

Final Report

To

**Joint Institute for Marine and Atmospheric Research
School of Ocean and Earth Science and Technology
University of Hawaii**

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Project Title: Hawaiian Archipelago Bottomfish Sampling Program (Project # 657787)

Funding agency: Hawaii Fisheries Disaster Relief Program (FDRP)

Fishery Targeted: Hawaii Bottomfish Fishery

Award Received: \$400,793 was received and after accounting for indirect costs, a total
of \$374,958 was available.

Actual Amount Spent: To be confirmed by JIMAR Administration.

Project Objectives:

With the funds requested, the Pacific Islands Fisheries Science Center (PIFSC) will
(1) contract 8 fishermen for one year to provide samples of 5 bottomfish species
caught during regular fishing trips and (2) implement a bottomfish fishery
dependent sampling program at the UFA fish auction. Samples of the 5 species of
bottomfish will be collected as available from the 3 different management zones in
the Hawaiian Archipelago: Ho'omalulu and Mau in the Northwestern Hawaiian
Islands (NWHI), and the Main Hawaiian Islands (MHI). Two to three fishermen
will be designated to collect bottomfish samples from each of these zone (Figure 1).
The bottomfish species of interest include four eteline snappers (opakapaka

Pristipomoides filamentosus, onaga *Etelis coruscans*, ehu *Etelis carbunculus*, and uku *Aprion virescens*), and hapu'upu'u grouper (*Epinephelus quernus*). The zonal collection of samples will enable comparison of growth and maturation curves, as well as a robust appraisal of bottomfish connectivity among reefs (or groups of adjacent reefs) throughout the archipelago. Viewed collectively, these estimates will provide the necessary data to evaluate possible stock structuring between NWHI subregions, as well as between the NWHI and the MHI. This information will greatly enhance the spatial resolution of stock assessments for these species. The purchase of these specimens directly from bottomfish fishers in Hawai'i also helps support the local industry.

How Objectives Were Met:

- a. Enlistment of fishermen
 - Town Hall Meetings and visits to local fishing clubs were used to enlist fishermen in the project.
- b. Procurement of specimens
 - Total number of fish received accompanied by all location information was 2,044 specimens. Length-frequency by zone of all bottomfish collected appears in Figures 2-6.
 - Vessel contribution, the total trips in each management zone, and the total contribution of targeted fish by species appears in Table 1.
- c. UFA market sampling
 - A total of 1913 fish were sampled at the auction including UFA determined weights. Data collected by NMFS staff includes productivity by date, number of vessels sampled, species measured for weights and lengths, and a breakdown for the number of fish sampled by species (Table 2).
- d. Data records
 - Mega-files were created in Microsoft Excel to track all samples received from fishermen (<H:\Bottomfish Data\Bottomfish Data-4.xls>), and from UFA auction sampling ([Table 2- UFA Results for Bottomfish Sampling.xls](#)).
- e. Storage of hardparts
 - Itemized log of gonads, DNA samples, otoliths, dorsal and anal spines, opercles, eyeballs, stomach contents, and stable isotope samples acquired from sampling are categorized and stored in Lab 152 at the Aiea Heights Research Facility.

Work Anticipated vs. Work Actually Completed:

- a. Procurement of specimens
 - Proposal outlined zonal contributions of 40 fish for each species from each fisherman contracted, totaling approximately 7,200 samples for the 5

bottomfish targeted. Due to the unexpected Western Pacific Fisheries Management Council (WESPAC) fishery closure for bottomfish in the months of May through September 2007 and the loss of participation by several fishermen, only 2,065 fish were contributed to the sampling effort.

- Collected fish covered a range of length and weight classes. Specimens of small size, presumed juveniles, were targeted in the latter portion of this project to allow for characterization of early growth rates in future studies. Length frequency distributions of species (Figures 2-6) denote where we were successful and unsuccessful in accomplishing this goal.
- Received 71 gindai (*Pristipomoides zonatus*), 14 kalekale (*Pristipomoides sieboldii*), 1 lehi (*Aphareus rutilans*), 1 hogo (*Pontius macrocephalus*), 1 golden kalekale (*Erythrocles scintillans*), and 1 Randall's snapper (*Randallichthys filamentosus*) as non-target species collected by contracted fishermen.

b. UFA market sampling

- Anticipated visiting the UFA auction on a weekly basis throughout the project. Influx of a high volume of bottomfish samples did not allow for continuous effort to be spent at the auction, but rather at the lab processing fish. In October and November when fish shipments were few, many visits to the UFA auction allowed for the sampling of 1913 fish.

c. Identification of specimen gender and stage of sexual maturity

- An account with the UH Histology & Imaging Core Facility at the John Burns School of Medicine in Kaka'ako was established during this project to produce 460 stained histological thin-sections of hapu'upu'u gonads. This was conducted to confirm gender identity of collected hapu'upu'u gonads. Work related to determining sex and stage of sexual maturity of hapu'upu'u and other bottomfish gonads will continue after the end of the contract period.

d. Radiometric aging pilot project

- Dr. Allen Andrews of the Moss Landing Marine Laboratories was contracted to conduct a pilot aging study on otoliths of opakapaka to test the feasibility of lead-radium (^{210}Pb : ^{226}Ra) dating as a mean to establish older ages of bottomfish. Old samples of known age juveniles collected from 1987 and 1997&1998 were analyzed and found to yield ages in good agreement with their actual elapsed ages (age plus time since capture). Results proved promising for establishing older age estimates and we would like to continue this work on opakapaka and other bottomfish species after the end of the contract period.

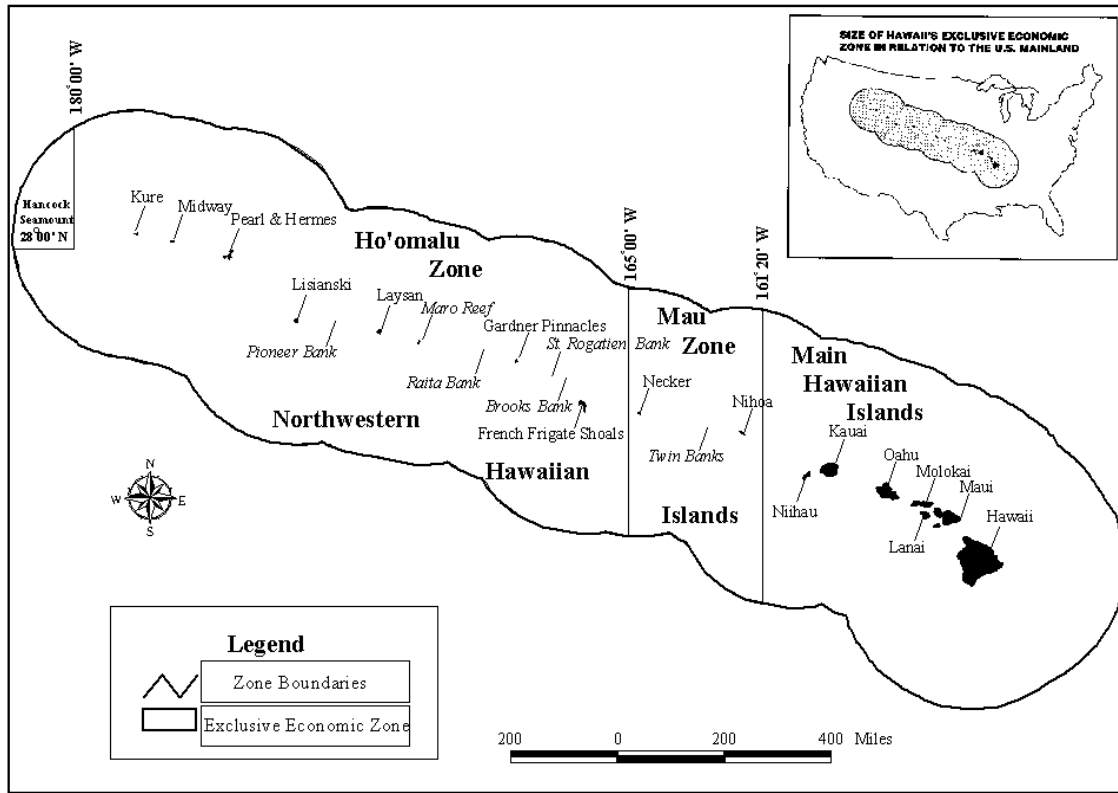
Expected vs. Actual Costs

- a. Because of the unexpected closure of the bottomfish fishery, significantly less fish were available for purchase. As a result, funds allocated for this activity were not fully utilized. The unused funds were returned to the grantee.

Publications:

- a. None to date.

Figure 1: Map of the Hawaiian Archipelago distinguishing the Ho'omalulu Zone, Mau Zone, and the Main Hawaiian Islands.



Western Pacific Fisheries Management Council

Table 1. Hawaiian Archipelago Bottomfish Sampling contributions.

Bottom fish Contributions: April 1, 2007- May 29, 2008				
Vessels That Fished	9	3	12	
Total Trips	61	21	82	
Zones Fished	Main Hawaiian Islands	Northwest Hawaiian Islands	Main Hawaiian, Northwest Hawaiian Islands	
Fish Contribution by Species	Ehu	188	207	395
	Gindai	22	48	70
	Hapu	30	259	289
	Onaga	384	24	408
	Paka	437	99	536
	Uku	135	214	349
	Misc	18	0	18
Total Fish Contribution	1214	851	2065	

*Miscellaneous species include; Kale, Lehi, Golden Rover, Hogo and Randall's

Figure 2. Ehu Length-Frequency 04/21/2007-05/29/2008 according to zone.

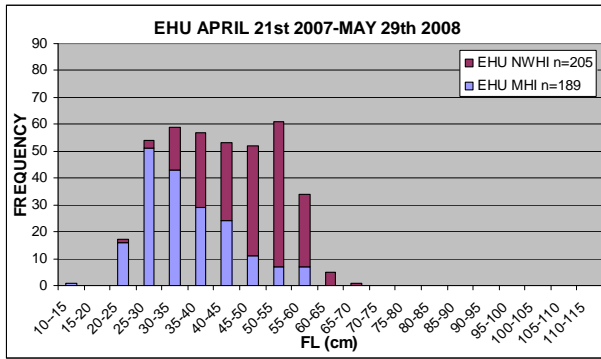


Figure 5. Paka Length-Frequency 4/21/2007-05/29/2008 according to zone.

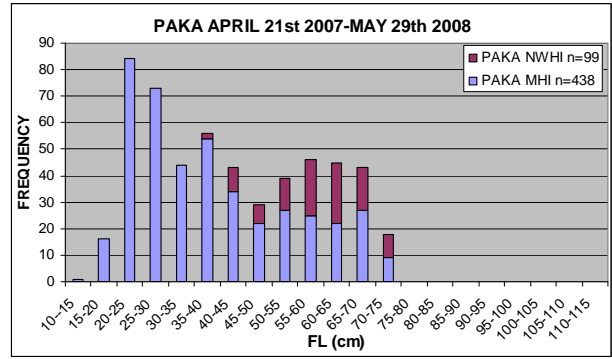


Figure 3. Hapu Length-Frequency 04/21/2007-05/29/2008 according to zone.

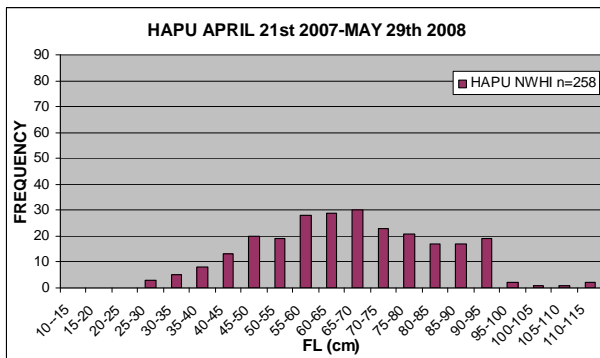


Figure 6. Uku Length-Frequency 04/21/2007-05/29/2008 according to zone.

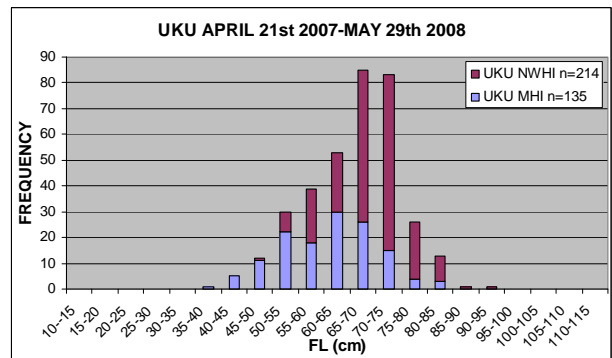


Figure 4. Onaga Length-Frequency 04/21/2007-05/29/2008 according to zone.

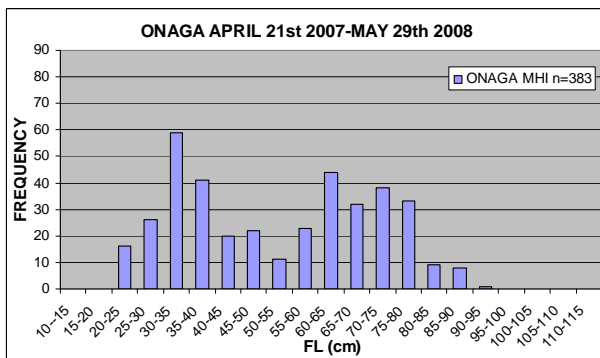


Table 2. UFA Auction Results for the Hawaiian Archipelago Bottomfish Sampling Program.

Month		OCT		NOV		Total Sampled***	
Vessels*		18		11		29	
Weights & Lengths		Wts	Lgths	Wts	Lgths	Wts	Lgths
Fish Sampled**		508	508	247	375	755	883
By Species	Ehu	53	53	38	44	91	97
	Gindai	0	0	6	6	6	6
	Hapu	9	9	29	29	38	38
	Onaga	142	142	75	113	217	255
	Paka	241	241	67	120	308	361
	Uku	43	43	16	34	59	77
	Misc***	20	20	16	29	19	22
Total Sampled****		508	508	247	375	755	883

* Vessels- Number of vessels that bottomfish were sampled from during that particular month.

** Fish Sampled- Number of Fish weights and lengths taken. Fish sampled totals may vary because both measurements were not always completed.

***Miscellaneous species include; Kale, Lehi, Golden Rover, Hogo and Randall's

****Total Sampled- Reflects all fish sampled for either weights, lengths or both weights and lengths