



# Marine Recreational Information Program

## Pacific Islands Regional Implementation Plan 2018-2022

Prepared by the MRIP Ad-hoc Steering Committee  
Approved by the Fishery Data Collection and Research Committee



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# **PACIFIC ISLANDS MARINE RECREATIONAL INFORMATION PROGRAM REGIONAL IMPLEMENTATION PLAN 2018-2022**

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## **Executive Summary**

The Pacific Islands Marine Recreational Information Program Regional Implementation Plan is developed in collaboration and partnership with the members of the Council's Fishery Data Collection and Research Committee (FDCRC) and its advisers. This plan provides the regional information to fulfill the information requirement required by the MRIP Executive Steering Committee for a regional implementation plan. The development of the plan occurred during several phases of individual agency consultations; a writing workshop of the FDCRC-Technical Committee; and the review and approval through the annual meeting of the FDCRC. The Pacific Island region identified five prioritized needs: 1) programmatic review of the Territory creel surveys; 2) full funding for the surveys that meets the minimum survey standards for Hawaii, American Samoa, and the Mariana Archipelago. This may include expansion of surveys (spatial and temporal) to better capture the fishery information and additional technical support for data entry and database management; 3) improved timeliness of non-commercial catch estimates; 4) development of an algorithm that extracts the non-commercial component of the total creel survey catch estimates; and 5) development of mobile data entry system to support near-real time reporting.

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## **Background**

The Western Pacific region is comprised of small island territories and the only island state in the US, each with unique cultures and traditions that revolve around the ocean and its fisheries. The non-commercial segment of the fisheries is comprised of subsistence, cultural-and-traditional take, charter for mostly large pelagic species, and catch-and-release. The number of participants in the non-commercial fisheries is believed to be more than the commercial fisheries. Thus, accurately estimating the non-commercial harvest and status of various stocks is important for maintaining sustainable management practices.

Non-commercial fishery data collection in Hawaii is currently accomplished through the Hawaii Marine Recreational Fishing Survey (HMRFS) for catch information and the Coastal Household Telephone Survey (CHTS) for effort information. Hawaii is one of the last US coastal states transitioning away from the two complementary surveys that were originally developed by the Marine Recreational Fishery Statistics Survey (MRFSS).

Non-commercial fishery data collection in the Territories of American Samoa, Guam, and the Commonwealth of the Northern Mariana Islands (CNMI) is currently accomplished using creel surveys to collect both catch and effort information.

This MRIP Pacific Island Regional Implementation Plan (PIRIP) is designed to identify priority needs and actions associated with understanding and management of the non-commercial fishery in the state/territorial and federal waters in the Western Pacific. This PIRIP augments the Strategic Plan developed for the improvement of fishery data collection developed by the Fishery Data Collection and Research Committee (FDCRC)<sup>1</sup>. An ad-hoc committee was formed to brainstorm and draft the PIRIP. The draft was then reviewed and approved by the FDCRC. The PIRIP also identifies the section of the MRIP Strategic Plan to which the priorities addresses directly or indirectly.

### **MRIP Ad-hoc Committee**

The Western Pacific region lacks a formal regional Fishery Information Network compared to the Alaska, Gulf, Pacific, and Atlantic. An ad-hoc committee was created comprised of staff from the WPRFMC, Pacific Island Regional Office (PIRO), PIFSC, and representatives from the local fishery management departments from American Samoa, Guam, Commonwealth of Northern Mariana Islands, and Hawaii. The ad-hoc committee is tasked to develop the PIRIP. MRIP provided a staff-point-of-contact to support the development of the plan.

### **Regional Collaboration through the FDCRC**

The absence of a formal FIN in the Western Pacific region made regional collaboration and coordination of data collection efforts very challenging. Hawaii DAR implements the commercial, through the mandatory fisher reporting system, and recreational fishery data collection, through HMRFS. The territories of American Samoa, Guam, and CNMI implement creel surveys to collect commercial and non-commercial fishery statistics. There is no formal

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<sup>1</sup> Fishery Data Collection and Research Committee. 2014. A Strategic Plan to Improve Fishery Data Collection and Coordinate Research: Western Pacific 2014-2019. Western Pacific Regional Fishery Management Council, Honolulu, Hawaii, 96813.

governance framework to monitor the status of the data collection and oversee the improvements in the on-the-ground data collection.

In 2014, the WPRFMC created a regional coordinating body comprised of the heads of the local fishery management agencies in the territories and State of Hawaii, the Council, PIFSC, Guam Bureau of Statistics and Plans, and the US Fish and Wildlife Service – Sportfish Restoration Program (funds the fishery data collection in the Territories). This regional coordinating body is called the **Fishery Data Collection and Research Committee**. The mission of the FDCRC is to: “...coordinate and support the improvements in the collection, analysis and dissemination of relevant, reliable and unbiased information and enhance the trusted exchange between stakeholder groups enabling an effective fishery management at all levels”. The FDCRC meets annually to identify data collection issues, discuss the status of the data collection improvement efforts, and approve funding plans that supports data collection. This policy level body is supported by a Technical Committee made up of data program managers, researchers from multiple disciplines, and management staff that uses the fishery data. The governance framework of the FDCRC allows for the committee to function as a regional FIN.

### **Fishery Information Network**

Established in 1981, the Western Pacific Fisheries Information Network (WPacFIN) is a partnership between NOAA-NMFS and fisheries management agencies in American Samoa, CNMI, Guam and Hawaii. Part of the PIFSC Fisheries Research and Monitoring Division (FRMD), Insular Fisheries Monitoring Program (IFMP), WPacFIN provides access to the best available fisheries monitoring data from the Western Pacific region to support a wide variety of fisheries assessment, monitoring and management needs within the region. In addition to NMFS, including PIFSC and PIRO, the WPRFMC is one of WPacFIN’s primary data clients.

WPacFIN partner agencies and data providers for the PIR include the American Samoa’s DMWR; Guam’s DAWR and BSP; the CNMI DFW; and Hawaii DAR. For a detailed history of the data collections that have contributed to WPacFIN since the early 1980s, see Fisheries Statistics of the Western Pacific (vol. 1-32, 198X-2016; <https://www.pifsc.noaa.gov/wpacfin/>).

Since 1982, these agencies have collaborated with WPacFIN to help standardize data collection systems, create compatible data fields and develop automated file transfer protocols (FTP) to improve speed, accuracy and reliability of data sharing. WPacFIN provides a limited amount of funding, and develops and maintains customized software to facilitate data management and file transfer to assist its State, Commonwealth and territorial partners in meeting a growing list of federal requirements. Leveraging funds provided to agency partners via other funding sources (e.g. US Fish & Wildlife Service’s Federal Aid in Sport Fish Restoration Act; NOAA’s Interjurisdictional Fisheries Act and Saltonstall Kennedy Grants, etc.), WPacFIN’s unique role has been to help its partners convert paper data collections into useful computer archives. This role has gradually evolved from providing basic access to computer technology to PIR fisheries agencies, to maintaining a central data warehouse, while compiling and summarizing fisheries data shared via the Internet.

# **Baseline Assessment of Current Regional Data Collection Programs**

## **Hawaii**

### **Hawaii Marine Recreational Fishing Survey**

In 2001, two independent and complementary surveys were re-initiated in Hawaii in collaboration with NOAA Fisheries' Marine Recreational Fishery Statistics Survey's (MRFSS). The Hawaii Marine Recreational Fishing Survey (HMRFS) follows the traditional MRFSS on-site Access Point Angler Intercept Survey (APAIS) used to collect non-commercial finfish catch information for shore and private boat fishing modes. A local contractor currently conducts the Coastal Household Telephone Survey (CHTS) which utilizes a random-digit-dial sampling method of household landline telephones to collect non-commercial effort information for both shore and private boat fishing modes. As of 2017, HMRFS consists of 13 field surveyors (one on Kauai, one on Maui, one on Molokai, six on Oahu, and four on Hawaii), one data manager, and one project manager. Ma and Ogawa (2016) provide a more detailed description of the current sampling and estimation procedures.

The charter boat mode is currently covered by the State of Hawaii's Commercial Marine License (CML) system whereby owners and/or captains of charter boats are lawfully required to purchase an annual CML and report catch and trip statistics on a monthly basis to the Hawaii Division of Aquatic Resources (HDAR). Issues with under-reporting (unreported trips with no catch or reporting of one trip for multiple boats or for multiple trips aboard the same boat on the same day) and non-reporting (suspected charter boats without an associated CML) that were identified in a 2009 MRIP project have been recognized by HDAR and efforts to address these data gaps have been ongoing (Ma et al. 2009). Recently, an online reporting system was developed and introduced to the public in order to expedite the monthly reporting process for both CML holders and HDAR staff. The reporting application is functionally similar to an electronic logbook and can be filled out after the completion of each trip. In conjunction with the online reporting system, the Civil Resource Violation System (CRVS) was also updated to help track late reports and increase compliance rates. Since the inception of the CRVS in 2009 and subsequent alignment with the online reporting system, timely reporting has steadily increased and is currently at over 80% compliance<sup>2</sup>. HDAR is also planning to incorporate a vessel-based CML where boat-based catch and effort would be reported by the owner and/or captain. A vessel license should help to further reduce the amount of under-reporting by charter boat owners or captains who report pooled trips from multiple boats. HDAR also plans to require a dealer license from retailers who purchase fish from CML holders. Similar to the monthly submission of CML reports, the dealers will also have to submit a monthly report which links reported catch between fishers and dealers via a unique CML number. This validation process would be automated between CML and dealer reporting systems and should provide added precision to catch statistics. Education and outreach efforts to address under-reporting and non-reporting has also been gaining momentum by HDAR staff. Proper procedures regarding trip and catch reporting are emphasized with new CML applicants and renewals. Increasing enforcement at strategic harbors is also slowly increasing compliance rates with non-CML associated charter boats.

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<sup>2</sup> personal communications, Reginald Kokubun, HDAR



Major limitations with the current survey design:

1. CHTS. Due to increasing non-response rates and reduced coverage of landline telephones, the telephone survey has steadily lowered confidence in the calculated estimates.
2. Sampling bias. Traditional MRFSS sampling protocols allow field staff to target sampling during peak fishing periods as well as visit up to two alternate sites per assignment in order to maximize intercept rates for any fishing mode.
3. Undercoverage. Site-specific creel sampling (APAIS) for the shore mode limits the potential number of shoreline intercepts and does not provide adequate representation of gear types and various fisheries. With the exception of a few pulse fisheries, fishers generally do not concentrate in a particular area and instead tend to disperse along the coastline.
4. Pooled gears. Significant differences in catch rate among various gear types potentially results in highly variable catch statistics. For instance, rod-and-reel is by far the most common gear used by both shore and private boat fishers in Hawaii (>90%) but the catch rate of this gear type is generally very low. In contrast, though less common, nets (e.g. gill nets, cast nets, surround nets, etc.) generally have much higher catch rates and can create significant fluctuations in catch estimates when gears are pooled.
5. Pooled islands/counties. Due to differences in fisheries, accessibility, population size, and cultural preferences among the different islands in Hawaii, statewide estimates often do not satisfy management needs.
6. Night fishing. A substantial amount of night fishing occurs at least for the shore mode.
7. Invertebrate catch. Beginning January 2012, invertebrate species were no longer recorded as requested by MRIP. However, a variety of invertebrate species are regularly targeted and harvested mostly by non-commercial fishers. Some of the more popular groups include octopus (*Octopus* spp.), lobsters (*Palinuridae* and *Scyllaridae*), crabs (*Portunidae* and *Raninidae*), and limpets (*Cellana* spp.). Many of these species are culturally important and intensively harvested and thus require consistent monitoring.
8. Data processing. Use of paper forms for intercept surveys significantly impacts the efficiency (field recording and key entry errors) and timeliness of data processing and delivery.

Hawaii is at the final stages of the MRIP Pacific Islands Regional Implementation Plan process based upon the three Tiers as outlined by MRIP: Tier 1 – Evaluation, Tier 2 – Innovation, and Tier 3 – Implementation. To meet Tier 1 requirements, an initial review of HMRFS data was conducted in 2011 (Ma et al. 2010) followed by a more extensive meeting in Honolulu from July 17-19, 2012 to formally review the survey design of HMRFS (Ma et al. 2012). The first review evaluated the current survey design and outlined adjustments needed to align HMRFS with MRIP's new estimation procedures. The review also identified potential improvements to the precision of the estimates by stratifying data by county and fishing method to account for differences in intercept sample numbers among counties (islands) as well as the proportion of fishing methods between the APAIS and CHTS, respectively. The second review centered around a workshop which included MRIP statistical consultants, partners from NOAA Fisheries (Office of Science & Technology, Pacific Islands Regional Office, and Pacific Islands Fisheries Science Center), the Hawaii Division of Aquatic Resources (HDAR), and the Western Pacific Regional Fishery Management Council (Council). The current status and limitations of the survey were first presented and evaluated, then potential design improvements were discussed,

and lastly various pilot surveys to test the proposed design changes were agreed upon by all attendees.

Tier 2 was covered primarily from 2013 through 2016 and consisted of three independent pilot surveys conducted exclusively on the island of Oahu. The first project was an address-based mail survey of registered boaters in 2013 testing an alternative to collecting private boat fishing effort information (Hawkins 2012). By utilizing the state vessel registry, a more discrete sampling frame targeting boat-based fishers was established and had promising results (42% response rate). The second pilot survey was conducted in 2015 to test various alternatives to collecting shoreline fishing effort data (Ma and Ogawa 2014). Three surveys were conducted simultaneously: 1) roving catch/effort surveys, 2) an aerial survey, and 3) an address-based mail survey. The mail survey was concluded to be the most comprehensive survey both spatially and temporally. The roving effort survey would provide valuable “ground-truth” information to complement a mail survey, though a common domain covered by both surveys would first need to be established. The expanded spatial coverage of the roving catch survey improved the average number of intercepts as well as captured a greater variety of gear types used by shoreline fishers. The roving survey also incorporated fixed sampling periods (time blocks) which were modeled directly after the new MRIP sampling and estimation strategy that has been in the implementation phase for the Atlantic and Gulf States since 2013 (Breidt et al. 2008). The main advantage of sampling randomized time blocks was to have full temporal coverage throughout the day rather than targeting surveys during times of peak productivity. The aerial survey was not recommended due to several limitations associated with sampling efficiency, coverage, and data processing. The last pilot survey was conducted in 2016 which mainly tested the fixed time block sampling strategy for the private boat mode (Ma and Ogawa 2015, MRIP project report in progress). Tier 3, the final phase, is outlined in this document and will be used to help guide transitioning efforts during the implementation process.

## **American Samoa**

### **Boat-based Creel Survey**

The boat-based data collection focuses mostly on the main docks in Fagatogo and Pago Pago and opportunistically surveying off sites like Aunuu, Auasi, and Asili. The boat-based data collection in Ofu-Olosega and Tau are opportunistic since there is no set schedule for boat to go out and land their catches. The survey follows a random stratified design. The stratification is by survey area, weekday/weekend, and time of day. The survey is divided into 2 phases: 1) participation run; and 2) catch interview phase. The participation run attempts to estimate the amount of participation by counting the number of boats “not on the dock” or presence of trailers. The catch interview phase occurs after the participation run that documents catch composition, catch per unit effort (CPUE), length-weight information, catch disposition, and some socio-economic information. The data is transcribed weekly into the WPacFIN database. Catch expansion is conducted on an annual scale through a simple expansion algorithm using expanded effort and CPUE. For more details of the boat-based creel survey see Oram et al. (in press). There is a non-commercial boat-based fishery to supply fish for family events or fa’alavelave. This non-commercial boat-based operation has limited coverage under the current protocol.

### **Shore-based Creel Survey**

The shore-based data collection covers spearfishing, gleaning, thrownet, rod and reel, hook and pile, gill net, and traps. Data collection follows the same scheme as the boat-based creel survey. The shore-based data collection is conducted by randomly selecting eight hour periods and location 4 to 5 times per week. Survey locations are: west side of Tutuila from Poloa to Vaitogi; central Tutuila from Tafuna to Laulii; and eastern Tutuila from Laulii to Tula. The following information are generated through these data collection programs: 1) catch landing; 2) effort; 3) CPUE; 4) catch composition; 5) length accurate to the nearest centimeter; 6) weights in pounds. The survey follows a random stratified design. The stratification is by survey area, weekday/weekend, and time of day. The survey is divided into 2 phases: 1) participation run; and 2) catch interview phase. The participation run attempts to estimate the amount of participation by counting the number of fishermen along the shoreline. The gear type, number of gear, and number of fishers are recorded. The catch interview phase occurs after the participation run that documents catch composition, catch per unit effort (CPUE), length-weight information, catch disposition, and some socio-economic information. The data is transcribed weekly into the WPacFIN database. Catch expansion is done on an annual scale through a simple expansion algorithm using expanded effort and CPUE. For more details of the boat-based creel survey see Oram et al. (in press).

## **Guam**

### **Boat-based Creel Survey**

Guam's Boat-based Creel Survey Program uses a random scheduling protocol to survey around the island and at three major boat ramp/port areas: Agana Boat Basin; Agat Marina; and the Merizo Boat Ramp to collect catch and effort data and to analyze participation levels in the boat-based fishery.

The boat-based creel survey uses a stratified, randomized data collection program to estimate catch and effort information about boat-based fishing activity. Data collection methods used include a Participation Count and an Access Point Survey (including Boat Logs and Interviews). Data collected from this program are used to expand and create annual estimated landings for this fishery. The data are expanded at a stratum level (expansion period [quarterly or annually], charter or non-charter, day type [weekday or weekend], and gear type) to create the estimated landings by gear type.

### **Shore-based Creel Survey**

Briefly, Guam's Shore-based Creel Survey Program uses a random scheduling protocol to survey the most accessible shoreline areas along Guam's coast to collect catch and effort data and to analyze participation levels in the shore-based fishery.

The shore-based creel survey uses a stratified, randomized data collection program to estimate catch and effort information about shore-based fishing activity. Data collection methods used include a Participation Count, an Access Point Survey (including Boat Log and Interview), and an Aerial Survey. Data collected are used to expand and create annual estimated landings for this fishery. The data are expanded at a stratum level (expansion period [quarterly or annually], charter or non-charter, day type [weekday or weekend], and gear type) to create the estimated landings by gear type.

### **Aerial Effort Survey**

The Aerial Survey collects data to estimate island-wide participation. Staff fly in a plane along Guam's shoreline counting fishermen engaged in fishing and counting the number of observed turtles, sharks and marine mammals. The data collected are used to determine a ratio of fishing effort at the accessible fishing areas versus the non-accessible areas (or the rest of the island).

The information gathered in the Aerial Survey includes (but not limited to):

- Number of gears
- Type of day (weekday or weekend)
- Fishing method
- Reef zone fished
- Shift start time and stop time
- Observations of marine mammals, turtles, sharks
- Take off time and landing time
- Number of marine mammals, turtles, sharks
- Time that fishing activity is observed
- Weather conditions
- Location of fishing activity
- Cloud conditions
- Number of fishermen
- Surf conditions

Other data may include boat-based fishing activities and other incidental information. An aerial survey is conducted on one weekday and one weekend per month. All aerial surveys begin and end at the same place. The direction is always clockwise because of the trade winds and staff needs to see out of the right-hand side of the plane.

## **Commonwealth of Northern Mariana Islands**

### **Boat-based Creel Survey**

The objective of the Boat-based Creel Survey Program is to quantify fishing participation, effort and catch that are collected from vessels in CNMI's waters. DFW had an early creel survey data collection program from 1988 to 1996, however since the methods were not standardized and the data collected with that early program are not currently being used. The early program was terminated due to a lack of resources. On April 2, 2000, the DFW fishery staff reinitiated the boat-based creel survey program on the island's boat-based fishery following a three year hiatus. The fishery survey collects data on the island's boating activities and interviews returning fishermen at the three most active launching ramps/docks on the island: Smiling Cove, Sugar Dock, and Fishing Base. Essential fishery information is collected and processed from both commercial and noncommercial vessels and will be crucial in the management process of one of the island's valuable natural resources.

Saipan's Boat-based Creel Survey Program utilizes a random scheduling protocol to survey at the three most active launching ramps/docks on the island: Smiling Cove, Sugar Dock, and Fishing Base to collect catch and effort data and to analyze participation levels in Saipan's boat-based fishery. The two types of data collection programs utilized by Saipan's Boat-based Creel Survey Program include: Boat-based Participation Count to collect participation data, and a

Boat-based Access Point Survey to collect catch and effort data (through Survey Maps, Boat Logs and Interviews) at the three major boat ramp areas listed above. The data collected are then expanded at a stratum level (expansion period [quarterly or annually], charter or non-charter day type [weekday or weekend], and gear type) to create the estimated landings by gear type for CNMI's Boat-based fishery.

### **Shore-based Creel Survey**

DFW had an early shore-based creel survey data collection program in 1984, and 1990 to 1994, however since the methods were not standardized and the data collected with that early program are not currently being used. The early program was terminated due to a lack of resources. In May 2005 the DFW fishery staff reinitiated the shore-based creel survey program on the island's shore based fishery following an 11-year hiatus. With the assistance of the Western Pacific Fisheries Information Network (WPacFIN) program at the Pacific Islands Fisheries Science Center (PIFSC), data processing software and a database were developed to process these survey data. In addition, expansion software was also developed to create annual expanded (estimated) landings for this fishery.

The objective of the Shore-based creel program is to capture all recreational, subsistence and cultural fishing activities along nearshore fishing areas. The Shore-based survey currently covers the Western Lagoon of Saipan. Some pilot surveys are being conducted on Saipan's Eastern beaches such as; Laolao Bay, Obyan Beach, and Ladder Beach. Other accessible areas are not covered at this time due to existing limited resource availability and logistical constraints. The Western Lagoon starts from the northwest (Wing Beach) and extends to the southwest (Agingan Point) of Saipan. This encompasses over twenty accessible and highly active shoreline access points.

Saipan's Shore-based Creel Survey is a stratified randomized data collection program. This program collects two types of data to estimate catch and effort information of the shore-based fishery. The two types of data collection are: Participation Count (P) and Interview (I). The Participation Count involves counting the number of people fishing on randomly selected days and their method of fishing along the shoreline. The Interview involves interviewing fishermen to determine catch, method used, length and weights of fish, species composition, catch disposition and if any fish were not kept (by-catch). The data collected from this program are used to expand and create annual estimated landings for this fishery.

## **Planning activities of the MRIP Pacific Island Regional Implementation Plan**

### **Ad-hoc Steering Committee Meeting**

The ad-steering committee conducted its first meeting on October 26, 2016 to discuss how to address each component of the regional implementation plan.

*Descriptions of regional needs for non-commercial fishing statistics, including needs for coverage, resolution, precision and timeliness of survey estimates:*

There were several efforts made to determine the regional needs through various meetings and workshops. These events were not specifically geared towards MRIP but do provide the overall

needs to improve the fishery data collection in the region. The regional needs for the non-commercial fishing statistics will be extracted from the following existing documents:

- Evaluation of the territory creel surveys (Bak 2012)
- Review of the HMRFS program by the MRIP statisticians
- Workshop reports on improvements to HMRFS
- Fishery Information Network review reports
- Creel survey data collection documentation (funded by MRIP in 2007)
- Fishery Data Collection and Research Committee – Strategic Plan
- Council 2006, 2009, 2011 Data Workshop reports

*A baseline assessment of current data collection programs, including the extent to which current programs satisfy needs and identification of data collection gaps*

The group agreed that Hawaii is already on the advanced stages of the MRIP Implementation Tier (Tier 1 – Evaluation; Tier 2 – Innovation; Tier 3 – Implementation). HMRFS had already undergone the evaluation stage through the MRIP review of HMRFS (Tier 1) and had conducted the pilot project using the mail survey, creel effort surveys, and aerial surveys (Tier 2). Once the analysis for the pilot surveys is complete then HMRFS is ready to embark on activities for Implementation Tier.

The territories of American Samoa, Guam and the Commonwealth of Northern Mariana Islands have been exempted from the National Saltwater Angler Registry due to the implementation of creel surveys that capture non-commercial information. In order to determine if the creel surveys are adequate to meet the minimum data quality standards of MRIP, there needs to be an evaluation of the territory creel survey programs.

The territories still need to undergo the evaluation stage although there were several projects initiated to address the innovation that can also feed into the evaluation. For example, the Guam Naval Base pilot project funded by MRIP determined that the fish catch and effort in the base is insignificant that it does not warrant a regular data collection program but instead a 5% calibration factor will be added to the creel survey island wide expansion to account for the catches in the base. The evaluation for the Territory Creel Surveys will be included in the Implementation Plan to initiate the process to get to Tier 2 and 3.

*Recommendations and justification for a sequential, prioritized approach for implementing improved methods that address national and regional needs that are currently unmet;*

The group recognized that the analysis for the HMRFS pilot project needs to be completed in order to determine any additional needs for the Hawaii non-commercial surveys. The group needs to consider the following in order to determine prioritization:

- Complete the identification of the data collection improvement needs;
- Identify potential approaches that would improve non-commercial data collection;
- Must consider federal and local management needs;
- Process should follow the established Tiers from evaluation to transition;

*A proposed process for combining statistics derived from multiple sources;*

For each island area, transitional planning of any new or revised methodology needs to be established following MRIP approval. Due to differences in implementation status for each area,

planning will be independent for each of those areas. Hawaii is the only area in the Western Pacific that collaborates with MRIP and is provided with direct technical guidance. In Hawaii, NMFS-OST is currently conducting the Fishing Effort Survey (FES, mail survey) to run parallel with the CHTS in 2017. Due to the absence of a non-commercial permit or license registry, the FES in Hawaii is based upon all household addresses and thus cannot complete the license matching stage which may reduce the efficiency of the survey. The FES is scheduled for a single year of parallel analysis with the CHTS with the intent of calibrating historical estimates. A subsequent analysis of the sampling level and associated cost to maintain or improve the current PSE level may be addressed following calibration.

The Territories collaborate with and receive technical guidance from WPacFIN. Fishery data from each of the Territories is centralized at WPacFIN where catch and effort estimates are calculated and posted. The committee noted that for the Territories, aside from the existing creel surveys, there are no other sources of non-commercial fishery statistics. If new surveys were to be developed, the fields must be compatible and take into consideration WPacFIN priorities. In developing the regional implementation plan, the group will consider using the Gantt chart to outline the various activities to be proposed in the plan.

### **Island agency consultations**

WP Council staff met with representatives from the Division of Aquatic and Wildlife Resources in Guam, Division of Fish and Wildlife in CNMI, and Division of Aquatic Resources in Hawaii on February 15, 16, and March 1, respectively, to discuss the details of the need identification and prioritization of needs.

For the Territories, the largest gap is the review of the existing creel survey program to determine the reliability of the catch estimates produced by these surveys. The survey design was developed in the early 1980s for the boat-based surveys while the shore-based surveys were developed in the late 80s to early 90's. It would be complacent to assume that the fisheries haven't evolved since then whereas the data collection has remained the same for decades. There were also some issues with maintaining base operations due to significant reduction in funding from the Wildlife and Sportfish Restoration Program and the Interjurisdictional Fisheries Act. Once assessed, gaps can be identified and steps can be taken to address those gaps.

For the State of Hawaii (latest meeting on March 1, 2017), the immediate needs are: 1) maintaining base-operations; 2) completing the certification; 3) calibration of historical HMRFS data; and 4) initiating the transition to the new methodology. In addition to these needs, HDAR is interested in increasing the resolution of their local surveys to include data stratification at island and gear levels as well as including invertebrate catch and effort data. Certain types of data such as invertebrate catch can be excluded and other strata pooled prior to delivery to MRIP for traditional estimation calculations. Database development would be required to accommodate the various survey design changes and would also incorporate the necessary programming adjustments for standard data processing and delivery to MRIP as needed. There is also interest in developing a more localized non-commercial fishery data analytical framework that caters to local and regional fishery management needs that require higher resolution information compared to the national requirements.

## **Fishery Data Collection and Research Committee – Technical Committee Deliberation**

The Fishery Data Collection and Research Committee-Technical Committee (FDCRC-TC) met on April 20 and 21, 2017 to evaluate the current non-commercial data collection system, identify data collection gaps, and prioritize the needs to support improvements in the non-commercial data collection system.

The following are the gaps identified by the respective Pacific Island Territories and State of Hawaii:

1. Lack of a comprehensive statistical review of the data generated from existing creel surveys in American Samoa, Guam, and CNMI;
2. Insufficient spatial and temporal coverage for the shore and boat based creel surveys;
3. Resource limitation in implementing the MRIP reviewed pilot-surveys in Hawaii;
4. Resource limitation in implementing base data collection program;
5. Resource limitation in pilot testing and implementing electronic monitoring;
6. Lack of examination on the efficacy of the expansion algorithm and the allocation of commercial and non-commercial segment of the total catch;
7. Lack of comprehensive analysis for the Guam aerial survey results to determine efficacy of the data to improve non-commercial fishing effort;

## **Description of Regional Needs for Non-Commercial Fishing Statistics**

A consensus among the FDCRC-TC resulted in the following prioritized list of important non-commercial data collection improvement needs:

1. Review of the Territory creel surveys to:
  - a. Evaluate the statistical rigor of the existing survey design;
  - b. Identify sources of errors and bias in the catch estimates;
  - c. Identify gaps and needs to improve the catch estimates;
  - d. Evaluate the expansion algorithm (including the estimation of the noncommercial segment of the total catch) and recommend potential improvements;
2. Completing the review process and securing MRIP certifications for the recommended regional survey designs;
3. Full funding for the surveys that meet the minimum survey standards for Hawaii, American Samoa, and the Mariana Archipelago. This may include expansion of surveys (spatial and temporal) to better capture the fishery information and additional technical support for data entry and database management;
4. Improved timeliness of non-commercial catch estimates;
5. Development of an algorithm that extracts the non-commercial component of the total creel survey catch estimates
6. Development of mobile data entry system to support near-real time reporting

Each priority is described below in more detail to provide justification for the regional importance along with the approach for implementation and the estimated annual costs.

### **Review of the Territory creel survey program:**

The Territory creel survey programs were established in the 1980's to characterize the territorial fisheries, both shore and offshore. These survey programs are funded through the Dingell-



Johnson Sportfish Restoration Program administered through the US Fish and Wildlife Service and through the Interjurisdictional Fisheries Act. The surveys cover both non-commercial and commercial fisheries to generate an estimated total catch.

Since its establishment in the 1980's, the survey programs have not undergone a formal programmatic review. The Council attempted to evaluate the programs by documenting the potential sources of errors and bias through a third-party contractor and document the catch expansion in an attempt to improve on the data collection protocol and estimation process (Bak 2012). The report concluded that the currently implemented survey program may not be adequate to provide statistically valid estimates due to: 1) the survey design and strategy of the creel survey programs do not extend to all fishery sectors; 2) the operational procedure and protocols of the creel survey programs are unclear, in practice, thus producing unknown errors in the data and estimates; and 3) the Expansion Algorithm uses unverified assumptions and imputation methods that introduce unknown level of uncertainty in the estimates.

In 2009, the Territories of American Samoa, Guam, and CNMI requested an exemption (50CFR§600.1415) in the implementation of the National Salt Water Angler Registry. The justification for the exemption was the implementation of the creel surveys. Part of the conditions in receiving an exemption was the assessment of how the data conforms to the requirements of §600.1416 or 600.1417. To our knowledge, there has been no formal review of the quality of data. Further, §600.1417(b)(4) requires the data collection program to “meet NMFS survey design and data collection standards”. Our interpretation of this requirement is that the data collection in the Territories must meet the survey design and data collection standards of MRIP.

**Coverage:** The plan calls for MRIP to review the boat-based and shore-based data collection program in American Samoa, Guam, and CNMI. The review may cover the following aspects of the programs: 1) history of the program; 2) program goals and objectives; 3) the historical and current survey design (includes temporal and spatial coverage) and estimation process; 4) issues and challenges in the implementation of the data collection program; 5) survey errors and biases; 6) recommendations for improvements. It is critical to have the review conducted in the Territories for the reviewers to have a first-hand look at the overall institutional capabilities in conducting and maintaining the surveys. This will also provide an opportunity to craft improvement recommendations that will fit each area.

**Resolution:** The resolution of the review should cover the fine details including the estimation process based on the design-based system. One of the issues the region face is the questionable reliability of the catch estimates. The catch estimation system does not internally document the potential infusion of bias and errors when there is a low sample size.

**Precision:** Not applicable at this time

**Timeliness of survey estimates:** Not applicable at this time

**Annual cost estimate:** The cost associated with this need would depend on whether the cost will be covered internally by MRIP through their review line items or will be a project outsourced to the MRIP applicants. If the cost of the review will be covered internally by MRIP then the outside cost will be minimal. If the cost will be outsourced, then the cost is estimated to be \$75,000 (\$25,000 per jurisdiction to be reviewed). This includes the professional cost of three reviewers, venue rental for the review, and travel associated costs.

## **Full funding for the surveys that meets the minimum survey standards for Hawaii, American Samoa, and the Mariana Archipelago.**

### **Hawaii**

#### ***Mail Survey***

**Coverage:** An address-based mail survey is recommended to replace the current CHTS for both private boat and shore modes. This mail survey aligns with MRIP's Fishing Effort Survey (FES) that is currently being calibrated for implementation in the Atlantic and Gulf states. As of 2014, the State of Hawaii vessel registry has been modified to include a principle use category of "non-commercial fishing." The registry serves as an adequate sampling frame for private boat fishers but does not have sufficient coverage for shore fishers. Due to the lack of a non-commercial fishing license and thus an ideal sampling frame, a random sample of households will be used to sample for the shore mode. The mail survey would be conducted statewide on the islands of Kauai, Oahu, Maui, Molokai, and Hawaii (potentially weighted and stratified by district).

**Resolution:** The mail survey would be conducted every Wave (two months) and would cover both day types (weekend/holidays and weekdays), day and night fishing activities, as well as public access areas, remote areas, and private/restricted areas. Questions pertaining to specific gear usage (number of gears and hours used on a typical trip) for both finfish and invertebrate targets would also be addressed.

**Precision:** A minimum of 30% precision (PSE, percent standard error) in total effort and participation per Wave or two-month period accuracy (power analysis to verify ).

**Timeliness:** Data submission every Wave (two months).

**Annual Cost Estimate:** \$200,000 (contractor, postage, and materials).

#### ***APAIS***

**Coverage:** The current APAIS is sufficient for sampling the private boat mode only (insufficient for sampling the shore mode). The APAIS would continue at public boat ramps statewide on the islands of Kauai, Oahu, Maui, Molokai, and Hawaii.

**Resolution:** The APAIS would be conducted during the day at popular public boat ramps and would cover both day types. More information regarding the extent of non-commercial night fishing activity for the private boat mode would be needed to justify night sampling. Preliminary observations of effort at targeted boat ramps would be needed to appropriately adjust pressure coding on the site register prior to any night sampling. During the day, three 6-hour time blocks (7AM-1PM, 1PM-7PM, and 11AM-5PM) would be sampled and if sampling were to be conducted at night, only two additional time blocks would be needed (7PM-1AM and 1AM-7AM). The morning and afternoon time blocks would ideally be shifted by one hour as compared to the Atlantic and Gulf States (8AM-2PM, 2PM-8PM, and 11AM-5PM) in order to more appropriately reflect day versus night in Hawaii. Because Hawaii does not follow daylight savings adjustments, temporal fluctuations for sunrise and sunset are not as drastic between winter and summer months. In addition to the current on-site survey questions, questions pertaining to specific gear usage (number of gears and hours used as well as gear-specific catch) for both finfish and invertebrate targets would also be addressed. Questions related to catch would also be modified to accommodate boat-based catch.

**Precision:** A minimum of 30% precision accuracy (in total biomass based upon gear-specific catch rates ).

**Timeliness:** Monthly data submission.

**Annual Cost Estimate:** \$880,000 – a minimum of 11 additional surveyors (salary, fringe, mileage, supplies, & equipment) to cover both the APAIS and the roving survey (see next section). Including both current and additional field staff, there would be a total of four surveyors on Kauai, four on Maui, four on Molokai, six on Oahu, and six on Hawaii.

### ***Roving Survey***

**Coverage:** A roving survey is recommended to replace the current APAIS for catch information as well as provide complementary effort information to support the FES for the shore mode only (APAIS is sufficient for sampling the private boat mode). The roving survey would be conducted along publicly accessible stretches of coastline statewide on the islands of Kauai, Oahu, Maui, Molokai, and Hawaii. A roving survey covers broader geographical areas when compared to the traditional APAIS design.

**Resolution:** Results from the pilot mail survey (Ma and Ogawa 2014) suggest as much as a third of the total shore fishing trips occurred at night. Thus, similar to the new APAIS sampling design, the roving survey would be conducted during the same fixed time blocks during both the day and night and would cover both day types. A minimum of two weekend/holiday nights and two week nights would be sampled per island per month. In addition to the questions asked during the current on-site survey, questions pertaining to specific gear usage (number of gears and hours used as well as gear-specific catch) for both finfish and invertebrate targets would also be addressed. Interviews would not be limited to completed trips but would allow for incomplete trips. The expected result from expanded spatial coverage as well as the ability to interview fishers who are actively fishing is an increase in overall sample sizes, especially for less common gear types with characteristically higher catch rates. In order to minimize sampling effort and maximize sampling efficiency, recording of both effort and catch is recommended during a single assignment. Though separate assignments were drawn specifically to collect either fishing effort or catch during the pilot roving survey, it was demonstrated that both types of data can be efficiently collected simultaneously during the catch survey assignments. In order to minimize sampling bias, effort data would be collected initially in one direction of a survey route, then catch data would be collected on the return trip. This survey protocol is currently followed in the Western Pacific island territories of Saipan and American Samoa which share similar characteristics to Hawaii and is thus suitable and more cost effective than conducting separate effort and catch assignments.

**Precision:** A minimum of 30% precision in total biomass based upon gear-specific catch rates.

**Timeliness:** Monthly data submission.

**Annual Cost Estimate:** Included with APAIS cost estimate.

### ***Database Development***

**Coverage:** Creation of a new database and data entry program to accommodate new survey design changes. A secondary QA/QC program may also be developed to identify more subtle errors with compiled monthly data sets.

**Resolution:** Onsite data entry using electronic devices such as tablets would vastly improve efficiency and eliminate additional time and resources needed to deliver paper forms to the main office in Honolulu, review of forms for completeness and accuracy, then entry data into a central database. The efficacy of using electronic devices for creel surveys is currently being explored

by multiple MRIP projects and is considered a significant improvement to current data collection programs (Hibschi 2012, Hibschi 2013, Hibschi 2014a, Hibschi 2014b, and Sminkey 2015).

**Precision:** Built-in QA/QC measures would significantly reduce the amount of errors and can be validated in the field when prompted.

**Timeliness:** One year.

**Annual Cost Estimate:** \$100,000 – rugged tablets (\$60,000 at \$1,500-2,500 each), software development (\$20,000), and surveyor training (\$20,000 to cover workshops and travel costs).

### ***Database Management***

**Coverage:** Database maintained on a secure local server (Hawaii Department of Accounting & General Services, Information & Communication Services Division).

**Resolution:** N/A

**Precision:** N/A

**Timeliness:** One year.

**Annual Cost Estimate:** \$5,000 (initial hardware purchase, no maintenance cost).

### **American Samoa**

American Samoa will be focusing on a pilot survey to address the spatial and fishery sampling gaps of the current non-commercial creel program:

- (1) There is a non-commercial bottomfishing activity of 3-4 boats once a month in Aunu'u Island. This has not been covered in the current creel program. This fishery will be covered in this pilot project;
- (2) The non-commercial trolling conducted by the members of the Pago Pago Gamefishing Association. Although the American Samoa DMWR is conducting surveys covering this fishery, this has not been integrated to an estimate of total fisheries in the Territory. There is a need to develop a platform in the current WPacFIN database to incorporate the survey data.
- (3) Analyses suggest that the adequate number of interviews per fishery is around 50 to 60 per year spread out through the year to cover seasonality. This was conducted on all fisheries except for the non-commercial bottomfish fishery. An analysis of the fishery interviews indicates the number of interviews conducted is below this recommended level. A couple of years have 0 to 2 interviews. We propose to pilot a project to conduct specific interview days to address this gap.
- (4) In addition, the current shore-based creel program only covers the southern part of Tutuila and this is an obvious gap in the current program. This has significantly limited the estimation of the total catch in Tutuila and in American Samoa as a whole.

A pilot creel survey was previously conducted at unsampled ports and shoreline to calibrate adjustment factors in the expansion of catch, effort and CPUE from existing creel survey in American Samoa. The short (6 months) pilot project estimated that the current creel survey program is missing a significant portion of the fishing activity. There are three major fishing grounds that are not covered in the current creel program. The unrecorded creel effort ranges from 25% to 38% of the total fishing effort. However, the missed creel may be as much as 80% due to differential distribution of fishing gear activities in Tutuila. The calibration factor varies from estimated catch/0.62 to 0.75 using gear distributions and fishing hour distributions, respectively. A longer pilot survey covering 2-3 years is proposed to cover variabilities in fishery

operations covering a wider range of changes in climate. The quarterly statistical analyses of catch will be conducted of the daily fish catch per non-commercial fishing gear between sampled (eastern central or western Tutuila) and unsampled sites (northern Tutuila combined) and the results will refine the subsequent sampling effort of these unsampled sites.

Quarterly data analysis is proposed to provide estimates of resolution and precision of the sampling effort. Technical support will be provided by the WPacFIN Database staff. The annual budget is estimated at \$75,000 to cover personnel, fringe benefits, and supplies.

### **Guam**

Guam has had a standardized creel format protocol since 1985. During surveys, effort, method, weather, and species caught are some of the data collected. Guam DAWR has the longest time series of species level creel survey data in the Pacific. DAWR staff undergoes regular training in fish identification so that surveys can be maintained at the species level.

Recent changes in the demographics of the fisheries on Guam have brought changes in fishing practices and methodologies. It is now common to have a group of fishers go out together, and return with a large catch of mixed species in a cooler. As catch reporting is not mandatory under Guam law, it is incumbent on the DAWR staff to assess catch as best as possible in a timely manner according to the goodwill of the fishers. When these individuals return from fishing, they do not often allow adequate time for DAWR staff to identify the complete catch to the species level, resulting in a catch classified under the catch all category of assorted reef fish. This category includes estimates of species, lengths, and total weight of catch.

To identify catch to species in the field can be time consuming. A useful tool to assist DAWR in increasing the accuracy of these interviews would be an electronic “tablet” type device which could be used to photograph a catch, for processing at a later, less hectic, time. Software that estimates the size of objects photographed would be extremely useful as well. These would increase the accuracy of DAWR creel survey by allowing a higher percentage of these “assorted reef fish” catches be identified to species with corresponding lengths.

DAWR requests funding for three tablet type electronic devices with photographic capabilities, as well as software which can estimate size of objects photographed. Estimated cost, \$1500.00

### **Commonwealth of Northern Mariana Islands**

#### ***Survey expansion to increase resolution on the island of Saipan***

**Coverage:** The current shore-based creel survey is solely focused on the Saipan Lagoon on the western side of Saipan. A pilot study has been conducted on other areas in Saipan and these catches were found to be needed for monitoring. A permanent survey is needed to incorporate this information into the Saipan non-commercial catch estimates. This creel survey will follow the basic design of the current shore based creel, but will need to be updated to ensure full coverage. The survey will cover the northern cliff fishing areas, western side pocket beaches, LaoLao Bay, and southern beaches and cliff fishing locations.

**Resolution:** The resolution will be at the fishing site level. This will allow catches from individual areas to be analyzed while allowing for island and jurisdiction wide combining of data.

**Precision:** The precision will be at gear type level. Shore-based fishing from land like hook and line and cast netting will be well captured while shore-based fishing while in water like spearfishing and gleaning will be lacking. The species contribution will be parsed using the ratio in the species composition file.

**Timeliness of survey estimates:** Survey estimates will be produced at least semi-annually.

**Annual cost estimate:** Annual cost estimate will be \$120,000. This will provide enough staff and equipment to complete the needed surveys.

#### *Survey expansion to the neighboring islands*

**Coverage:** The current shore-based creel only operates on the island of Saipan. A pilot creel study has been conducted in Tinian and a separate pilot creel in Rota. These smaller islands are important to capture in the non-commercial fishing effort of the CNMI, and these estimates need to be integrated with the Saipan surveys to provide catch and effort for the entire CNMI. Surveys need to be conducted in each of these less populated islands periodically to update the catch and effort estimates for these islands. The smaller populations of these islands mean that it would not be cost effective to have a continual creel survey operating on each island. Every 3 to 5 years a survey should be conducted on Tinian and Rota to update the estimates. These surveys will follow the Saipan creel and pilot studies for each island incorporating lessons learned.

**Resolution:** The spatial resolution for this project will be at the fishing site level. This will allow catches from individual areas to be analyzed while allowing for island and jurisdiction wide combining of data.

**Precision:** The precision will be at gear type level. Shore-based fishing while on land like hook and line and cast netting will be well captured while shore-based fishing while in water like spearfishing and gleaning will be lacking.

**Timeliness of survey estimates:** Survey estimates will be produced one year after each island survey is completed.

**Annual cost estimate:** Annual cost estimate will be \$80,000. This will provide enough staff and equipment to complete the needed surveys.

#### *Use of remote observation and mobile technology for surveys*

**Coverage:** The current shore-based creel has a problem with participation and catch information from certain gear types. Shore-based fishing while on land like hook and line and cast netting are well captured while shore-based fishing while in water like spearfishing and gleaning will be lacking. An additional creel survey that targets spearfisherman needs to be developed to fill in this gap. The survey methods need to be flexible allowing staff to intercept fisherman when they come in as these types of fisherman only pass the interaction point once during a fishing trip. Using novel methods of participation counts and interviews also need to be developed. Current Saipan creel protocols have surveys counting participants from shore using binoculars when fisherman may be upwards of a mile and a half from shore. While more commonly fishermen are fishing within half a mile from shore, it is still difficult to spot individual fishermen that are barely exposed above the water from shore. Roving creels using a boat to intercept fisherman is one option but it may not be cost effective. A better possible approach using current technology is the use of a drone with a camera. Aerial surveys have been used in other jurisdictions but are often cost prohibitive or require extensive coordination with the aviation company. Use of a

drone to count participation will allow for quicker participation counts and allow surveyors to better predict when interviews are possible. Interviews can also be improved by enlisting fishermen to upload pictures of their catch online using their personal phones or tablets. This method will require outreach to explain the process and desired data needed to fishermen. It will also involve setting up a website with the ability to upload data and pictures of catch. A known size object (e.g. ruler or coin) can be used calculate size of uploaded fish pictures.

**Resolution:** The resolution for this project will be at the fishing site level. This will allow catches from individual areas to be analyzed while allowing for island and jurisdiction wide combining of data.

**Precision:** The precision will be at gear type level. Spearfishing will be the primary gear target, but other types of fishing will be able to be monitored.

**Timeliness of survey estimates:** Survey estimates will be produced at least semi-annually.

**Annual cost estimate:** Annual cost estimate will be \$130,000. This will provide enough staff and equipment to complete the needed surveys.

#### ***Support for data management***

Technical assistance managing the Saipan creel survey data is currently provided by the Western Pacific Fisheries Information Network (WPacFIN). They are only able to provide assistance for existing surveys. Adding additional surveys to improve the data collection efforts in the CNMI will result in a need to manage, incorporate, and consolidate these new data streams into a useable catch and effort estimate for the entire CNMI. The resolution will be at the fishing site level. This will allow catches from individual areas to be analyzed while allowing for island and jurisdiction wide combining of data. The precision will be at gear type level. Survey estimates will be produced at least semi-annually. Annual cost estimate will be \$30,000. This will provide enough staff and equipment to complete the needed surveys.

#### **Improved timeliness of non-commercial catch estimates**

The catch and effort estimates from the Hawaii Marine Recreational Fishing Survey (HMRFS) and creel surveys in the territories are used for stock assessment and for annual catch limit (ACL) monitoring. Currently non-commercial catch estimates from HMRFS can be used for stock assessment for Deep-7 bottomfish and for coral reef fish in Hawaii. Monitoring of ACLs in Hawaii is currently based on catch from the commercial fishing reports and/or log book reports for the commercial sector. For Deep-7 bottom fish, the fishery is closed for both commercial and non-commercial fishing when the catch from the commercial sector reaches the annual catch limit. In the territories, catch estimates (including commercial and non-commercial fishing) from creel surveys are used for ACL monitoring and for fish stock assessment.

The estimates of catch and effort from HMRFS are generated for every two months. The preliminary estimates are usually posted in the first half of the following year and the estimates are finalized several months later. Presently there are no specific ACLs for non-commercial fisheries per se in Hawaii. Thus timeliness is not critical for non-commercial catch estimates because there is no need for in-season monitoring. This is a significant area of management improvement. Attaining a near-real time monitoring for the non-commercial sector of the fisheries is essential in the implementation of ACL-based management.

Non-commercial catch estimates generated annually satisfy the timeliness needs for stock assessment<sup>3</sup>. However, in order to improve on the management of the stock, particularly the Hawaii deep-7 bottomfish, monitoring the non-commercial catch in a near-real time manner needs to be conducted. The Hawaii deep-7 bottomfish fishery is the only insular fishery in the Western Pacific region that has an in-season ACL. The catches are, however, tracked using the commercial data due to absence of real-time monitoring of the non-commercial catches. Once the ACL is reached, both the State and Federal waters close and it is prohibited to possess deep-7 species which addresses the non-commercial segment of the fishery. A separate in-season catch monitoring should be developed for the bottomfish and coral reef fisheries.

For territories, the catch and effort estimates are usually made yearly even though the estimates can be made quarterly for catch coming from common gears and common fishing methods (i.e. trolling and hook & line). The number of survey assignments would need to be increased in order to get quarterly catch estimates from non-common gear types and non-common fishing methods<sup>4</sup>. Annual estimates satisfy the timeliness needs for stock assessment in the territories. The catch estimates from creel surveys in territories include catch from commercial and non-commercial catch. Catch disposition has been used to estimate the proportion of non-commercial catch (Walker et al. 2012).

In order to attain improved timeliness of the non-commercial estimates, the plan requires hiring a well-qualified data manager that would oversee the timely submission and transcription of the data sheets. The manager will also monitor the progress of the data collection by tracking the sample size of the participation count and the catch interviews by fishery. This can be done through the development of a database analytics tool that summarizes the data holdings and conducts descriptive statistics (including power analysis) to determine how much more data is needed to attain the precision of the non-commercial catch estimates.

The overall cost of implementing this priority is \$120,000 per year (\$40,000 per jurisdiction) for the data manager position. The database analytics software was already developed for CNMI. The cost of developing this tool is \$35,000 x 2 (Guam and American Samoa; hardware included). This is not an annual cost.

### **Development of algorithm that extracts the non-commercial component of the total creel survey catch estimates**

The creel survey covers questions on the disposition of the catch whether all or a proportion of the catch will be sold. The unsold proportion of the catch is deemed the non-commercial component. There is a need to establish a statistically viable means of extracting this information from the estimated total catch. There is also a need to automate the results and be transmitted to MRIP for the national reporting. This is part of the conditions of the Memorandum of Agreement for the exemption where the data will be shared with NMFS (50CFR §600.1415(b)(2)).

**Coverage:** The development of the non-commercial catch proportion algorithm will cover several fishing methods as long as there is a large enough sample size to estimate the total catch.

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<sup>3</sup> personal communications, Annie Yau, PIFSC

<sup>4</sup> personal communications, Michael Quach, PIFSC



This algorithm may be applied to the territory bottomfishing, trolling, shore-based rod-and-reel, and cast nets. Future improvements in the data collection program will increase the number of fisheries that will be included in the non-commercial reporting.

**Resolution:** The algorithm will be applied to the gear level. Expanding the algorithm to cover the whole coral reef fishery and the bottomfish fishery is dependent on the robustness of the total catch estimate. The calculation of the species level non-commercial catch estimates will be challenging given the coarseness of the taxonomic resolution implemented in the surveys. Only the dominant species will be reported on a species level. The algorithm needs to be able to generate quarterly estimates in non-commercial catch.

**Precision:** The precision of the annual non-commercial catch estimate will be consistent with the estimated CV described in priority #2.

**Timeliness of survey estimates:** Depending on the amount of collected data and the reliability of such, the algorithm will generate at minimum quarterly estimates for the bottomfishing, trolling, rod-and-reel, and cast net fisheries. For other fishing methods, it will be at an annual level.

**Annual cost estimate:** Majority of the cost is associated with contracting a statistician and programmer to map the estimation procedure and develop an appropriate algorithm that would extract the non-commercial portion of the catch. This is estimated to be at \$50,000. This includes the development of the graphic user interface that allows for downloading and visualization of the data.

### **Development of mobile data entry system to support near-real time reporting**

In order to support the timeliness of the data submission, the FDCRC recognizes the importance of upgrading the surveys to utilize electronic monitoring and reporting. Mobile technology is starting to become more and more robust and available to support faster information exchange. New technology allows for a more efficient information transfer if designed properly. The camera technology, development of fish identification application and the use of image analysis to derive length from a standard photo increases the efficiency of the surveys.

**Coverage:** This priority will be implemented on both the boat-based and shore-based creel surveys. This will be used on all the shifts and the GPS on the tablet or mobile phone will log the location and associate the location with the data point. This will cover all the fisheries and fishing methods that will be intercepted during the survey.

**Resolution:** This will enhance the taxonomic resolution of the surveys by providing a documented photo of the catch that can later be validated either by fish ID books, outside experts, or an application specifically designed to support the survey. This will also provide high spatial resolution for the data collected using the GPS coordinates built into the tablet or mobile phone. It is expected that the data resolution will improve as well because the data collectors will no longer have to estimate the fish remaining in the coolers but able to efficiently go through the catch by taking photos. The weight data can be derived from using the allometric length-weight conversion from the NMFS BioSampling Program.

**Precision:** It is expected that the precision will be enhanced since majority of the potential steps that errors can be infused will be automated. It is critical to develop a robust Quality Assurance/Quality Control filter that would raise flags if there are potential errors in the data.

**Timeliness of survey estimates:** The timeliness of the data will be an essential by-product of this priority. This priority envisions that the quarterly estimation will be improved when this priority is combined with priority 3 and 4.

**Annual cost estimate:** The cost associated with this project will be broken down into several components: 1) hardware; 2) annual subscription; and 3) software support. The hardware will include the one time purchase of the tablet and accessories to protect the tablet (e.g. waterproof case, carrying bag) and supplies for the surveys. The hardware cost is estimated at \$2,000 for all areas. The annual subscription is associated with the 4G WiFi for one year for all areas. This is essential to get the real-time upload capability. This is estimated at \$8,000 for all areas. The software support is the largest expense. This is associated with the development of the software that allows for the electronic input of the data and communication with the data servers. This also includes the QA/QC support to screens the data for potential errors. Included in the package is the development of a fish ID application that would provide photos to the data collector to enhance the taxonomic identification of the catch. Another aspect is the automation of the length measurements from the picture with a known reference-sized object via image analysis. Once the general framework is developed, then the software can be tweaked to cater the needs of each jurisdiction. This cost is estimated at \$100,000.

## **Recommendations and Justification for a Sequential Approach for Implementing Improved Methods**

For the Territory creel surveys, the programmatic review constitutes the critical stage of improving the non-commercial fishery data collection. The recommendation provided by the reviewers will be the basis for the actions needed to improve the non-commercial catch estimate. The pilot project results submitted to MRIP will be based on the review. The implementation of the third, fourth, and fifth priority is independent on the outcome of the review. These priorities can be applied concurrent with the completion and implementation of the pilot projects from the review recommendations.

For the State of Hawaii, the recommended survey design changes would be implemented in several stages. During the first year, preparation for both the mail (effort) and roving surveys (catch and effort) would be the primary goal. Calibration of the mail survey (FES) with the CHTS has already begun in Hawaii (Wave 1 (January-February) of 2017) so the next immediate step would be the development of two similar mail surveys specific for the shore and private boat modes. These surveys would be modeled after the pilot shoreline mail survey and adjusted accordingly. In addition to the mail surveys, the intercept survey would also be modified following the pilot shoreline roving survey as a template. Unlike the mail survey, only one intercept survey would be used for both the APAIS (private boat mode) and roving survey (shore mode). Both mail surveys and the intercept survey would require OMB approval and would ideally be submitted for review as early as possible.

A transition plan for the Western Pacific region will be developed following the process described in the Atlantic and Gulf region<sup>5</sup>. The new method needs to be calibrated with the existing method in order to optimize the historical time series brought about by the new method used.

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<sup>5</sup> <https://www.st.nmfs.noaa.gov/Assets/recreational/pdf/MRIP%20FES%20Transition%20Plan%20FINAL.pdf>

Pending MRIP certification, the roving survey sampling routes for the shore mode would also be developed for each island during the first year. A surveyor(s) from each island would work closely with the project manager during the development process to ensure that the routes are realistic and manageable. Following implementation, some of the routes may require adjustments in order to maintain sampling efficiency within the specified time frame of an assignment.

During the second year, pending OMB approval, the mode-specific mail surveys would be implemented and database development for the new field surveys would be initiated. Data entry software specific for an electronic field device would also be developed. Due to the relatively high volume of data collected, data entry in the field is considered essential to the efficiency and timeliness of data delivery.

During the third year, the APAIS and roving surveys would be implemented simultaneously. New staff would then be hired in order to achieve adequate sample coverage. Application of the revised/new field surveys would signal the last stage of the transition.

### **Proposed Process for Combining Statistics Derived from Multiple Sources**

The Western Pacific region has a single source of non-commercial fisheries information. For the territories of American Samoa and the Mariana islands, the boat and shore-based creel surveys are the sole data source while HMRFS (or whatever we are calling this now) is the primary source for Hawaii. The non-commercial catch estimates from these data collection programs can be reported directly as estimates from each jurisdiction.

### **Connection to the MRIP Strategic Plan**

This regional implementation plan provides the connection of its priorities to the MRIP Strategic Plan developed to guide MRIP in the implementation of the program as required by the Government Accountability Office. Identifying the strategies to which the PIRIP priorities fit provides the MRIP program managers information on how the PIRIP priorities meet the strategic plan.

<b>PIRIP Priorities</b>	<b>MRIP Strategic Plan Strategy</b>
Programmatic review of the Territory creel surveys	Goal 4: S3T1 - Seek independent reviews of current and proposed survey designs, estimation methods, and data collection technologies that are on the MRIP Certification Track. Goal 4: S3T2 - Conduct periodic regional reviews of data programs to identify potential sources of bias and errors
Full funding for the surveys that meets the minimum survey standards for Hawaii, American Samoa, and the Mariana Archipelago.	Goal 6: S1T2 - Use Regional Implementation Plans to develop a national inventory of partner needs and associated costs (see Regional Plans goal).

Improved timeliness of non-commercial catch estimates;	Goal 2: S1T2 - Collect data (i.e., conduct surveys) consistent with minimum requirements;
Development of algorithm that extracts the non-commercial component of the total creel survey catch estimates	Goal 2: S3T1 - Develop complete documentation of survey and estimation protocols, quality assurance procedures, and data quality control procedures
Development of mobile data entry system to support near-real time reporting	Goal 5: S1T2 - Evaluate the potential application of new electronic technologies into the program.

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