

Final Report to the Pacific Island Fisheries Science Center, NMFS, NOAA

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Advancing Bottomfish Assessment in the Pacific Islands Region



Prepared by:

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About this Document

This report is prepared by the Pacific Islands Fisheries Group (PIFG) under contract to the National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS), Pacific Islands Fisheries Science Center (PIFSC) Requisition/Purchase Number NFFR7400-12-03466. This report summarizes activities from September 25, 2012 to September 24, 2013 conducted by the Pacific Islands Fisheries Group (PIFG) to meet the deliverables as detailed in the scope of work and specifications of this contract (no. RA 133F-12-CN-0118).

All data and samples collected from this project were provided to PIFSC for analysis and assessment. Deliverable products provided include bio-samples, data log sheets and associated observer notes, meeting agendas, sign-in sheets and meeting reports, official correspondence with participating fishermen, outreach materials and other products produced under this contract. PIFG continues to maintain a database of all tags distributed to fishermen, tagged fish, recoveries and contact information. The database is used to support tagging outreach and reward programs for recovered tagged fish.

The PIFG is a 501(c) 3 non-profit organization established in 2005 to help organize, engage and keep Pacific Island fishermen informed on local, national and international fishery issues. PIFG supports programs that benefit US Pacific Island marine resources, enhance fishing community awareness, bridge relationships between fishermen and the scientific community and promote conservation practices and ethics. PIFG supports agencies responsible for managing and conserving our islands fisheries.

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I. INTRODUCTION

The National Marine Fisheries Service (NMFS) administers the National Cooperative Research Program (NCRP) as a competitive Federal assistance program that funds projects seeking to increase and improve the working relationship between researchers from the NMFS, state fishery agencies, universities and fishermen. The NCRP's principal goal is to facilitate involvement of commercial and recreational fishermen in the collection of fundamental scientific fisheries information to support assessment of fishery resources, as well as the development and evaluation of management and regulatory regimes.

Through NCRP projects, scientists and fishermen partner to bring valuable tools and experience to address the objectives and meet the goals of fisheries research projects. Scientists realize that fishermen have empirical knowledge of fishery resources and the marine environment, honed seamanship skills, and their vessels provide viable scientific research platforms. Fishermen understand that the scientific data must be collected using scientific methods or the information will not be reliable and used in management decisions. Participating in cooperative research studies facilitates the exchange of knowledge and experience between the fishing and scientific communities, while at the same time building trust and confidence in knowledge gained through such projects. Fishermen and scientists alike improve their understanding of the complex interactions between fishery resources and fishing practices through this cooperative effort.

The Pacific Islands Fisheries Service Center (PIFSC), with assistance from the Pacific Island Regional Office (PIRO), administers the NCRP in the Pacific Islands region. One of the primary goals of the Fishery Biology and Stock Assessment Division (FBSAD) at PIFSC is to "conduct research on the life history, ecology, and stock status of bottomfish species (snappers, groupers, and jacks) that support important, small-scale U.S. handline fisheries in the Pacific Islands Region." A series of stock assessment workshops for Hawaiian Archipelago bottomfish were convened over the past five years to review available life history information and fishery dependent data, assess the utility of existing data for stock assessment purposes and identify necessary research to advance stock assessment. One recurring outcome from the workshops is the need to conduct fishery-independent research on the bottomfish fishery to better understand the spatial dynamics of the stock, provide an independent index of abundance, and collect life history information for key commercially important species.

II. SCOPE OF SERVICES

To address the need for independent bottomfish fishery research, PIFSC utilized the NCRP to solicit and fund the Pacific Islands Fisheries Group (PIFG) to aid in conducting fishery-independent research on Main Hawaiian Island (MHI) bottomfish species. The general scope of work to be carried out through this cooperative research project included four tasks:

- 1) Contract fishing vessels to conduct fishing to understand information on operations in the waters around Maui. Scientific observers are placed as data loggers on chartered bottomfishing vessels to document vessel operations while bottomfishing.
- 2) Engage bottomfish fishermen throughout the MHI, Guam and CNMI to mark and recapture (tag and release) bottomfish in an effort to supplement the bottomfish tagging program that PIFG has run since 2006.

- 3) Identify a network of bottomfish landing ports and fishermen in the MHI to conduct length and weight sampling, and assist with the development and implementation of sampling protocols to collect such data.
- 4) Periodically conduct outreach and town hall meetings to discuss progress of the projects with local constituents. (see attachment)

PIFG was engaged from September 25, 2012 to September 24, 2013 to provide the services under this contract. PIFG has met the scope of work and services as required. This report details the tasks and activities undertaken, products developed and produced, information learned and suggestions made for improving sampling methods, strategies and services.

Administrative oversight

Throughout the contract period, PIFG members regularly met with PIFSC staff to review activities, discuss issues, receive direction and guidance on upcoming efforts and address administrative matters. Coordination meetings with PIFSC project leadership and PIFG staff were held on:

- October 10, 2012, Honolulu, Hi
- November 9, 2012, Honolulu, Hi
- December 13, 2012, Honolulu, Hi
- January 16, 2013, Honolulu, Hi
- February 20, 2013, Honolulu, Hi
- February 21, 2013, Honolulu, Hi
- March 18, 2013, Honolulu, HI
- March 28, 2013, Honolulu, Hi
- April 8, 2013, Honolulu, Hi
- May 1, 2013, Honolulu, Hi
- May 15, 2013, Honolulu, Hi
- June 18, 2013, Honolulu, Hi
- July 2, 2013, Honolulu, Hi
- August 12, 2013, Guam
- September 11, 2013, Honolulu, Hi

PIFG hired a project manager to oversee the implementation and execution of this contract. The manager provided general oversight, coordination and logistical support for all aspects of the work carried out relating to bottomfish tagging, independent survey, bio-sampling and education and outreach. PIFG and its advisors also provided support on specific aspects of this project as required, including conducting legal reviews of contracts, regular accounting and auditing of project funding and contract monitoring and compliance.

III. ACTIVITIES AND TASKS

Activity 1. Implementation of a pilot fishery-independent survey for bottomfish in waters around Maui

Vessel Selection and Requirements

PIFG identified and contracted 4 vessels to conduct the fishery-independent survey of bottomfish in waters surrounding the islands Maui/Lanai/Kahoolawe. All vessels were required to maintain insurance per contract requirements and meet USCG safety standards. Vessels were fully equipped with all necessary deep sea bottom fishing equipment, gear and bait. Vessel size and bottom fishing experience were used as criteria in selecting vessels and operators. Operators were required to work cooperatively and communicate effectively with observers and scientists in carrying out targeted independent research.

During contracted vessel operations, each captain or operator was responsible for conducting bottomfish operations and overseeing the safety of scientific data collectors. Captains were responsible for providing food and beverages for observers during contracted trips. For multi-day trips, vessels provided sleeping areas for observers.

Based on guidance from PIFSC staff, contracted vessel operators participating in the Hawaii phase of the independent observed trips were directed to conduct normal bottomfishing operations, which included the selection of fishing site locations and targeting of bottomfish species. This allowed for the collection of basic vessel operation information to improve understanding of typical fishing operations and capabilities and to inform and improve the bottomfish survey methodology and protocols.

Vessel size selection was constrained by the present trend in bottomfishing operations in Hawaii. Currently, the majority (95%) of Hawaii's bottomfishing fleet is made up of trailer boats that range in size from 17 ft. to 32 ft. Today, there are fewer than a dozen larger, locally-built, traditional wooden sampans in operation in the Hawaii's bottomfish fishery. Therefore, 3 trailer boats (ranging from 27 ft. to 32 ft.) and one sampan were selected and contracted to participate in this cooperative research project to reflect vessel size trend.

Participating vessel captains or operators were required to have at least five years of experience in the bottomfish fishery. Most of the captains selected to support this project had extensive bottomfish knowledge and are considered high-liners in the Hawaii fishery. Combined total years of experience in the bottomfish fishery among captain and crew selected for the project is over 85 years.

The following vessels and captains were contracted to participate in the independent research project.

Captain/Operator	Vessel Name	Length	Location	Make
Gary Dill	Imua	50'	Kewalo Basin, Oahu	Wooden sampan
Layne Nakagawa	Naomi K	32'	Trailer, Maui	Fiberglass
Nathan Abe	No Name	27'	Trailer, Hawaii	Fiberglass
Ray Shirakawa	Hokuloa	30'	Trailer, Hawaii	Fiberglass

Vessel Captains Workshop

All captains participated in project pre-cruise briefing workshops on March 28, 2013 and July 22, 2013 on Oahu to discuss project goals and objectives. Each captain received packets that contained the following materials: PIFG vessel registration form; USCG auxiliary Float Plan form (ME 2(b)); NOAA Policy sheet, "Protection of Confidential Fisheries Statistics" (NAO 216-100); "PIFSC Policy of Confidentiality of Fisheries Operations Data"; NOAA Statement of Non-Disclosure of Confidential Data; a bio-sampling list of species (for NOAA); and PIFG Vessel Contract Forms. At these meetings, PIFG reviewed all of the

above materials and discussed additional topics, including NOAA confidentiality of handling data, bio-sampling, safety and overall cruise coordination and communications.

High among PIFG project priorities is establishing safety protocols for monitoring vessel activities, trips and duration at sea. Vessel captains were required to file a float plan prior to each trip. Contracted observers were required to call the project manager prior to and after each trip. The final decision to fish or not to fish rested with individual chartered captains, as they knew best their vessels' capabilities with regard to sea conditions.

Pre-trip planning meetings were held with the PIFG project manager, PIFSC Chief Scientist & staff, vessel captains and observers to discuss projected start and end times for each trip, destination, number of personnel on board (including observers), fishing/research activities and targeting for each trip. Upon return, follow-up debriefing sessions focused on trip recaps and plans for the next trip taking into consideration prior outcomes and PIFSC priorities.

Observers

PIFG contracted and trained observers to participate in the fishery-independent survey. Personnel were selected for this project based on the following criteria: experience at sea, working knowledge or participation in the bottom fishery, good communication skills, availability and flexibility to work when needed, ability to work with others, function at sea under adverse and confined conditions, ability to identify and measure fish and be responsible with paperwork.

On Hawaii-based trips, observer duties were to record daily fishing effort and sea conditions, measure and identify catch and record other parameters affecting fishing effort. On July 18, 2013, PIFSC staff held a species identification training workshop for 3 new PIFG observers to standardize and assure proper species identification and measurements during observed trips. Observers were instructed not to interfere or influence fishing operations to avoid skewing of effort and landing data collected through this project.

Observers were also instructed to collect bio samples for the PIFSC Bottomfish Bio Sample Life History program. During the survey, all fish caught and landed (except large sharks) were identified measured and recorded on the customized project log sheet for deployment and retrieval of gear. PIFSC provided a list of targeted bottomfish species and criteria (preferred sizes) that were targeted for retention as bio samples. Each retained fish was tagged with a numbered label tie strap through the mouth and gill of the fish. The fish were then collect at the end of each trip and transported to the R/V Sette for processing.

A total of three new observers were selected for the project by the PIFG project coordinator, project advisory personnel and PIFSC staff. Training for the three new observers (Hunter Farr, James Alzavedo from Oahu and James Tanaka from Maui) was conducted on July 18, 2013 on Oahu. After successfully completing training, each observer received a tote bag containing gear, equipment, and supplies necessary to perform their task. Each observer received an observer kit and packet containing the following documents: a sample log sheet; log sheet instructions; NOAA Policy sheet, "Protection of Confidential Fisheries Statistics" (NAO 216-100); "PIFSC Policy of Confidentiality of Fisheries Operations Data"; NOAA Statement of Non-Disclosure of Confidential Data; a bio-sampling list of species needed by NOAA; and the PIFG Contract Agreement. All literature distributed was discussed in detail during the meeting.

Distributed Observer Kits contained the following:

- Water resistant traveling tote
- USCG-approved first aid kit
- Full “Grundens” jacket/pants raingear
- Rubber boots “Xtratuff”
- 2 pairs of gloves
- Olympus or Fuji waterproof camera
- Vinyl retractable tape measure
- 6” Victorinox knife
- Momoi mono cutting tool
- Ziploc specimen bags (various sizes)
- Specimen tie straps
- Water resistant specimen labels
- 2 Stacking Pencils
- Clip board
- Waterproof Log sheets (50 to 100 sheets)
- Laminated Data Log Instruction Sheet
- Laminated Data Sample Data Log Sheet
- Laminated Bio-Sample Specimen List (NOAA, for life history study)
- Appropriate Laminated Maps and Coordinates for each Island sampling area (such as Penguin Banks, West Hawaii and Maui grid boxes)
- Measuring Boards and Calipers

Vessel / Observer Workshops

Once contracted vessels and observers were selected, two workshops were held with PIFG personnel, vessel captains, observers and project advisors to assure that all participants clearly understood project goals and objectives, clarify roles and responsibilities and to establish clear protocols for communication during the research events. In particular, discussions focused on communication and coordination between the PIFG project manager, chartered captains, observers and PIFSC cruise personnel. Other concerns that were emphasized during the meetings were safety protocols, data confidentiality and general communication among all participants. The two captains/observer workshops were held on March 28, 2013 and July 18, 2013 in Honolulu to support the two Maui Gear Calibration Cruises.

PIFG provided a contact list with names and contact numbers for all individuals participating in the project. This critical exchange of information helped facilitate communication during the project, which allowed operations to run smoothly.

Critical to successful research operations was the communication between captains and observers, as the captains were relied upon for professional interpretations on fishing conditions that were recorded on the log sheets. Sea and weather condition reports greatly influence catch ability and landings during a trip and the captains, through experience and empirical knowledge, provided valuable insight on this aspect of the project. Noted on log sheets were detailed descriptions of operations, such as anchoring or drifting, current speed and direction, bottom type, species identification depth, location (lat. /long), chum (palu), bait type, purpose and target per trip. During discussions with bottomfish fishermen, it was frequently noted that many seemingly minor factors influences the outcome and success of each

bottomfish trip. Given this input, the above fields were added during development of the log forms for this bottomfish research project to help aid in catch per unit effort (CPUE) analysis of this fishery.

Observer Trips

Initially, this pilot fishery-independent survey was designed, implemented and executed in the Main Hawaiian Islands around the island Maui based a spatially directed sampling design. The data collected contributed to the development of an optimal survey design and effective bottomfish log form.

The bottomfish log form was developed through consultations with PIFSC scientist and fishermen to capture critical information such as sea conditions, style of fishing, number of hooks per line, bait, chum, etc. that could affect fishing performance. As noted above, these factors significantly influence bottomfishing (CPUE). Log sheet form evaluation was conducted during two Oahu debriefing workshop on May 15, 2013 and September 18, 2013 with NOAA staff, PIFG staff, observers and captains which results in continued refinement to the survey tool.

Observed Trips

Main Hawaiian Islands

In the Main Hawaiian Islands during this contract period, PIFSC conducted two independent survey sampling trips off of Maui (see attached maps) that which PIFG provided support as contracted. Sample site locations were pre-selected by PIFSC staff based on depth range of deep 7 bottomfish, habitat contours and bathymetry data. Most of the selected sites were on slopes and ranged in depths from 40 to 170 fathoms.

The two Gear Calibration Cruise operations took place in the sheltered-offshore waters between the islands of Maui, Lanai and Kahoolawe during the two periods between April 18-24, 2013 and August 1-9, 2013. Within the two periods the vessels completed a combined total of 42 trips and sampled 276 sites. The purpose of this collaborative research effort was to evaluate potential fishery independent sampling methods that can be used to improve deep-7 bottom fish stock assessments. During these cruises up to four sampling gears were deployed relatively simultaneously into adjoining 500 meter by 500 meter grids (see attached map). Data from each gear type deployed will be analyzed by PIFSC to evaluate and compare the effectiveness of each.

In coordination with each Gear Calibration cruise, contracted PIFG Fishing vessels were instructed to conduct observed sampling (fishing) operations as *R/V Hukipono* deployed Bottom Camera's (Botcam) and the *R/V Oscar Sette* conducted acoustic beam, AUV or ROV sweeps of each grid cell.

Captains/ Observer Debriefing

Debriefing meetings for captains/observers supporting the Maui Gear Calibration Cruises were held on May 15, 2013 and September 18, 2013 with PIFSC, PIFG staff and PIFSC project design and assessment consultants. The reflection prior performance successes and challenges provided for a healthy exchange of ideas on fishing protocols which will be incorporated into future sampling designs and protocols to improve the independent survey sampling methods. One of the protocols discussed and implemented in these cruise significantly affecting catch ability was directing vessels to "search" for bottomfish habitat within each 500m x 500m grid prior to fishing. Captains were able to observe bottom topography and search for aggregations of fishing targets. GPS coordinates of productive fishing sites within each grid

were immediately relayed to NOAA personal via cellphone (due to confidentiality of each location). The NOAA staff used the information to coordinate deployment of other gears such as Botcam, AUV and ROV to those locations. Other recommendations for future cruises included the following: 1) Use of squid and fish bait during all fishing operations to be consistent with normal MHI bottom fishing efforts; 2) Depth of sampling should not be deeper than 150 fathoms as most fishermen will fish much shallower; 3) Weather days need to be factored into each cruise to account for possible down time. These changes in protocol and research operations improved sampling duplication and better reflect bottomfishing operations within the fishery.

Observer Log Sheet Data Forms

Modifications continue to be made to the forms to improve the quality of data collected by PIFG observers and to better communications between scientist and PIFG observers. On the April and August 2013 cruises, PIFSC staff made arrangements for all observers at the end of each of sampling day to overnight on the R/V Sette. Observer log sheets were directly collected and reviewed by PIFSC staff to assure accuracy and completeness. Prior to the next day of sampling, observers would be briefed by NOAA chief scientist on daily assignments and project updates. For these two cruises, all observer log sheets and associated data collected were transferred directly from the observer to NMFS personnel aboard the R/V Sette on a daily basis. Disposition of these forms and information remain within and are the responsibility of PIFSC staff aboard the R/V Sette. In prior years, PIFG manager collected the observer forms which were later made available to the PIFSC contract monitor as a deliverable under the NOAA contract. Because of the change in protocol under this year's contract, PIFG is not responsible for the collection and inspection of observer log sheets.

Activity 2. Expand State of Hawaii bottomfish tagging program and continue Marianas (Guam and CNMI) tagging program

Tagging

Bottomfish tagging as conducted under this cooperative research program aid in the collection of life history information, particularly on growth rates and movement, of Hawaii and Mariana Islands deep water bottomfish species. As prescribed under this contract, PIFG purchased 2,000 3.5-inch yellow PDS-2 dart tags from Hallprint tags in Australia. Each dart tag is individually-numbered and imprinted with, the PIFG contact phone number to aid in the recovery and reporting of recaptured tagged bottomfish. These tags are consistent with tags used in the previous PIFG bottomfish tagging projects. The deep-7 bottomfish species targeted under this project include: Onaga (*Etelis coruscans*), Ehu (*Etelis carbunculus*), Opakapaka (*Prisitipomides filamentosus*), Kale kale (*Prisitipomoides sieboldi*), Gindai (*Prisitipomoides zonatus*), Hapuupuu (*Epinephelus quernus*) and Lehi (*Aphareus rutilans*) (see attachment).

Bottomfish fishermen participating in the tagging project were recruited and personally trained by PIFG staff in proper tagging technique, placement of tags in deep-7 bottomfish and protocols for assessing condition and treatment of captured fish. For new fishermen who could not attend the scheduled workshops, individual one-on-one training sessions were arranged with PIFG project manager.

During this contract period, bottomfish tagging continued in waters off of the Commonwealth of the Northern Mariana Islands (CNMI). PIFG applied and obtained a scientific studies permit from the CNMI Division of Fish & Wildlife to conduct tagging operations in CNMI waters. The bottomfish species tagged

in CNMI included: Onaga (*Etelis coruscans*), Ehu (*Etelis carbunculus*), Opakapaka (*Prisitipomoides filamentosus*), Pink Opakapaka (*Prisitipomoides flavipinnis*), Yellowtail Kalekale (*Prisitipomoides auricilla*), Gindai (*Prisitipomoides zonatus*), and Lehi (*Aphareus rutilans*)

Fishermen (listed by island) currently participating in the PIFG deep-7 bottom fish tagging project include: **Oahu** – Glenn Ashimine (f/v Carrie Y), Leonard Yamada (f/v Lauren Y), Roy Morioka (f/v Renee M), Gary Dill (f/v Imua); **Kauai** –Jonathan Hurd (f/v Kai Pali); **Maui** – Alfred Ching (f/v Peter Pan II), Layne Nakagawa (f/v Naomi K), John Meston (f/v Paka Lips); **Molokai** – Kenneth Corder (f/v Munchkin); **Hawaii** – Dennis Colon and Leroy Pi (f/v She-nelle), Geoff Walker (f/v Jeanette M), Kevin Awa (f/v Taylor K), Len Nakano (f/v Kuulei aloha), Nathan Abe (vessel no name), Ray Shirakawa (f/v Hokuloa). **Guam** – James Borja (f/v Stonefish), Ken Borja (f/v Stonefish) and Stephen Meno (f/v Analea); **Saipan**- Tony Flores.

Tag Kit Content

At each workshop, participating fishermen were each given a tagging kit consisting of the following equipment: dart tags, stainless steel tag applicator, PIFG stainless steel venting tool, venting syringe, purge stick, drop shot (recompression device), water resistant tag data log sheets, measuring stick, clip board, stacking pencils, self-addressed postage paid envelopes (for tag data sheet return), PIFG Tagging instruction manual, laminated Drop Shot instruction sheet, bottom fish identification pamphlet and other informational material.

Tag Instructions

At each workshop, fishermen were briefed on the following information: the target species (deep 7), proper fish handling, tagging techniques, how to identify and deal with barotrauma, use of the drop shot, logging of tag data and submission of data.

During the workshop the “Tagging Manual” was distributed and reviewed in detail. PIFG conducted a page-by-page review of safe handling of fish and proper tagging techniques with photos of proper tagging techniques and tag placement. This information is essential for better tag retention and plays a major factor in assuring the success of the tagging project.

Taggers were trained to identify and treat landed fish that showed signs of barotrauma. This condition is common among some fish brought up from these depths. The quick change in pressure causes the air bladder to expand rapidly, which may sometimes force the stomach out of the fish’s mouth. If the fish shows signs of barotrauma fishermen are instructed to purge the fish by inserting a purging tool developed by PIFG to vent the air bladder and relieve internal pressure within the fish. In severe cases of barotrauma, pressure may even cause the eyes and scales on the fish to protrude. Fish with severe cases of barotrauma were not tagged and released. Each tag kit contained a laminated Purge and Drop Shot instruction sheet that displays photo examples of barotrauma treatment.

Protocol for tagging bottomfish is to first examine each fish for signs of barotrauma and treat if necessary. It is recommended that fishermen place each potential fish for tagging in a holding tank to observe and make sure each fish is lively, healthy and capable of swimming upright. If the fish swims upright and is lively, the fish is removed, measured for fork length, tagged and released.

Fish that have been observed to swim upright can be immediately tagged and released. Other fish that are lively but may have problems orienting upright is recommended to be released with the aid of a

“drop shot.” The “drop shot” is a weighed recompression device developed specifically to return fish with barotrauma to the deep bottom. The weighed device is attached to the fish and dropped overboard weight first, taking the fish down to the bottom. A retrieve line is attached to the weight once it reaches the bottom or at least 40 fathoms. A sharp jerk on the line assures the fish is released and the weight is then retrieved for another fish.

The drop shot assures that the fish is oriented towards the bottom and returns quickly, minimizing chances for predation. It will also help re-pressurize the fish and revive it on the way down, as water is forced over the fish’s gills. Fishermen have often report bottomfish swimming off the drop shot on the way down before getting close to the bottom. It is good when fish do well enough to swim off the drop shot before reaching the bottom.

Fisherman are required to complete a log sheet with the following information for each tagged bottomfish: tag number, fork length measurement, indication of barotrauma treatment was needed by checking “P” (purge) or “D” (drop shot), species, date, location (lat./long) and depth. Fishermen submit their data immediately after each trip in order to receive compensation for their tagging efforts. Fishermen on the outer islands can call or email a notice of their completed trip after each trip rather than mail in their data sheet. Fishermen were given a supply of self-addressed stamped envelopes to assure timely and accurate delivery of their data sheets. Fishermen on Oahu either mailed their sheets to PIFG or were serviced directly by PIFG staff who arranged for direct pick up of log sheets. The number and species of fish tagged per island from September 25, 2012 to September 24, 2013 is shown in (Tables 3 & 4).

Table 3. Number and species of fish tagged: Sep 2012 – Sep 2013 (MHI)

Species	Kauai	Oahu	Molokai	Maui	Hawaii	Total
Onaga		11		148	24	183
Ehu	34	92		116	81	323
Kalekale	11	135		155	130	431
Opakapaka	8	105	100	687	138	1038
Gindai	5	1		5	14	25
Lehi						
Hapuupuu						
Total:	58	344	100	1111	387	2,000

Table 4. Number and species of fish tagged: Sep 2012 – Sep 2013 (Marianas)

Species	Guam	Saipan	Total
Ehu		3	3
Gindai	7		7
Yellowtail Kale	10	3	13
Pink Opakapaka	1	18	19
Onaga			
Total	18	24	42

Once the tagging data log sheets were received, the data were entered into a customized database. This database is designed and managed to facilitate outreach and engagement to participating taggers and

bottomfish fishermen by providing recovery information on a timely basis. Through this system, each recovered and reported tagged bottomfish generates letters to the original tagger of the fish and to the person who recaptured the fish detailing the date, location and site of where that fish was initially captured, recaptured and growth. This is a critical component of the tagging projects as it reinforces the fishing communities' engagement in the fishery, science and management of the resource.

Tag Recovery Program

The success of angler-based tagging project is strongly linked to the outreach and feedback provided by the project managers to the fishing community. Successful tagging programs require cooperation from community stakeholders including fishermen, tackle retail establishments, agencies and others to be effective. Reward posters were distributed directly to tackle shop and fish dealers to inform and alert all subsistence, recreational and commercial fishermen about tagging and recovery efforts. The poster contains a picture of a dart tag (one that was actually used in the project), the PIFG contact phone number and information requested when reporting tag bottomfish recapture, which includes tag number, species of fish, measurement (fork length) and location of where the fish was caught. Project advertisements were placed periodically throughout the year in the following publications: Lawai'a magazine, and Hawaii Boats and Yachts magazine.

In addition, PIFG produced Bottomfish Project updates published in the Lawai'a magazine under the PIFG Koa section of the magazine of Issues 10, 11, 12 & 13 (see attachments). The articles contained information on the following: drop shot success; tag recovery results; general tagging project statistics; and tag recovery and reward information. Lawai'a magazine is now distributed statewide through various food, convenience store outlets tackle and fish dealers. The PIFG Koa section is also printed separately as a newsletter and distributed to fish and tackle dealers across the State of Hawaii. The newsletter is also distributed at various local PIFG functions, fishing club meetings public meetings, tournaments and other fishing-related community events.

The articles highlight current tagging efforts and fishery observer work being conducted on Oahu, Hawaii and Maui. It further acknowledged the cooperative research work being conducted by NOAA Fisheries, Pacific Islands Fisheries Science Center, and the PIFG and bottomfish fishermen.

Tag Recovery Reward

As an incentive for reporting a recovered tagged bottomfish, fishermen receive a PIFG custom-designed bottomfish t-shirt. The angler must report the following information for each recapture: date of capture, tag number, species of fish, fork length measurement, location of capture (lat./long) and depth. Along with the t-shirt reward, the angler who recaptured the tagged fish and the fishermen that originally tagged the fish both receive an informational letter from PIFG on how long the fish was at liberty, how much it grew, the distance traveled (linear distance). PIFG also sends a self-addressed postage paid envelope to the fishermen for returning the tag to verify the number.

Tag Recoveries

During the project period from September 25, 2012 to September, 2013 a total of 21 tagged bottomfish were recovered (All tag recoveries were opakapaka). One of the recovered tagged opakapaka traveled from Penguin Banks to Oahu and two others traveled from Maui to Kahoolawe.

Bio Sampling

Participating taggers have responded to a request by NOAA Fisheries, PIFSC for the collection of small juvenile bottomfish. A table of the species and sizes being sought by PIFSC were distributed to participating PIFG taggers as they requested more tags. Fishermen immediately responded with the collection of deep 7 bottom fish (see table). Specimens were collected by PIFG personnel and immediately turned over to PIFSC staff for processing and analysis. Fishermen will continue to collect specimens as they become available and will contact PIFG, who will collect the samples.

Tagging Data

During this project period PIFG collected and sorted all tagging data log sheets by island and individual fishers (taggers). Tagging log sheets were reviewed and edited for accuracy by PIFG project personnel and transmitted to PIFSC staff for data entry and analysis.

Activity 3. Expand fishery-dependent sampling of bottomfish at major landing ports and/or auctions throughout the MHI

PIFG worked with PIFSC Life History and Stock Assessment Program staff to identify bottomfish species and target size classes needed to address existing data gaps. PIFG assisted by the PIFSC Life History Program, distributed flyers to all PIFG bottomfish observers, participating captains and taggers in 2012 calling for bottomfish samples to support their age and growth research. Bottomfish bio-sampling flyers were also distributed during fishing club meetings, at PIFG events and to key highline bottom fishermen.

Flyers were not distributed to seafood dealers and the United Fishing Agency due to concerns over the sale of illegal size bottomfish. Concern was also raised by cooperating fishermen for retaining undersized bottomfish species. To address this, bottomfish fishermen participating in the cooperative research effort were included on the PIFSC/State of Hawaii scientific collecting permit.

During a meeting on October 10, 2012 with NOAA staff it was decided that collection of bio samples would continue but compensation would be the responsibility of NOAA PIFSC during the remainder of the grant period. Under past contracts, PIFG provided compensation for bio samples that were turned in through PIFG from fishermen. But due to reduction in grant award monies for this period, NOAA assumed responsibility.

Bio Sample Data

On the island of Maui through the collaboration of PIFG bottomfish fishermen, PIFSC staff and a fish wholesaler established and maintained a bottomfish sampling system. Protocols were set up to allow PIFSC staff to directly sample bottomfish as they were being received at the wholesaler from the fishermen. Other bio samples were collected during two Gear Calibration cruises off of Maui during this project period. PIFG also collaborated with fishermen on Oahu and other islands to collect and provide bio samples as requested by PIFSC. All bio samples and data collected by PIFG from fishermen during this project period have been provided to PIFSC staff for processing and analysis. (Fig. 1)

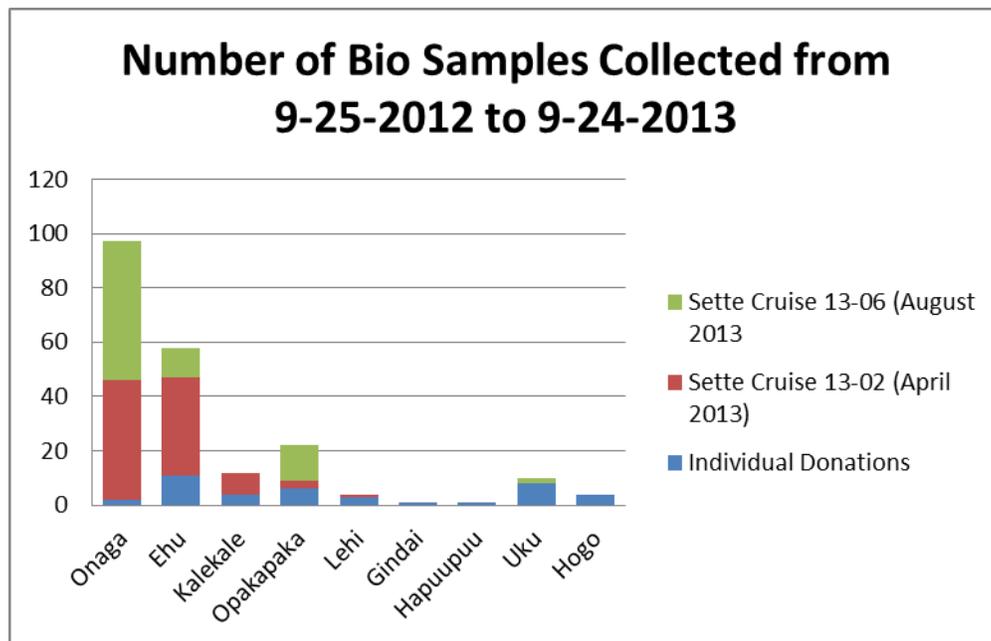


Figure 1. Possible Hybrid tissue donated to PIFSC for identification by Bill Chang

Activity 4. Education and Outreach

Education and outreach activities were carried out though the duration of the contract to support bottomfish tag recoveries, bio-sampling efforts and overall bottomfish research efforts. PIFG published articles and ads about this bottomfish research in periodic newsletters, Lawai'a, Hawaii Boats and Yachts and other periodicals as available. Outreach to fishing and seafood communities included hosting informational booths at numerous fishing forums, festival and workshops. A list of education and outreach efforts conducted during the contract period follows.

Timeline of Activities/Products

MONTH	ACTIVITIES AND PRODUCTS (Sep 2012 – Sep 2013)
OCT 2012	<ul style="list-style-type: none"> Participated with NOAA in the Hawaii Fishing and Seafood Festival by providing outreach and education on the bottomfish tagging project. Cooperative Fisheries project presentation provided to the Western Pacific Fisheries Council 111th Scientific and Statistical Committee meeting at the Council Office
NOV 2012	<ul style="list-style-type: none"> Published Lawai'a magazine no. 10 contained Bottomfish Project update and tag recovery advertisement.
DEC 2012	<ul style="list-style-type: none"> Bottomfish Flyers and I.D. charts were mailed to all participating bottom fishermen in the Cooperative Fisheries research project in Hawaii, Guam and CNMI.
JAN 2013	<ul style="list-style-type: none"> Published Lawai'a magazine no. 11 featured article "PIFG & Science Behind Bottom fishing", project update and tag recovery advertisement.
JAN 2013	<ul style="list-style-type: none"> Hosted booth at the Izuo tackle show distributed Lawai'a and Bottom fish tag recovery flyers to tackle dealers.
FEB 2013	<ul style="list-style-type: none"> Participated in CNMI Fisheries workshop and visited Guam to pass out Lawai'a magazine and bottom fish tag recovery flyers. PIFSC MHI Bottomfish Research Workshop
MAR 2013	<ul style="list-style-type: none"> Attended Ray Hilborn seminar and passed out bottomfish tag recovery flyers at the Lawai'a table Participated in the Hawaii Fish & Dive Expo providing general program information and distribution of Lawaia Magazine.
APR 2013	<ul style="list-style-type: none"> Attended Maui Co-op monthly meeting provided Pre Cruise presentation, visited Maui tackles shops, Fish Dealers and State agency offices. (Distributed 300 flyers) Participated in the Hawaii Ocean Expo on Oahu providing bottomfish outreach and educational material
MAY 2013	<ul style="list-style-type: none"> Published Lawai'a Magazine no. 12 featured article on Bio Sampling "What did I Catch" (hybrid bottomfish) contained Bottomfish Project tag recovery advertisement and project update.

JUN 2013	<ul style="list-style-type: none"> • Presentation Cooperative Fisheries Project, Moanalua High School Marine Education Program • Produced and published on the PIFG website a short tag and release video demonstrating use of the Drop Shot • Updated PIFG Cooperative Fisheries Research web page
JUL 2013	<ul style="list-style-type: none"> • On Maui to distribute 200 Pre Cruise flyers, tackle dealers, fish dealers, Maui Co-op, Maui Trailer Boat Club and State offices. • Western Pacific Fishery Council MHI Bottomfish Working Group Meeting
AUG 2013	<ul style="list-style-type: none"> • PIFG participated in Guam’s Peskadot and distributed bottomfish tag recovery flyer, Lawai’a magazine and drop shot information, conducted additional outreach at Tackle Shops
SEP 2013	<ul style="list-style-type: none"> • Published Lawai’a Magazine no. 13 featured bottomfish tagging article “A Channel Crosser”, tag recovery advertisement and project update. • Western Pacific Fishery Council MHI Bottomfish Working Group Meeting

IV. DISCUSSION AND RECOMMENDATIONS

Activity 1. Implement a pilot fishery - independent survey for bottomfish in waters around Hawaii, Oahu, Maui and Guam

- Discussed, developed and implemented this year was the attempt to standardize fishing operations, time, and bait and hook size. The aim is to standardize fishing methods that are comparable with current commercial fishing operations that can be employed by all vessels in all areas during independent survey operation. Standardization of methods ensures results are comparable among different fishing vessels operating simultaneously within or between study areas. Removing the fishing method variable should help to better evaluate CPUE for differences in other factors such as weather conditions, current, temperature, fish assemblage and other factors. Through collaborative discussions between PIFG project management, PIFSC scientist and participating fishermen, it was agreed that during each fishing vessel operation would deploy two bottom lines with four #10 mustad circle hooks (or of equivalent size) on each line. Each hook was attached to the down-line with leaders approximately 1-meter in length. One line was baited with squid while the other was baited with fish bait (type of fish determined by fishermen). Each vessel used a palu bag that was filled with ~1 kg of a 50/50 mixture of ground squid and anchovy or sardine (depending on availability). Vessels would fish in each survey grid for 30 minutes before moving to the next location. The 30 minutes was the time the line hit the water for a total of 30 minutes of fishing time (line in the water). Typically this resulted in two 15-minute “drifts” as the vessel fished untethered to the bottom and drifted slowly through each grid area.
- The modified observer log sheets developed under this contract continues to capture critical operational and environmental elements that affect bottomfishing CPUE. The log sheets have

been revised during this contract period, but overall modifications were cosmetic in nature reducing redundancy in writing and number of log forms. Log forms are now printed on front and back to reduce the total number of log sheets needed by each observer trip. One side of the log sheet was printed with effort and trip information, while the opposite side captured landing data. By having the landing data and effort information together, chances having those data separated and lost are mitigated. The change in format and protocol requires that observers fill out one log sheet for each drift.

- Observer transfer to the R/V Sette at the end of each day of survey sampling was initiated during the April 2013 cruise. The transfer was initiated to improve observer data collection and quality and, at the same time, improve communication between observers (fishermen) and scientist. Together observers and scientist can exchange and discuss ongoing survey operations to address deviations, problems, interpretations and other issues on timely basis. This arrangement and change in operations worked so well that it was incorporated into the standard operating procedures for the August 2013 cruise.
- The total number of Main Hawaiian Island contracted observers increased from 4 to a total of 6 under this year's contract. This provided improved independent survey coverage that better supports the increase in number of survey cruises throughout the year.
- Based on completed observer trips and the 2012 Gear Calibration Cruise, PIFSC and PIFG staff discussed and determined that alternate survey sampling site be identified off of the south side of Maui. The new area provided a default sampling area that could be safely accessed and surveyed during adverse weather conditions, especially during periods of small craft warnings. It was also suggested that Olowalu, on the south side of Maui, be considered another default area since it is generally protected from adverse weather conditions. Further research and discussion on selecting a default sampling areas will be done in consultation with fishermen.
- Having a NOAA staff on the water monitoring survey vessels greatly improved operations during transition of gears in and out of selected grid areas. The communications was critical in the success of all gears being able to locate fish based on successful fishing operations.
- Getting lead project design consultants and key PIFSC staff on board fishing vessels during the Gear Calibration Cruise fishing operations was very productive. But due to high insurance cost and legal paperwork, PIFSC staff decided to suspend these plans until cost factors can be addressed.
- Night sampling operations were also discussed but not implemented during this survey sampling period due to logistics, safety concerns for fishermen and lack of budget.

Activity 2. Expand State of Hawaii bottomfish tagging program and continue Marianas (Guam and CNMI) tagging program

- Having a full bottomfish year or season (no closure) allowed taggers in the MHI to implement their allocations of tags this season. Bottomfishing overall was very slow throughout the year due to windy weather conditions with approximately 70% of the Annual Catch Target taken during the season. 100% of the 2000 tags that were allocated under this contract were applied and PIFG continues to monitor for recoveries.

- PIFG feels that it is important to continue bottomfish tagging efforts in the Main Hawaiian Islands for several more consecutive seasons. Tagging numbers of Gindai, Lehi and Hapuupuu remain low due to availability and these species being highly susceptible to barotrauma. Lehi also seems to be very seasonal and location dependent. PIFG will continue to encourage participating anglers to tag these species.
- Tagging efforts in Guam and Saipan were low due to severe weather conditions and a small boat bases fleet that is highly susceptible to weather conditions. Also PIFG stopped tagging efforts in the Marianas during the summer to support Main Hawaiian Island bottomfish tagging due to reduction in grant budget this period.
- An alternative to conventional tag and recovery of deep-7 bottomfish is to develop or search for small satellite pop-up tags that can be used on bottomfish. Information learned through the use of satellite tags could be very useful in remote fishing areas or for species with low tag recovery rates. Data can provide a profile on depth and habitat range, along with any travel associated with each species. Information can also be learned on survivability rates from capture, tagging and release trauma.
- Future tagging efforts should also look at evaluating the effectiveness of different treatment methods for barotrauma. National discussion continues regarding the use of venting tool versus the use of decompression devices. Anecdotal observations from the Hawaii bottomfish tagging projects (Henry Okamoto and PIFG) showed Hawaii snappers to survive invasive treatment methods.

Activity 3. Expand fishery dependent sampling of bottomfish at major landing ports and/or auctions throughout the MHI

- PIFSC continued to work with the PIFG Maui fishermen in setting up the monitoring of freshly caught Deep-7 bottomfish through a fish wholesaler. Arrangements are made in advance to have PIFSC staff present at the wholesaler as the fish are off loaded by the fishermen. The fish are measured, weighed and gonads are removed for later analysis. This greatly benefits PIFSC in supporting MHI Deep-7 life history studies.
- PIFG continued to assist PIFSC by engaging the bottomfishing community to aid in the collection of juvenile Deep 7 bottomfish bio-samples throughout the year. Although PIFG compensation for bio samples were discontinued due to a significant reduction in project funding. PIFG continued working with fishermen to collect and donate valuable juvenile bottomfish samples.
- During the August 2013 Gear Calibration cruise many bottomfish specimens were collected to support NOAA PIFSC Life History studies. Especially since the bottom fishing season did not close under the ACL during the summer when bottomfish are known to be spawning.

Activity 4. Conduct outreach and town hall meetings with local constituents, including fishermen, to discuss progress of the projects

- Overall, PIFG education and outreach activities were successful. Fishermen throughout the MHI and Guam were informed about and engaged in, this cooperative research effort. Articles and ads about the tagging project were placed in the major fishing magazines – Hawaii Boats and Yachts and Lawai’a magazine. Information was also provided to fishing tackle dealers,

distributors, seafood markets and other marine industries. All these activities will continue to be supported by PIFG to support tagging recovery.

- PIFG provided direct information to Maui fishing community about upcoming Maui Bottomfish Cruises in April 2013 and July 2013 by visiting and passing out a combined 500 flyers to Maui Co-op Fishermen's Association, Maui Trailer Boat Club, Tackle Dealers, Fish Dealers, State DAR and DOBORE offices.

V. ATTACHMENTS

- a. Observer Bottomfish Trip & Effort Log Sheet (revised 2012)
- b. Maui Cruise grid maps
- c. NOAA Select Sizes of Interest (revised March 2013)
- d. Bottomfish Cruise Flyers (April & July 2013)
- e. Lawai'a Magazine Bottomfish Ad, Articles & project updates Issue no. 10 (Sept. 2012), 11 (May 2013), 12 (July 2013) & 13 (Sep.2013)
- f. Hawaii Bottomfish Tag Recovery Poster
- g. Hawaii Deep-7 Species Identification Sheet for tagging
- h. Guam CNMI Bottomfish Tag Recovery Poster
- i. Guam Bottomfish Species Identification Sheet for tagging
- j. Chronology of PIFG project coordination activities and public outreach and education efforts for period between September 25, 2012 to September 24, 2013.

Attachments