled were 91% after and 89% prior to that the transition.

Various fishing methods are used by recreational fishermen in Hawaii. Figure A-2 summarizes the percentage of occurrence of each fishing method in the past 10 years of CHTS data. Trolling is the major fishing method. Other methods include bottom fishing, casting, spear fishing, hand lining (excluding bottom fishing), and netting.

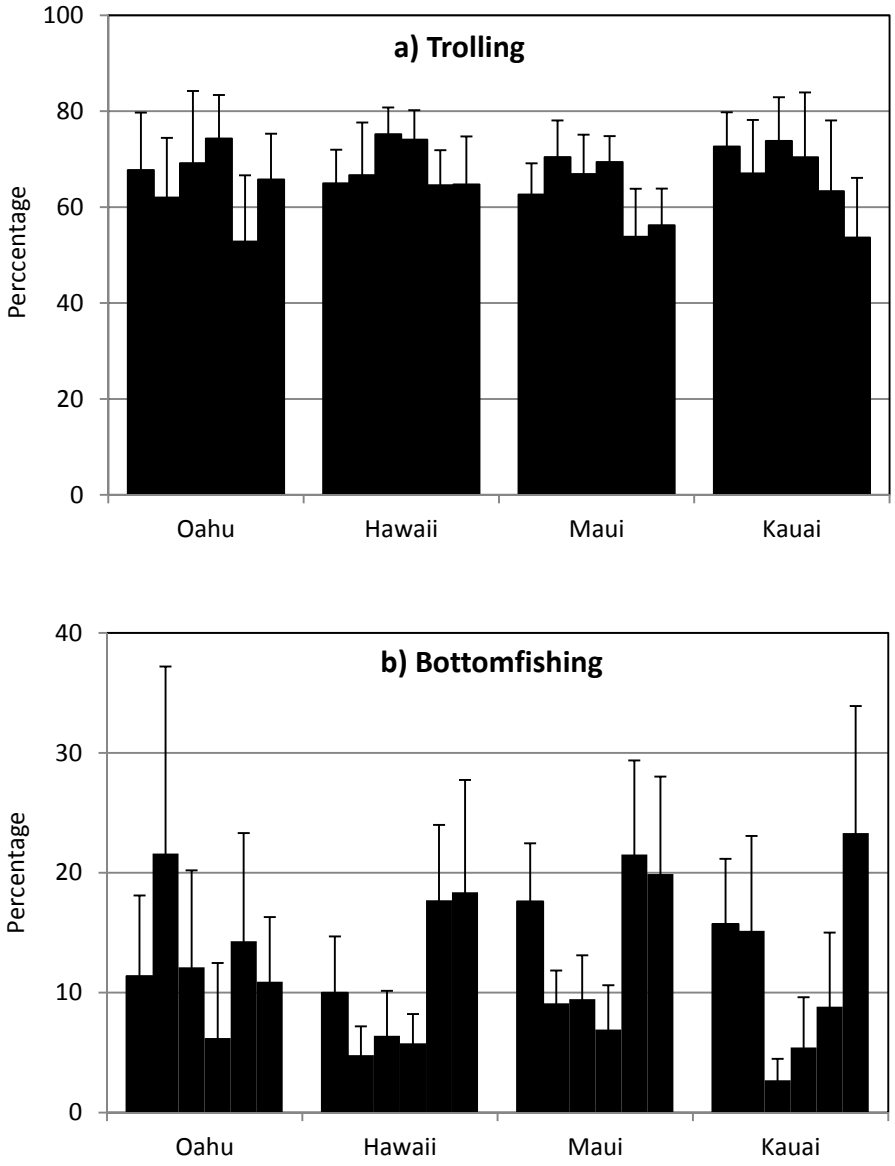

Figure A-2. Percentages of occurrence of different fishing methods in survey data by wave, 2001-2010 (6 waves per year) and county. The error bars (2*standard error (SE), SE = standard deviation/√n) show variations within a wave among different years.

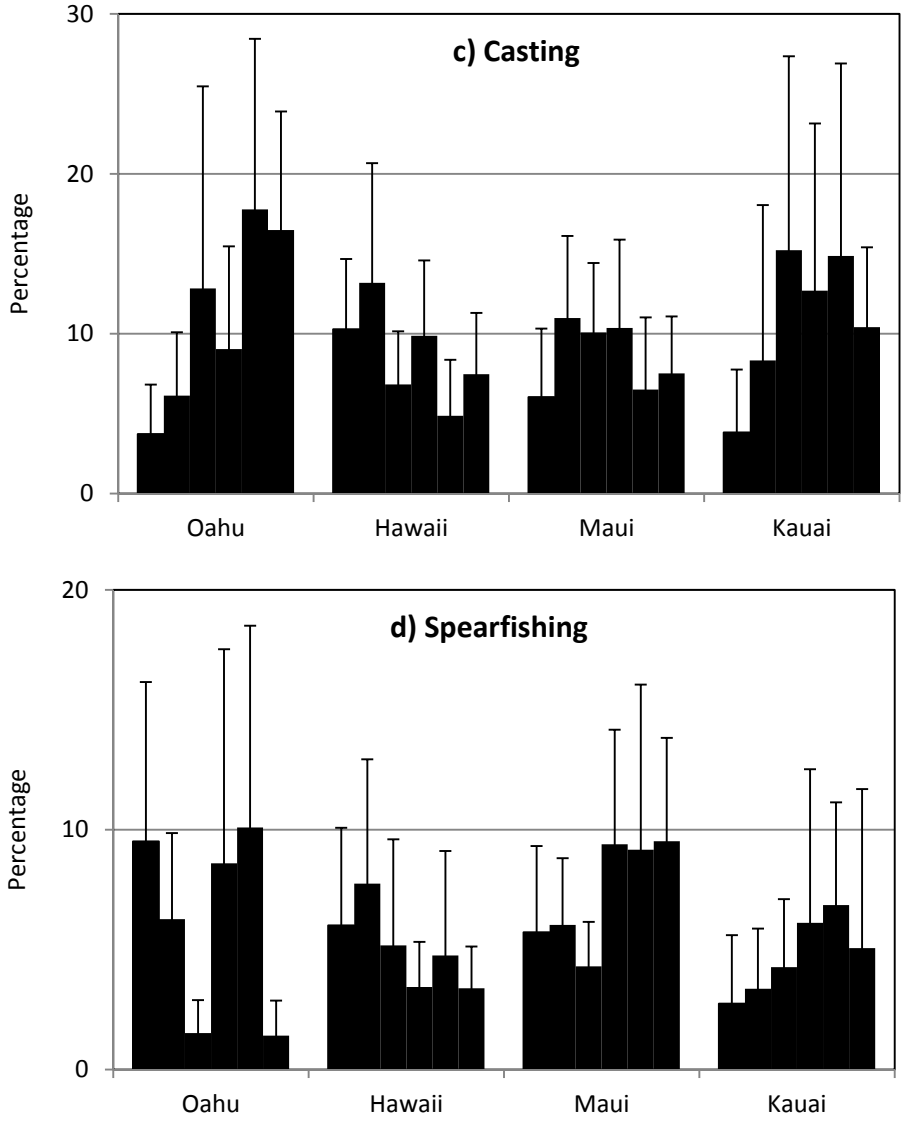

Figure A-2. Continued.

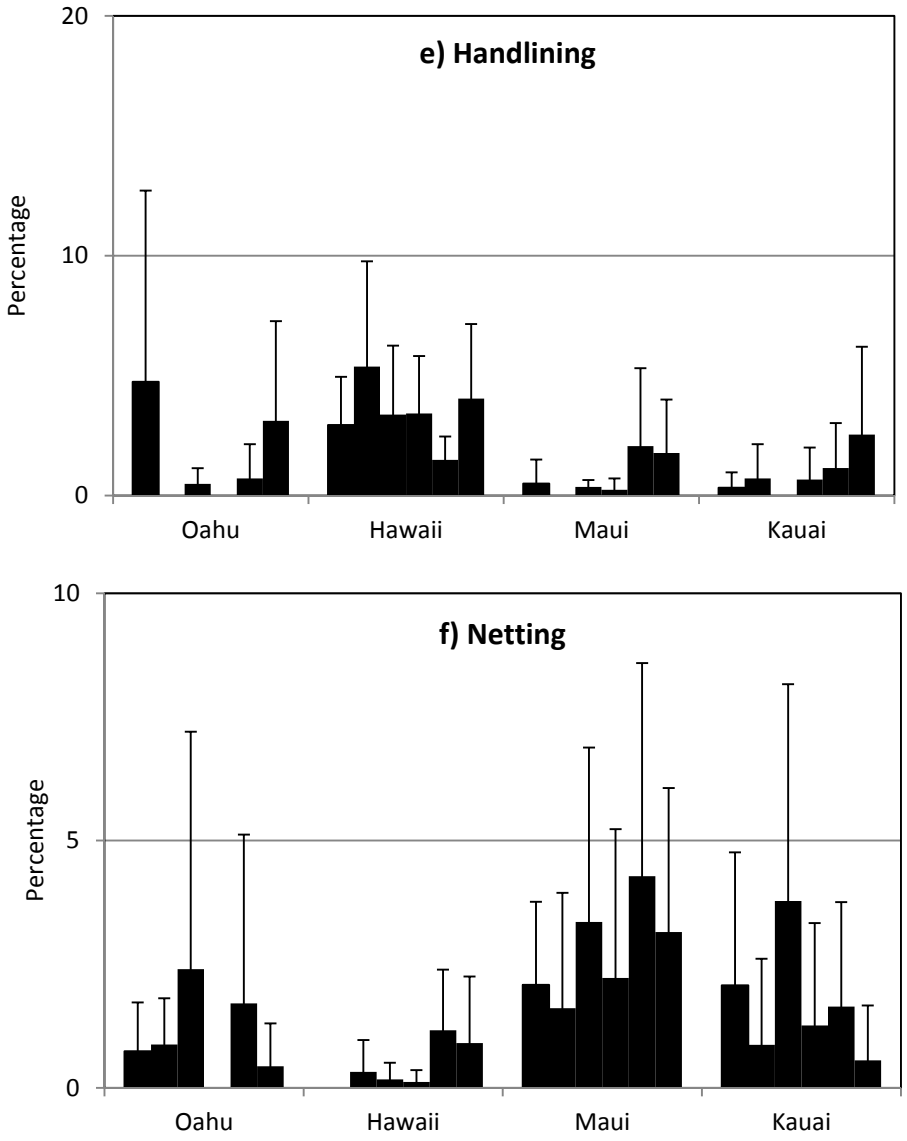

Figure A-2. Continued.

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Appendix B: Contract Report (by Laura Johansen, OAK Management, Inc.)

The following project documentation for the Hawaii pilot study to improve the intercept survey was completed for the NMFS Office of Science and Technology by Laura Johansen of OAK Management, Inc., under contract *NFFR7400-10-20265*A. The findings, conclusions and opinions expressed in the contract report are those of the author as an independent investigator and do not necessarily reflect views of PIFSC, the National Marine Fisheries Service or NOAA.

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Hawaii Pilot Study to Improve Intercept Survey: Statistician/Data Analyst Project Documentation

Issued under Contract No. NFFR7400-10-20265
Conducted on behalf of the National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Science and Technology

Prepared by Laura Johansen, OAK Management, Inc.
March 31, 2011
Edited December 5, 2011

1. Introduction
   1.1. Project Background

The Hawaii Marine Recreational Fishing Survey (HMRFS) is conducted by Hawaii Division of Aquatic Resources (HDAR) (the on-site survey in Atlantic contracted through MACRO and the Gulf States Marine Fisheries Commission in the Gulf). Components of HMRFS include collecting catch data at various shoreline, private boat, boat ramp, and marina sites around the state and conducting telephone interviews of Hawaii households.

The HMRFS is similar in sampling design to the Marine Recreational Fisheries Statistics Survey (MRFSS). In 2006, the National Research Council published findings from a review of the MRFSS in a report titled *Review of Recreational Fisheries Survey Methods*. In response to issues identified in this report, alternative estimation methods were developed to reflect the complex sampling design in the MRFSS. These new alternative catch-rate estimation procedures were tested using data from states on the Atlantic and Gulf coasts and did not include HMRFS data. This project attempted to determine if the new sampling and estimation methods developed under Marine Recreational Information Program (MRIP) can be directly applied to HMRFS data.

   1.2. Objectives

The major objective of the project was to assess the sampling design for HMRFS and to investigate the applicability of new MRIP estimation method to HMRFS. Focus was placed on reviewing the site register (including fishing pressure), sample draw, and other files essential to the alternative estimation methods. Major tasks necessary to complete this work included:

- Compiling and cleaning files for sample selection;
- Examining survey data for components necessary for new methods;
- Editing/modifying existing survey data for alternative estimation methods (e.g. island-based method);
- Helping NMFS to develop new estimation methods/programming; and
- Participating as necessary in meetings or training activities concerning assigned projects.

Tasks were updated following the review of initial results and focus was shifted from determining the applicability of alternative estimation methods to historic data, to ensuring that all necessary information will be gathered and supplied to NMFS for the new sampling and estimation programs to be utilized in the future. Updated tasks included:

- Review HMRFS procedures and provide clarification if necessary;
- Ensure all necessary information is being provided to NMFS;
- Update sample draw program to improve efficiency and applicability to HMRFS specific needs;
- Review Coastal Household Telephone Survey data.

2. Estimation Procedures

2.1. New Estimation Requirements

During an initial review of the new estimation methods, there were two essential components identified that could have posed difficulties in applying these new methods to historical Hawaii data: Time Slice Distribution and Alternate Site Weighting.

The time slice component will allow the sampled on-site survey time slice to be expanded to an entire day. This will be accomplished using a distribution of completed angler fishing days taken from historical CHTS data. A review of CHTS raw data (T1 - household level data files, T2 - angler level data files, and T3 - trip level data files) may be required to ensure the reference time slice dataset can be created for Hawaii using historical data.

In order to account for a large amount of data having interviews and counts from alternate sites (violating random selection paradigm), selection probabilities and associated weights must be applied to these interviews. These weights will be calculated using historic data. In reviewing Hawaii APAIS data, it is important to focus on the I1 datasets as well as all draw files, site registers, and assignment summary forms. These three files must be compared to ensure that the data is correct and consistent.

3. Data Compilation and Formatting

3.1. Historic Data Availability and Formatting

Historic HMRFS data was gathered from both HDAR and NMFS to determine full data availability and consistency. There were four types of data files identified as significant that were reviewed if available:

- Draw Files
- Pressure Files
- Site Registers
- Assignment Summary Forms (ASF)

The series of sample draw files (containing a list of assignments by wave) appear to be the most complete having over 90% of the draw files available for the time period wave 6 2002 through wave 6 2010 (at the time of this project). All of the draw files are in Microsoft Excel format, but not all files contain the same variables and formatting is not consistent.

The pressure files and site register are very important to the new sampling and estimation methods. It is crucial that the pressures used to draw assignments are known and match the pressures listed in the draw files. In order to ensure consistency, the site register and pressure files used for each draw should be saved and documented. This has not been standard practice in Hawaii and therefore a large majority of the pressure and site register files are not available. Very few (likely less than 50%) of the site registers and pressure files used for sample draws between wave 6 2002 and wave 6 2010 are available for review (though more recent years are more complete). This is expected to be an impediment to the implementation of the new estimation methods for historical Hawaii data.

Of the available site registers and pressure files, only the most recent 2 years of data were formatted consistently. The available files were saved in many different formats: Microsoft Excel, .dat, .txt, etc. The files were not named consistently and variables we not formatted the same (when variables of the same name were present). See section 3.3, Pressure Files and Site Registers, for more information on these files.

According to HDAR, all ASF are available. However, none of these forms are in electronic form and would need to be entered into a database before use in the new estimation programs. Further investigation is required to determine completeness of the ASF forms.

3.2. Data Formatting

One of the primary tasks for this project included compiling and cleaning files. Following the initial look into the availability of different files (draws, site registers, and pressure files), steps were taken to convert all files of a single type to one consistent format and then compile (per type: draw, site register, and pressure).

SAS programs were created to read each of the different draw files, site registers, and pressure files. These programs used data manipulation and a template data set to read each file into the desired format and output a copy of the file that could be used to feed into programs preparing them for the new estimation programs.

Many of the available files have been converted to SAS data sets and have consistent formatting. However, the time was not taken to convert and compile all data. Discovering the degree to which historic files are missing and also the inconsistency of formatting led to a change in the prioritization of tasks for the project. With so much of the data required for the new estimation programs missing or unavailable, it was decided

that focus would be taken off of historic data, and placed on the procedures necessary for moving forward. Instead of investigating the applicability of historic HMRFS data to the new estimation methods, focus was placed on ensuring that, moving forward, all necessary information will be gathered and supplied to NMFS for the new sampling and estimation programs to be utilized without problems.

3.3. Pressure Files and Site Registers

In the past, pressure files and site registers have been kept as separate files due to input file specifications required by the draw program. The program required that all pressures be input in a specific format and that format was not consistent with the site register format. However, the pressure file contains information that is taken directly from the site register.

Even when kept separately, these two files should be updated on a regular basis and the pressure for one site in the site register should always match the pressure for that same site in the pressure file. In Hawaii, current practice was not upholding this standard. Due to the direct need for the pressure files (as input for the draw program), they were given primary focus in terms of updating and maintaining. The site register was rarely used at the time of this project and the information between the two files did not match.

When HDAR receives an update to a pressure or information for a site, the project leader opens the pressure file and adjusts the pressure accordingly. The file with the new pressure is saved with the same name as the old and therefore all record of past pressures is lost. This practice is not ideal and is what has caused such large gaps in availability of historical data.

What does all of this mean in terms of updating the procedures in preparation for the new sampling and estimation? More focus must be placed on the site register as the master database of all site information, including pressures. The first step in this was to create an updated complete site register that contains all sites and site information for every island in Hawaii. After obtaining the most up-to-date site registers and pressure files, all files were compared and combined, ensuring consistency, into one master site register for Hawaii. This updated site register is in Microsoft Excel and contains a different sheet for each island. Formatting of this file is consistent across all sheets.

To account for the changes in site register format, changes were made to the sample draw program allowing it to read from this site register. See section 5 of this report for more information on the use of the updated site register and changes to the sample draw program. With these changes, the pressure files are no longer necessary. HDAR will now make all changes to site information and site pressure in one file. The importance of updating the site register and maintaining the formatting in the updated file was expressed to HDAR and recorded in the document Site Register and Draw Program Instructions FEB2011 (See Appendix C for document).

3.4. Assignment Summary Forms

Assignment summary forms (ASF) are filled out by interviewers on each HMRFS on-site intercept assignment and contain data about that assignment. This includes site location, counts of the number of anglers who were not interviewed, times of interviews, etc. On the Atlantic and Gulf Coasts, after an assignment is completed the paper ASF is submitted to the contractor and the data is entered into a database. For HMRFS data, this step has not yet been completed for any of the historic data.

To begin the process of creating the database and making the data entry simple, NMFS staff created a Microsoft Access data entry form. This form was provided to PIFSC staff for use in entering the ASF data. PIFSC plans to hire a student to enter the data.

After the data is entered it will be important to compare the data entered from the paper copy ASF to the comparable fields in the raw Intercept data already in electronic form. These fields include interview dates, mode of interview, count of interviews completed, and more. To prepare for this comparison, a SAS program was written to create all of the ASF electronic files and populate them with those variables that are available from the raw intercept data. This data was provided to PIFSC for later use.

4. Procedural Highlights

While reviewing current policies and procedures used by HDAR in running the HMRFS, several practices were brought to light that deviated from practices currently in use by NMFS on the Atlantic and Gulf Coasts. In order to ensure that the new sampling and estimation methods designed with the Atlantic and Gulf Coasts in mind will be applicable in Hawaii, it is important that these policies and procedures are consistent across the coasts.

4.1. Form Fields

During a meeting with HMRFS project manager, several questions were raised concerning the definitions and importance of fields required on the ASF. Many of the count fields on the ASF are not completed while on assignment and many of the interviewers are not entirely sure of what the fields refer to. For example, the columns MISSED and NOT DONE located in the summary section of the ASF. Currently (and historically) these columns have not been filled in by interviewers. This is problematic. It is important for the new sampling and estimation methods to have counts of the numbers of anglers MISSED (those fishermen who were probably eligible, but who were not approached because the interviewer was busy) and those NOT DONE (fishermen actively fishing), as well as other fields that are currently not being completed by HMRFS interviewers.

NMFS was consulted to provide descriptions of the fields and emphasize their importance. Detailed descriptions of the specific fields highlighted by the HMRFS project manager were provided by NMFS. To assist in clarifying other definitions and procedures, a copy of the 2001 HDAR HMRFS Procedures manual was compiled and

formatting updated (table of contents added for easier navigation). Though this manual is out of date and should be updated, HMRFS project manager was urged to consult this manual for basic definitions of fields as well as guidelines for procedures. The project manager acknowledged that he did have a copy of this manual but the compiled version with table of contents was much easier to use.

4.2. Data Deliveries

Since NMFS produces the catch and effort estimates every wave, it is crucial that all site pressure, sample draw, assignment summary, and raw data are delivered to NMFS consistently. Under the current/old estimation methods, the packaged delivery of data had been incomplete but sufficient for estimation. Though pressure information used for the sample draw was not always delivered, the raw data was and NMFS was able to compute estimates. Under the new estimation methods, other data elements of the HMRFS are becoming important and therefore strict procedures for delivery of data must be developed and followed.

There are essentially four pieces of the data delivery to NMFS that are important:

- The site register containing the information/pressures used in the sample draw for a given month/wave.
- The draw file containing the assignments for a given month/wave.
- Assignment summary forms (ASF) having all fields completed on each assignment. This data should be in electronic form upon submission.
- The raw intercept data

HDAR staff have continually delivered the raw data, but other files have not been included. The importance of these other files including the completed ASF forms has been emphasized throughout this project. Currently HDAR is working to make sure that these new practices are put in place and continued.

The inconsistency in delivery of site registers along with the sample draw file was addressed in the updating of the sample draw program. The new draw program contains an output section that produces all files that should be sent to NMFS. See section 5, Updated Draw Program, for more details.

5. Updated Draw Program

5.1. Changes to Draw Program

The draw program in use for the HMRFS at the beginning of this project had a few deficiencies in terms of efficiency and applicability to Hawaii's island needs. NMFS requested updating the sample draw program so that Hawaii was selecting sample the same way as the Gulf and Atlantic coasts. The changes made to the draw program provided by NMFS were as follows:

- Run for all islands – The updated draw program has been edited to run for either one island at a time, or to loop through all islands. The user enters their choice at the beginning of the run and the appropriate sample draw is taken.
- Specify sample size by island, month, and mode –The updated program allows the user to enter the number of assignments to draw by island, month, and mode.
- Site register input – The updated site register is the only file required as input for the draw. Instead of having to create additional files and input multiple files (one pressure file per island), the same site register (with data updated regularly by HDAR) is used for all runs of the updated draw program.
- Output – In sections 3 and 4 of this document, the importance of deliveries to NMFS was discussed along with the importance of saving copies of the site register used to obtain each draw. The updated draw program takes the input data and creates copies of these files along with permanent output files, using consistent naming, that are to be sent to NMFS following the draw. All files required by NMFS will be created as output in this program, and all files will be formatted as requested by NMFS.
- Coding updates – Other coding updates were made to eliminate manual input.

5.2. Documentation

To ensure a smooth transition to the updated sample draw program, a document outlining instructions on the use of the program and the maintenance of the sample draw were provided to HDAR and PIFSC along with the program. The document describes the site register and draw program, how to edit default values, how to run the program, and how to maintain the site register to ensure the program runs smoothly every wave. See Appendix C, Site Register and Draw Program Documentation, for this document.

6. Coastal Household Telephone Survey

6.1. CHTS Contractor Performance

Prior to 2009, the Coastal Household Telephone Survey (CHTS) in Hawaii was conducted by the contractor that also conducted the CHTS in the Atlantic and Gulf states. Beginning in wave 3 of 2009, Hawaii began using a local contractor to administer the CHTS. Hopes were that this local contractor would help to improve refusal rates, data completeness, and in general, the quality of the data collected. As an additional task on this project, PIFSC requested a compilation of CHTS data and basic summary statistics to assist in a review of local contractor performance.

Hawaii specific data from the CHTS wave reports was compiled into a Microsoft Excel spreadsheet and provided to PIFSC for review. This data will help PIFSC investigate any changes in contractor performance including: refusals rates, percentage of anglers profiled with trip cards, etc.

Data completeness was also a consideration in switching to a local contractor. In order to determine the completeness of the raw telephone data, SAS was used to calculate basic statistics such as:

- Proportion of fishing households that had at least 1 angler profiled
- Proportion of fishing households that had at least 1 trip profiled
- Average number of trips profiled out of total trips reported

These numbers were calculated for all anglers contacted who reside in Hawaii and all results were provided to PIFSC for review.

6.2. CHTS Data Review

Method of fishing and target species are of great importance in Hawaii. There is a general interest in breaking down catch and effort estimates to the method level. PIFSC requested an initial look into the completeness of the data from the CHTS as well as a look at what methods and target species are being reported by anglers.

A summary of methods and target species by year and mode was compiled using SAS. Counts for every year between 2001 and 2010 were collected for every value of the method and target species variables listed. PIFSC staff is exploring this data for possible alternative catch estimation methods based on fishing methods.

6.3. County-level Effort Estimation

PIFSC expressed a keen interest in producing estimates at the county, or even more specific island, level. In order to look closer at this possibility, PIFSC requested a look at effort estimates at the county level (CHTS data is collected at the county level and thus effort estimates should be possible at this level). While reviewing the estimation programs currently in use by NMFS, it was discovered that in 2006 code was added to output county level estimates. All available county-level estimates for Hawaii were compiled and provided to PIFSC for review.

Appendix C: Site Register and Draw Program Documentation

Instructions for New Hawaii Intercept Draw Program and Site Register Maintenance

Laura Johansen, Oak Management, Inc. - February 4, 2011

This document has been provided with the following Excel workbook and SAS program to provide guidance on their maintenance and use:

- Hawaii_Site_Register.xls
  This workbook is the most recent site register for all islands in Hawaii. There are 5 spreadsheets within the workbook, each one containing the list of sites for the given island. The worksheets are named for the islands: Hawaii, Oahu, Kauai, Maui, and Molokai.

  The pressures listed in this site register were confirmed to be correct by HMRFS project manager as of February 3, 2011. Any time changes must be made to the site register, the project manager will make the necessary changes in the appropriate place in this workbook. It is important for the future of the survey that this site register is complete and up-to-date at all times. Note that as of February 2011, the pressures are still listed by month and kind of day with 3 digit values representing pressures for Shore Mode | Charter Mode | and Private Rental Mode respectively (SH|CH|PR). It is likely this will change in the future, but will remain the standard for now.

  Please be sure that you DO NOT change the formatting of any variables or name of any variables. Doing so would cause errors in the SAS draw program. If you wish to make any changes, please notify Laura Johansen (laura.johansen@noaa.gov) or Tom Sminkey, Ph.D. (NMFS) (tom.sminkey@noaa.gov). They will be able to make any appropriate changes to the site register and account for such changes in the SAS draw program.

- HMRFS_Draw_2011.sas
  This SAS program runs the HMRFS draw. The program is setup to run either ALL islands at one time or ONE island at a time. When the program is run the user will be asked to enter the following information:
  - Year of draw
  - Wave of draw
  - Island to draw for OR all islands
  - Number of assignments per island – Number of assignments to draw, specified by island, for each month during the wave.
  - Location (directory) of the Hawaii_Site_Register.xls workbook (the Site Register must have this name and file type)
  - Location to store output files

  The user should simply open the program and click "Run". A display box will pop-up on screen asking the user to enter the information above. Notice that some of the

fields will be populated with default values (See below for information on editing default values). Simply enter the information (use delete/backspace button to clear values, copy and paste will not work in this window) by entering through. Once all information is entered, click enter again and wait for program to run. Nothing further is required. Once the program has finished running there will be 4 new files in the folder you specified as your out directory. The files are as follows (in the examples, the program had been run on February 4th 2011 at 1:39pm:

- Hawaii_sr_04feb11_1339.sas7bdat
  This SAS data set is a SAS copy of the site register used for the draw.
- Drw_HI04FEB11_1339.xls
  This is the list of assignments drawn. The workbook includes one sheet titled the same as the workbook that is the complete list of assignments drawn (includes all islands included in the draw, all months, etc.), one sheet per island/month combination listing the drawn assignments for that island/month, and a simple summary listing some of the variables used in the draw.
- drw_HI04feb11_1339.sas7bdat
  The SAS data set of the entire draw
- Drw_HI04FEB11_1339.log
  This is the SAS log that was produced when the program ran.

In order to **edit the default values** in the draw program, open the program in SAS and find the section at the top of the program pictured below (note the default values may already be different than pictured):

```
%let dir_out = J:\Hawaii;
%let dir_in = J:\Hawaii;
%let year       = 2011;
%let wave       = 1;
%let islabbrv   = ALL;
%let BIGn_assign   = 20 0 15;
%let OAHn_assign   = 30 0 25;
%let KAUn_assign   = 10 0 5;
%let MAUn_assign   = 18 0 12;
%let MOLn_assign   = 7 0 5;
```

This section is where the default values are set. Simply change the value for the variable (ONLY the part of each line between the "=" and the ";") you wish to change and save the program. The sections highlighted in yellow below are the only areas that should be changed, altering the text in the rest of the line would cause an error in the program:

```
%let dir_out = J:\Hawaii;
%let dir_in = J:\Hawaii;
%let year       = 2011;
%let wave       = 1;
%let islabbrv   = ALL;
%let BIGn_assign   = 20 0 15;
```

```
%let OAHn_assign   = 30 0 25;
%let KAUn_assign   = 10 0 5;
%let MAUn_assign   = 18 0 12;
%let MOLn_assign   = 7 0 5;
```

Use the following guidelines when assigning default values:

- dir_out – The path of the folder where all files created during the run of the draw program are saved.
- dir_in – The path of the folder where the Site Register that will be used as input is stored.
- year – 4-digit year (ex: 2011)
- wave – 1-digit wave (range: 1-6)
- islabbrv – This 3-letter uppercase variable specifies which island(s) to run the draw for. Valid values include: ALL, BIG, OAH, KAU, MAU, MOL
- *ISL*n_assign – Each of these variables (one per island) give the number of assignments to draw per month for that island. There should be 3 numbers listed separated by a space, one for shore mode, one for charter mode (currently always 0 because no assignments in charter mode), and one for private rental mode in that order. For example, if you enter 10 0 5, this tells the program to draw (for that island and each month in the wave) 10 assignments for shore mode, 0 assignments for charter mode, and 5 assignments for private rental mode.

Note: Changing other parts of this program could cause the program to error. If changes need to be made, please contact Laura Johansen (laura.johansen@noaa.gov) or Tom Sminkey, Ph.D. (NMFS) (tom.sminkey@noaa.gov).

Delivering the Draw to NMFS HQ

After running the draw program, HDAR can send all of the files created by the draw program to NMFS HQ. This should satisfy the data needs associated with this step of the survey process.