

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

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## Advancing Bottomfish Assessment in the Pacific Islands Region



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## About this Document

This report is provided by Kendall Enterprises Inc. (KEI) as a contract requirement of the National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS), Pacific Islands Fisheries Science Center (PIFSC), Advancing Bottomfish Assessment in the Pacific Region Requisition/Purchase Number NFFR7400-13-02014. This report summarizes activities from September 16, 2013 to September 15, 2014 the Bottomfish Cooperative Research contract between PIFSC and KEI.

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 the SOW. To assist in the delivery of services, KEI subcontracted the Pacific Islands Fisheries Group (PIFG) to aid in contracting participating vessels and observers, 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.

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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 KEI who sub-contracted the Pacific Islands Fisheries Group to aid in conducting fishery-independent research on Main Hawaiian Island (MHI) and Guam (Galvez Bank) 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 16, 2013 to September 15, 2014 to assist in delivering the services as required under this contract. KEI has met the scope of work and services as required. This final 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, KEI and PIFG 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, KEI and PIFG staff was held on:

- October 16, 2013, Honolulu, Hi
- October 18, 2013, Honolulu, Hi
- November 15, 2013, Guam
- November 21, 2013, Guam
- December 4, 2013, Honolulu, Hi
- December 20, 2013, Honolulu, Hi
- January 9, 2014, Honolulu, Hi
- January 17, 2014, Honolulu, Hi
- January 22, 2014, Honolulu, Hi
- February 5, 2014, Honolulu, Hi
- February 7, 2014, Honolulu, Hi
- February 14, 2014, Honolulu, Hi
- February 27, 2014, Honolulu, Hi
- March 4, 2014, Honolulu, Hi
- March 9, 2014, Honolulu, Hi
- March 12, 2014, Honolulu, Hi
- April 8, 2014, Maalaea, Hi
- April 9, 2014, Maalaea, Hi
- April 14, 2014, Maalaea, Hi
- April 24, 2014, Honolulu, Hi
- May 1, 2014, Honolulu, Hi
- May 16, 2014, Honolulu, Hi
- July 18, 2014, Guam
- July 20, 2014, Saipan
- September 8, 2014, Honolulu, Hi

KEI 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. KEI 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 and Guam**

##### *Vessel Selection and Requirements*

PIFG identified and contracted 3 vessels to conduct the fishery-independent survey of bottomfish in waters surrounding the islands Maui/Lanai/Kahoolawe. In addition PIFG contracted 2 vessels to conduct fishery-independent survey of bottomfish in waters on Galvez Bank, Guam. All vessels were required to maintain insurance per contract requirements and meet USCG safety standards. Vessels were fully equipped with all necessary deep-sea bottomfishing 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, 5 trailer boats (ranging from 20 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 95 years.

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

<b>Captain/Operator</b>	<b>Vessel Name</b>	<b>Length</b>	<b>Location</b>	<b>Make</b>
<b><i>Main Hawaiian Islands</i></b>				
Gary Dill	Imua	50'	Kewalo Basin, Oahu	Wooden sampan
Layne Nakagawa	Naomi K	32'	Trailer, Maui	Fiberglass
Nathan Abe	Ride On	27'	Trailer, Hawaii	Fiberglass
<b><i>Guam</i></b>				
James Borja	Stonefish	21'	Trailer, Guam	Fiberglass
Michael Duenas	3 D	20'	Trailer, Guam	Fiberglass

### *Vessel Captains Workshop*

All captains participated in project pre-cruise briefing workshops on March 13, 2014 on Oahu and July 17, 2014 in Guam 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 and Guam-based trips, observer duties were to record daily fishing effort and sea conditions, measure and identify catch and record other parameters affecting fishing effort. 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 selected bio samples in accordance with 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. Bio samples collected during the Hawaii cruise were at the end of each day transported to the R/V Oscar E. Sette for processing. On Guam, bio samples collected were transferred at the end of each day to Guam PIFSC staff.

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 KEI and PIFG personnel, vessel captains, observers and project advisors to assure all participants clearly understood project goals and objectives, clarify roles and responsibilities and to establish clear protocols for communication during the research events. PIFSC staff was highly encouraged to participate in each workshop to meet and initiate dialog between chartered vessel operators, observers and cooperative research scientists. In particular, discussions focused on communication and coordination between the PIFG project manager, chartered captains, observers and PIFSC cruise personnel. Other concerns emphasized during the workshops included safety protocols, data confidentiality and general

communication among all participants. The captains/observer workshops were held on March 13, 2014 in Honolulu and July 17, 2014 on Guam to support a Maui fishery independent pilot survey and an independent survey cruise at Galvez Bank, Guam, respectively.

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

Successful research operations relied on communication between captains and observers, as the captains provided professional interpretations on fishing conditions that were recorded as part of the data collected through this project. Sea and weather condition reports greatly influence catch ability and landings and the captains, through practical experience and empirical knowledge, provided valuable insight on this aspect of the fishery. 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 sheets for the 2014 Maui cruise was altered immediately after the captain/observer briefing on March 13, 2014. Additional form changes were implemented during the cruise operations. The most significant change was how fishing time was recorded and collected. Two stop watches were used to track and provide assurances that each reel/station fished for a total of 30 minutes per grid. Times collected were noted on the new forms, once the observers got used to tracking time per station data, input went smoothly.

The Guam survey was based on directed or targeted sampling/fishing sites that were used during the NOAA Research Cruise on Galvez Bank in March 2010. Although sampling was done in shallower waters around selected Guam sites, as compared to deep-seven depths, the survey was easily adapted to meet the Guam sampling needs. The trip and log forms developed and used in 2012 were once again used to collect consistent data in the 2014 research cruise.

#### *Observed Trips*

PIFG conducted and successfully completed two observed fishing survey trips during the contract period from September 16, 2013 to September 15, 2014. One trip was fishery independent pilot survey in the Main Hawaiian Islands off of the island of Maui that involved working with the R/V Oscar E. Sette from

April 6-18, 2014. And the other was an Independent Fish sampling survey on Galvez Bank in Guam from August 23, 2014 to September 6, 2014.

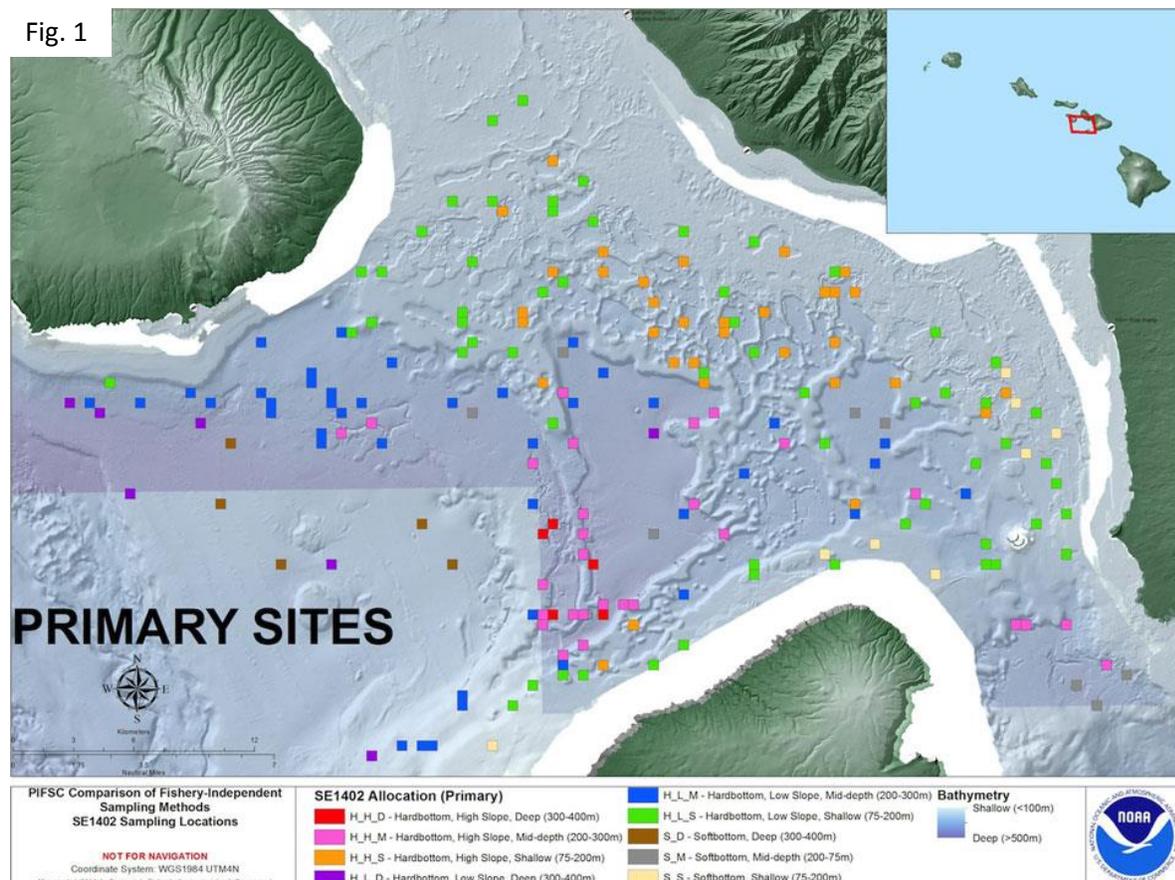
Main Hawaiian Islands Observed Trips

In the Main Hawaiian Islands during this contract period, PIFSC conducted one independent survey sampling trip off of Maui (see attached maps) that which KEI and 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 fishery independent pilot survey operation took place in the sheltered-offshore waters between the islands of Maui, Lanai and Kahoolawe (Fig. 1 Primary Sites) on April 6-18, 2014. During this cruise 3 PIFG contracted 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 three sampling gears were deployed relatively simultaneously into adjoining 500 meter by 500 meter grids. Data from each gear type deployed will be analyzed by PIFSC to evaluate and compare the effectiveness of each.

In coordination with each pilot survey, 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.

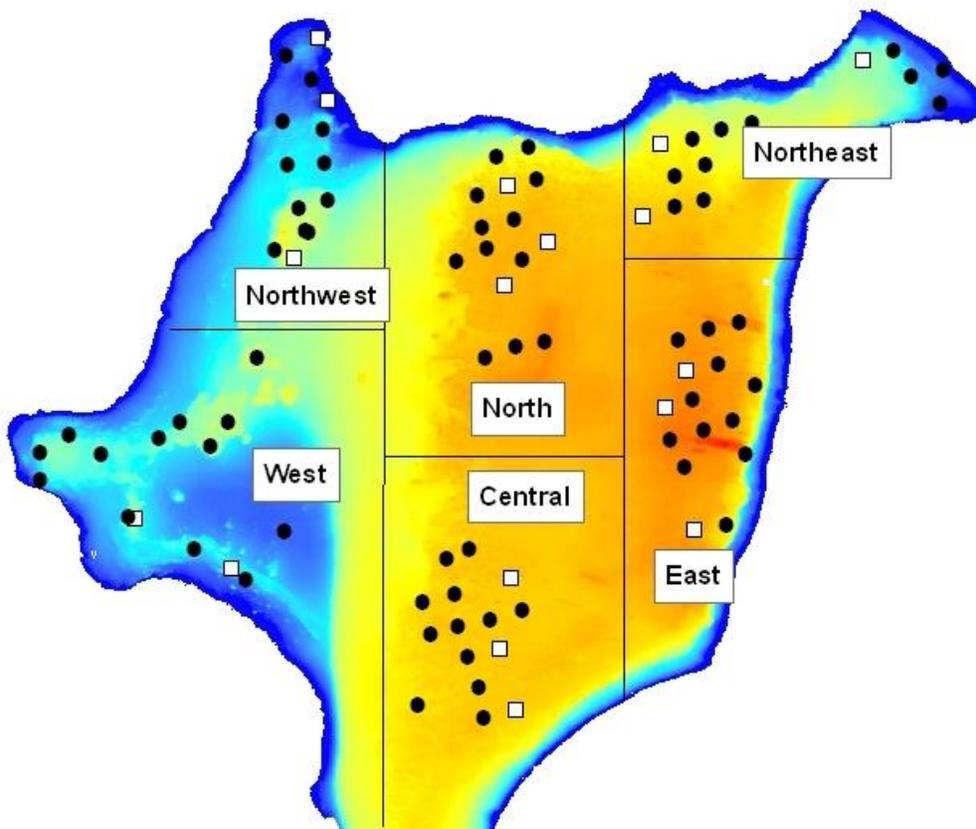
Fig. 1



### Galvez Bank, Guam Observed Trips

On Guam, a total of 77 stations were sampled (7 observed trips) from August 23, 2014 to September 6, 2014 on Galvez Bank (approximately 20 miles south of Guam see fig.2). The stations sampled corresponded to Bot-Cam and baited station work conducted by NOAA in 2010 on Galvez Bank. Fishing was conducted at each station using a suite of techniques. At each station, fishing was conducted by drifting, power drifting (holding the boat on location by using its motors to counter drifting) or multiple drops. Observers were instructed to sample each grid for a total time of 30 minutes each. Effort and number of drops varied due to shallow and deeper depths identified for sampling. For shallow depths on Galvez bank, fishing effort in terms of drops were per site were higher than deeper sites. The difference in water depth and composition of species were very different from survey efforts compared to Hawaii deep water complex. The contract vessels completed the required sampling sites and also conducted exploratory fishing at randomly selected sites. This effort can be compared to those of pre-selected sites and evaluated for the type of species landed and productivity.

Fig. 2



In Guam during the Independent Survey sampling cruises, all bottomfish samples were identified, measured (see Table 1) and retained for otoliths and gonads sampling by PIFSC staff. At the end of each observed trip, PIFSC staff Eric Cruz would meet vessels and observers dockside to collect bio sample specimens. All specimens were taken back to the Guam PIFSC lab where they were weighed, measured, and otoliths and gonads extracted. The fresh fish were then immediately returned that to each vessel captain. Certain whole fish samples were also kept for DNA sequencing. The contracted trips in Guam provided a significant number of fish for the bio-sampling and DNA analysis that was not previously available from prior NOAA cruises.

Table 1.

### 2014 Galvez Bank Shallow Bottom Species Sampling Project Summary

Grid	NorthWest	North	NorthEast	West	Center	East	Total
Species							
Blacktip Grouper	6	45	71	3	51	105	281
Redgill Emperor	26	33	2	38	26	2	127
Flagtail Grouper		5	6	1	3	11	26
Blueline Snapper	4	4		1	14		23
Yellowspot Trevally	5	1		1	2	1	10
Multibarred Goatfish	1	6	1			1	9
Ringtail Wrasse		1	2		1	3	7
Lyre Tail Grouper	2	1	1	1		1	6
Peacock Razorfish	4			1			5
White Margin Lyretail Grouper	2	1			1		4
Green Jobfish		2		1			3
Bar Cheek Trevally					1	1	2
Highfin Grouper				2			2
Orange Stripe Emperor				2			2
Small Tooth Jobfish	1			1			2
Stout Emperor	2						2
Yellowlip Emperor	1					1	2
Blue Spotted Bream				1			1
Coral Trout				1			1
Trumpet Fish						1	1
Twin Spot Snapper				1			1
Yellow Saddle Goatfish				1			1
Triggerfish (Released)	5	10	1	1	7		24
White Tip Reef Shark (Released)		1					1
Total	59	110	84	57	106	127	543

### *Captains/ Observer Debriefing*

In place of a debriefing meeting after the Maui fishery independent pilot survey, PIFG captains/observers were each mailed on June 24, 2014 cruise evaluation, performance and contractor critique forms. The forms were to be filled out returned as soon as possible and returned. PIFG used the forms to serve, capture and document information and concerns more accurately from each participant. In addition, several individual captains and observers discussed cruise operations directly with PIFG staff. Written comments will help provide details to help improve future cruises.

Debriefing meetings for captains/observers supporting the Galvez surveys on Guam was held on September 24, 2014 with KEI and PIFG staff. The reflection on prior survey performance successes and challenges provided for a healthy exchange of ideas on fishing operations in relation to sampling protocols which will helpful in improving the future sampling design and methods used in the independent survey. One major issue noted was the 5 grids on the Northeast sector of Galvez Bank could not be sampled due to extreme depths at that location which did not correlate with given NOAA GPS grid locations.

### *Observer Log Sheet Data Forms*

Modifications continue to be made to the forms to improve the quality of data collected by PIFG contracted observers and to better communications between fishery scientist, fishermen and PIFG observers. On the April 2014 Maui cruise, PIFSC staff made changes to the log form to reduce the amount of writing and to more accurately keep track of minutes per grid fished. During the 2014 Maui cruise arrangements were once again made 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 the Maui cruise, 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. This helped improve and expedite daily data collection throughout the cruise. 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 aids 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, KEI 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 and email address 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 in Hawaii 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*). For the Mariana Islands (Guam and Saipan) the bottomfish species targeted 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*)

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 barotrauma in captured fish. Treatment and protocols for fish that exhibited visual barotrauma condition varied with individual fish. Prescribed barotrauma treatment for these fish were venting, recompression “drop shot” or a combination of both. For new fishermen who could not attend the scheduled workshops, individual one-on-one training sessions were arranged with PIFG project manager. Proper handling, treatment and tagging of each is critical to the survivability of each and every fish tagged and released.

Fishermen (listed by island) who participated and tagged fish during this seasons PIFG deep-7 bottom fish tagging project include: **Oahu** – Roy Morioka (f/v Renee M), Gary Dill (f/v Imua), Breland Tam (f/v no name), Corwin Tam (f/v no name); **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), Basil Oshiro (f/v Okalani); **Molokai** – Kenneth Corder (f/v Munchkin); **Hawaii** – Dennis Colon (f/v She-nelle), Geoff Walker (f/v Jeanette M), Kevin Awa (f/v Taylor K), Kent Onaka (f/v Ride On), Len Nakano (f/v Kuulei aloha), Nathan Abe (f/v Ride On), **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 or board, 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 (recompression device), proper logging 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 16, 2013 to September 15, 2014 is shown in (Tables 2 & 3).

Table 2. Number and species of fish tagged: Sept. 16, 2013 – Sept. 15, 2014 (MHI)

Species	Kauai	Oahu	Molokai	Maui	Hawaii	Total
Onaga		8	19	104	4	135
Ehu	50	43	8	103	62	266
Kalekale	13	4	8	78	83	186
Opakapaka	4	167	521	494	242	1428
Gindai	20				17	37
Lehi				4	14	18
Hapuupuu	5			1		6
<b>Total:</b>	<b>92</b>	<b>222</b>	<b>556</b>	<b>784</b>	<b>422</b>	<b>2076</b>

Table 3. Number and species of fish tagged: Sept. 16, 2013 – Sept. 15, 2014 (Marianas)

Species	Guam	Saipan	Total
Ehu	1		1
Gindai	1		1
Yellowtail Kale	9		9
Pink Opakapaka	1		1
Onaga			
<b>Total</b>	<b>12</b>		<b>12</b>

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 Lawai'a magazine.

In addition, PIFG produced Bottomfish Project updates published in the Lawai'a magazine under the PIFG Koa section of the magazine of Issues 13, 14, & 15 (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. In addition the magazine is now carried in tackle shops in Guam and Saipan. 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, public meetings, tournaments and other fishing-related community events.

A PIFG Bottomfish Tag Recovery commercial runs as a public service announcement throughout the year on cable channel 16, especially during weekly episodes of Hawaii Goes Fishing. HGF has one the highest ratings and viewership on channel 16.

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.

Information regarding the tagging program is also hosted on the PIFG website, [www.fishtoday.org](http://www.fishtoday.org), which includes project reports, videos of dropshot methods, contact information and other project details.

#### *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 16, 2013 to September 15, 2014 a total of 46 tagged bottomfish were recovered. The first recovered tagged onaga was recaptured off of Maui (the first to be recovered in this project) it was recaptured from a depth of 124 fathoms and was at liberty for approx. 3 months.

Interisland tagged deep 7 recoveries: 1) One tagged opakapaka was recovered off of the island of Hawaii it had been originally tagged off of Maui. 2) One tagged opakapaka was recovered off of Oahu and was originally tagged on Penguin Banks. 3) One tagged opakapaka was recovered off of Lanai and was originally tagged off of Maui.

#### *Bio Sampling*

Participating taggers have responded to a request by NOAA Fisheries, PIFSC for the collection of small juvenile bottomfish. Although no compensation for juvenile bottomfish was available during this project year PIFG fishermen continued to collect and donate specimens to PIFSC Life History program. 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 turned over 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**

KEI and 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. Assisted by the PIFSC Life History Program, the "hit list" of needed specimens was distributed to all PIFG bottomfish observers and participating captains during pilot survey and Independent survey sampling trips. Those specimens collected during sampling trips were all turned over directly to PIFSC for processing and analysis.

Although there were budget constraints during this project year and no compensation for bio samples were available to fishermen through the grant, PIFG continued to assist in soliciting bio samples for PIFSC through fishermen who were willing to donate specimens. Most of the specimens were turned over directly to PIFSC for processing and analysis, therefore PIFG does not have an accounting of the number of specimens turned over to PIFSC.

In the later part of the project, NOAA Life History Program acquired limited funding for the collection of bio samples. PIFSC staff contracted and worked with a few PIFG fishermen directly to collect a number of bio samples for a limited time.

#### *Bio Sample Data*

PIFSC staff and a fish wholesaler continued to maintain a bottomfish sampling system on the island of Maui through the collaboration of PIFG bottomfish fishermen. Protocols were set up to allow PIFSC staff to directly sample bottomfish as they were being received at the wholesaler from the fishermen.

#### **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. KEI and PIFG published articles and ads about this bottomfish research in periodic newsletters, Lawai'a, 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 2013 – Sep 2014)
SEPT 2013	<ul style="list-style-type: none"> <li>• Attended WPRFMC MHI Bottomfish Working Group meeting</li> </ul>
OCT 2013	<ul style="list-style-type: none"> <li>• Participated in the "Sea to Me" seafood tasting event where PIFG provided a bottomfish display staffed by PIFG bottom fishermen. Also present with a Lawai'a table where magazine and outreach material were passed out.</li> <li>• Participated in the "Fishing for the Hungry" fishing tournament to support HIS through fresh fish donated by fishermen in the tournament Lawai'a table was present to pass out Bottomfish tag recovery flyers and copies of past Lawai'a magazines.</li> <li>• Participated in the "Hawaii Fishing and Seafood Festival" by providing outreach and education on the bottomfish tagging project from a booth.</li> <li>• Participated in the Western Pacific Fisheries Management Council "Fisher Forum" with a table display where copies of the Lawai'a magazine and bottomfish outreach materials were passed out.</li> </ul>

	<ul style="list-style-type: none"> <li>• Attended the 114<sup>th</sup> SSC WPRFMC meeting</li> <li>• Attended the 158<sup>th</sup> Meeting of the Western Pacific Regional Fisheries Management meeting.</li> </ul>
<b>NOV 2013</b>	<ul style="list-style-type: none"> <li>• Present in Guam and Saipan to distribute bottomfish project flyers and Lawaia magazine to tackle shops and fish dealers.</li> <li>• Participated in the WPRFMC Main Hawaiian Island Bottomfish Working Group Meeting in Honolulu.</li> </ul>
<b>DEC 2013</b>	<ul style="list-style-type: none"> <li>• Submitted the First Quarter Bottomfish Project report to PIFSC staff.</li> </ul>
<b>JAN 2014</b>	<ul style="list-style-type: none"> <li>• Hosted booth at the Izuo tackle show distributed Lawai'a magazine, Bottomfish tag recovery flyers and project updates to tackle dealers.</li> </ul>
<b>FEB 2014</b>	<ul style="list-style-type: none"> <li>• Updated PIFG Cooperative Research Project on the PIFG website.</li> <li>• Moved forward with obtaining scientific collecting permit in order to tag bottomfish in Saipan.</li> </ul>
<b>MAR 2014</b>	<ul style="list-style-type: none"> <li>• Attended Maui Co-op monthly meeting provided Pre Cruise presentation, visited Maui tackle shops, Fish Dealers and State agency offices. (Distributed 250 flyers)</li> <li>• Published Lawai'a Magazine no. 14 contained Bottomfish Project recap in the PIFG Koa section and included full page Bottomfish Tag Recovery advertisement.</li> <li>• Attended WPRFMC 115<sup>th</sup> SSC Meeting</li> </ul>
<b>APR 2014</b>	<ul style="list-style-type: none"> <li>• Participated in the first ever R/V Oscar E. Sette open house for select Maui fisher's and family off of Lahaina. Guest we treated to a vessel tour, AUV deployment and recovery in addition to a sensational lunch in the ships galley.</li> <li>• Completed and submitted the Second Quarter Project report</li> </ul>
<b>JUN 2014</b>	<ul style="list-style-type: none"> <li>• Presentation Cooperative Fisheries Project, Moanalua High School Marine Education Program</li> <li>• Published Lawai'a Magazine no. 15 contained Cooperative Research Bottomfish Tagging project update in the PIFG Koa section. Also contained full page Bottomfish Tag Recovery advertisement.</li> <li>• Attended the WPRFMC SSC meeting.</li> <li>• Participated in the WPRFMC "Fisher's Forum" with a table display where copies of the Lawai'a magazine and bottomfish outreach materials were passed out.</li> </ul>

	<ul style="list-style-type: none"> <li>• Attended the 159<sup>th</sup> Meeting of the Western Pacific Regional Fisheries Management meeting.</li> <li>• Completed and submitted the Third Quarter Project report</li> </ul>
<b>JUL 2014</b>	<ul style="list-style-type: none"> <li>• Attended the Marianas Fishing Derby in Saipan, distributed Lawai'a magazine and Cooperative Fisheries outreach material to tackle shop, fish dealers and government agency.</li> </ul>
<b>SEP 2014</b>	<ul style="list-style-type: none"> <li>• Participated in the "Hawaii Fish &amp; Dive Expo" provided a Cooperative Fisheries Bottomfish Research display and handouts. Also had Lawai'a table where over 1,000 past copies of the Lawai'a magazine were distributed.</li> </ul>

#### IV. DISCUSSION, OUTCOMES AND RECOMMENDATIONS

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

Maui Cruise 2014

*1) Sampling protocols and modification of the log forms* were implemented 3 weeks prior to the cruise. Although sampling protocols were discussed during the pre-cruise briefing on March 13, 2014, log forms were modified after the briefing; therefore training had to be conducted days prior to the cruise without actually in water testing.

\*Recommendation: To better prepare for upcoming cruises it is recommended that more lead time and preparation be allocated to allow for modification of sampling and protocols or materials prior to individual cruises. Minimum of one month lead time would be preferable to allow for project contractor to facilitate changes and plan for training and preparation of materials.

*2) New locations and number of sampling grids* as revealed during the pre-cruise briefing on March 13, 2014 3 occurred just weeks prior to the sampling cruise. The locations and number of sampling sites posed logistical problems in terms of distance, time and travel for survey vessels. The new sites and increase in travel distance impacted fuel cost and reduced daily sampling time. Had this been included in the original scope of work, there may have been better coverage. But accommodations on behalf of the contractors were made in good faith to accomplish project goals which lead to the success of this project.

\*Recommendation: If possible it is suggested that significant changes to sampling protocols must be discussed and included in the project scope of work prior to the project bid process. This would enable proper planning in order to plan for and fulfill project scope of work.

*3) Strong winds and unstable weather* made sampling for difficult during the majority of the cruise. Small craft advisories for waters surrounding Maui were posted for 8 out of the 13 days during the scheduled cruise. Although alternate sites were designated for such weather

conditions, prolong bad weather periods were not considered and accounted for in the project scope of work. This led to resampling of already sampled grids/areas reducing coverage of the outer-most grid sites.

\* Recommendation: Weather conditions can be unpredictable but scheduling during months that historically have had better weather conditions may improve or optimize sampling surveys efforts for this magnitude and scale in the future.

4) *Daily Sample site selection by NOAA* based on project objectives could have been coordinated better by prioritizing survey sample sites in advance. Many times it was observed that site selection was determined in the morning of the survey based on early morning reconnaissance by the R/V Sette. This would often result in vessels having to travel far greater distances to rendezvous with the R/V Sette in order to transfer observers or GPS sampling gear. Sampling site priorities appeared to be based on AUV sampling sites which often times differed greatly between fishing survey and botcam sites.

\* Recommendation 1. If there is no need for real time or simultaneous sampling of gears in coordination with the AUV, then fishing and botcam surveys should be independent of the AUV sampling in terms of daily site selection.

\* Recommendation 2. It would be better for each fishing vessel to retain observers and return to port each day. Data could then be downloaded daily to shore-based computers and sent to the ship for processing. Eliminating the need for at sea observers to transfer to the Sette daily would provide vessels more flexibility and increase available sampling time. Under the prior protocol, morning transfers of observers from the Sette to the fishing vessel did occur until 0800-0830. Then in the evening, vessels were required to be ready transfer observers back to the Sette by 1530. This protocol added significant travel time and cost for each vessel to rendezvous with the Sette prior to and after each sampling day. Eliminating this step will extend the overall available sampling time and help increase daily sampling coverage. If observers need to be transferred to the Sette, perhaps the transfers could occur every other or third day of sampling.

5) *Total number of fishing survey sample days* per cruise needs to be considered in the overall sampling plan. It has been observed over the last 3 Maui cruises that there should be no longer than 6 sampling days in a row without a break or change in crew. We recognize that fishing especially in harsh conditions can be very taxing. Captains, crew and observers have shown physical and mental fatigue by the end of 6 days. So far we have been very lucky that there has been no serious incidence during past cruises. But this should be strongly considered to avoid possible accidents and/or injury in future cruises.

\* Recommendation: The total number of sampling days should be limited to no more than 5 consecutive fishing days. Participants need time to rest, refuel, prep and repair gear, etc. so they will not overextend and expose themselves to potential injury and harm during the overall cruise period.

Guam Cruise 2014

- 1) *Galvez Northeast 5 of the grids* need to be checked as the sites do not reflect sampled depth indicated by R/V Sette in prior sampling. Depths for 5 of the sites were over 900 ft. whereas given depths were reported to be only half that depth.

\*Recommendation: NOAA should recalibrate the sites and depths prior to any future survey sampling.

- 2) *Log Forms* in the future should be redesigned to better capture the different bottomfish complexes encountered during survey sampling of Galvez Bank. There are two distinct bottomfish complexes shallow and deep. Both were encountered during Galvez Bank cruise survey. Fishing effort in shallow grounds can be very intense as there are more interactions with species than in deeper waters.

\*Recommendation: The forms should be prelisted so there is less redundancy in terms of header information for sampling shallow grounds since many log sheets are used during sampling.

- 3) *Catch composition differed by moon phase and season* at selected sampling sites. Contract fishers noted a significant difference in the presence and absence of certain key species in the past 3 surveys. Sampling has occurred in different months and moon phases between years as noted by fishers.

\*Recommendation: Future survey sampling should attempt to confirm these observations as they could seriously impact assessment of Galvez Bank.

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

6) *Tagging efforts and direction* PIFSC should consider designing sampling protocols to test different treatments of barotrauma to look at survivability or mortality in the tag and release of deep water bottomfish, especially for species such as onaga and ehu that are the deepest dwelling. PIFSC should also focus future tagging efforts that address tag placement quality and survivability and not quantities of tags distributed. Based on the recovery of one onaga and one ehu perhaps there is need to refocus attention to these species to improve overall tag recovery in this program.

7) *Focused tagging efforts* PIFSC should consider saturation tagging in certain areas especially juvenile Deep 7 grounds. In order to accomplish this we need to collaborate with scientist and fishermen to target optimum juvenile grounds or areas, perhaps looking at past tagging sites and tag recovery data.

8) Tagging efforts in Guam and Saipan were low due to severe weather conditions and occurrences of a series of typhoons in the area. The small boat fleet in Guam is highly susceptible to weather conditions. Also some of the highline taggers participated with the NOAA R/V Sette cruise in Saipan and Guam and therefore were not available to assist in tagging.

9) An alternative to conventional mark and recapture tagging of deep-7 bottomfish is to develop or search for small satellite pop-up tags that can be used on bottomfish species. Information learned through the use of satellite tags could be very informative 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.

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

10) 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.

11) KEI and 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. PIFG continued working with fishermen to collect and donate valuable juvenile bottomfish samples. NOAA PIFSC should continue to seek bio sample funds and work through KEI and PIFG to assist in collection of specimens.

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

12) 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 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 KEI and PIFG to support tagging recovery.

13) KEI and PIFG participated in coordinating the Open House event onboard the R/V Sette on Maui. There was tremendous interest from the Maui community in wanting to participate in the open house. NOAA should consider making the open house a regular part of future Maui Research cruise plans. This is a very positive initiative of for Cooperative Research.

14) NOAA/KEI/PIFG should consider doing a Cooperative Research Project presentation on each of the major islands to help foster better community relations and provide much needed outreach and education.

V. ATTACHMENTS

- a. Observer Bottomfish Log Sheet MHI (revised 2014)
- b. Observer Bottomfish Trip & Effort Log Sheet Guam (revised 2013)
- c. NOAA Select Sizes of Interest MHI (revised March 2013)
- d. Bottomfish Cruise Flyers (April 2014)
- e. Lawai'a Magazine Bottomfish Ad, Articles & project updates Issue no. 13 (Oct. 2013), 14 March 2014), & no. 15 (June 2014)
- 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 coordinated activities and public outreach and education from September 16, 2013 to September 15, 2014. (included above)

# Attachments