



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE/NOAA FISHERIES

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CRUISE REPORT¹

VESSEL: *Oscar Elton Sette*, Cruise SE-13-06

PROJECT PERIOD: July 30, 2013 to August 11, 2013

AREA OF OPERATION: Leeward Maui

TYPE OF OPERATION: Comparison of Fishery-independent Methods for Sampling Main Hawaiian Islands Bottomfish Assemblages

ITINERARY:

SE-13-06 sailing was delayed from July 28 to July 30 due to the approach of Tropical Storm Flossie.

30 July	0800. All scientists aboard.
30 July	0900. Start of project. Departed Pearl Harbor en route to Maui.
30 July–1 August	Conducted nighttime EK60 calibration near Lahaina Harbor (20 52.6N × -156 42.4W). Conducted ballast/trim ROV dive. Prepared SeaBED AUV for dive operations.
2–8 August	Continued night-time EK60 calibration.. Conducted coordinated bottomfish gear calibration surveys (EK60, BotCam, AUV, Research Fishing) off the coast of Maui and/or surrounding islands. Coordinated vessels included: NOAA Ship <i>Oscar Elton Sette</i> , RV <i>Huki Pono</i> , RV <i>Naomi K</i> , RV <i>Imua</i> , and RV <i>Ride-On</i> . On-station morning or afternoon transfers of observers from <i>Sette</i> to PIFG vessels were conduct using <i>Sette</i> small boat (SE-4).

¹ PIRSC Cruise Report CR-13-005
Issued 16 December 2013

9 August	RV <i>Huki Pono</i> conducted BotCam/MOUSS camera drops. NOAA Ship <i>Oscar Elton Sette</i> conducted paired EK60 acoustic and ROV operations for target-strength identification.
9–10 August	Conducted paired EK60 acoustic and ROV operations for target-strength identification.
11 August	0800 Arrived Pearl Harbor. Upon arrival, disembarked science party. End of project.

MISSIONS AND RESULTS:

This research project targeted areas (grid cells) where density of Deep-7 bottomfish was expected to be high. Target areas were selected based on spatial surveys conducted during prior research projects and in situ sampling. During SE-13-06, areas with high bottomfish density were resampled whereas areas found to have low bottomfish density were not. This is a departure from the traditional stratified-random sampling protocol and was adopted to ensure that adequate data density to compare the selected sampling methods is achieved as quickly as possible. Once the method comparison is complete, a subset of sampling methods will be selected for the full stratified-random survey.

The scientific objectives for SE-13-06 were:

1. **Conduct calibrations of the Simrad EK60 echosounder by the placement of a metallic calibration sphere at various locations underneath the ship's hull.** This objective met with mixed results. Successful calibration of all 4 acoustic frequencies (38 kHz, 70 kHz, 120 kHz, and 200 kHz) was achieved, but necessitated 5 separate two-point anchoring events by the NOAA Ship *Oscar Elton Sette*. Calibration was conducted in a known large-vessel anchoring area south of Lahaina, Maui (20 52.6N × -156 42.4W) (Fig. 1). A proof-of-concept drift calibration of the 200 kHz frequency was also successfully completed.
2. **Research and development of methods to cross-compare or calibrate fishery-dependent (extractive) and fishery-independent (nonextractive) sampling methodologies for use in stock assessment.**
3. **Estimate size-structured abundance of Hawaii Deep-7 bottomfish using a variety of extractive and nonextractive methods including:**
 - a. Baited and un-baited underwater stereo-video camera systems
 - b. SeaBED AUV (Fig. 3)
 - c. EK60 active acoustics
 - d. Phantom ROV (Fig. 4)
 - e. Research hook-and-line fishing

Objectives 2 and 3 are related and were successfully completed during SE-13-06. All 4 primary fishery-independent sampling methods (cooperative research fishing, BotCam stationary stereo-video camera systems, SeaBED autonomous underwater vehicle, and EK60 active acoustics) were successfully deployed. One hundred and twenty-five

cooperative fishing sampling events occurred, along with 62 BotCam sampling events, 12 AUV sampling events, 10 daytime EK60 sampling events, 12 night-time EK60 sampling events, and 2 ROV sampling events (Table 1). A single fishing event represents 30 min of fishing time, which may be composed of multiple drift events within the grid cell. A BotCam event represents 2 separate 15-min BotCam deployments within the grid cell. An AUV event typically represents a standardized sparse-grid survey track within each grid cell, except when sea-floor topography and operation risk warrants an alternate survey track. An EK60 event represents 3 N-S and 3 E-W transects through the grid cell. An ROV event represents a deployment of the ROV into a fish school discovered using the EK60.

During BotCam operations, a previously tagged Opakapaka (*Pristipomoides filamentous*) was observed in the stereo-video (Fig. 5). This is a first occurrence and the individual appeared to be healthy and interacting normally with conspecifics.

Additionally, the Phantom ROV and a working prototype of the Modular Optical Underwater Survey System (MOUSS) were successfully deployed.

The data from these sampling events is now being processed for analysis.


4. **Conduct paired EK60/ROV/fishing surveys to ground-truth EK60 data.** This objective was conducted as a proof-of-concept as the loss of 2 sea days due to Tropical Storm Flossie and the difficulties of EK60 calibration reduced the time available for this objective. Two separate ROV/Acoustic dives were conducted. Schools of fish were targeted using the EK60 and the ROV was deployed into those schools for optical validation of species composition and size structure. While the goal was to deploy the ROV vertically into the fish schools, vessel handling and drift considerations often resulted the ROV being deployed updrift of the school and drifting into the school horizontally. The ROV clump weight was baited to attract fish to the clump weight where they could be simultaneously observed by the ROV and EK60. On the first dive, a large school was seen in the EK60 but only one Opakapaka (*Pristipomoides filamentous*) and one bluespine unicornfish (*Naso unicornis*) were observed by the ROV. On the second dive, a large school was seen in the EK60 but only Opelu (*Decapterus sp.*) were seen by the ROV. These results are not conclusive as only 2 dives were conducted and the ROV was maintained at an altitude of 10 meters off the bottom. While the EK60 data showed that the schools were distributed from the bottom to well above 10 m altitude, it is possible that the species composition near the bottom differed from that observed by the ROV.

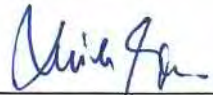

SCIENTIFIC PERSONNEL:

Name (Last, First)	Title	Date Aboard	Date Disembark	Gender	Affiliation	Nationality
Richards, Benjamin	Chief Scientist	7/28	8/11	Male	PIFSC	USA
Qin, Chuan-xin	Stock Assessment Scientist	7/28	8/11	Male	CAFS South China Sea Fisheries Research Institute	China
Li, Xiaoguo	Stock Assessment Scientist	7/28	8/11	Male	CAFS South China Sea Fisheries Research Institute	China
Yau, Annie	Stock Assessment Scientist	7/28	8/11	Female	PIFSC	USA
Rooney, John	AUV co-PI	7/28	8/11	Male	JIMAR	USA
Clarke, Elizabeth	AUV co-PI	7/28	8/11	Female	NWFSC	USA
Taylor, Jeremy	AUV technician	7/28	8/11	Male	JIMAR	USA
Anderson, Jeff	AUV technician	7/28	8/11	Male	JIMAR	USA
Cohen, Gabriel	Video analyst	7/28	8/11	Male	JIMAR	USA
Hoover, Aimee	EK60 Technician	7/28	8/11	Female	JIMAR	USA
Copeland, Adrienne	EK60 Technician	7/28	8/11	Female	JIMAR	USA
Ebisui, Eddie ¹	PIFG Fisheries Observer	8/1	8/7	Male	PIFG	USA
Tam, Breland ¹	PIFG Fisheries Observer	8/1	8/7	Male	PIFG	USA
Eguchi, Scott ¹	PIFG Fisheries Observer	8/1	8/7	Male	PIFG	USA
Tanaka, James ¹	PIFG Fisheries Observer	8/1	8/7	Male	PIFG	USA
Farr, Hunter ¹	PIFG Fisheries Observer	8/1	8/7	Male	PIFG	USA
Demarke, Chris ²	BotCam technician	NA	NA	Male	UHM	USA
Barlow, Jamie ²	Small boat logistics/ BotCam technician	NA	NA	Male	PIFSC	USA
Alexander, Benjamin ²	BotCam technician	NA	NA	Male	UHM	USA

¹These personnel stayed aboard the *Sette* each evening. During the day, they were aboard the PIFG commercial fishing vessels as observers. They disembarked the *Sette* each morning and embarked again each evening. Only 3 observers were active at any one time, with 2 reserved for rotation or backup.

²These personnel were aboard the RV *Huki Pono*.

Submitted by: 
Benjamin L. Richards
Chief Scientist

Approved by: 
 Samuel G. Pooley
Science Director
Pacific Islands Fisheries Science Center

Attachments
Table

Table 1. SE-13-06 sampling effort. Numbers indicate the number of sampling event by gear by grid cell. A single fishing event represents 30 min of fishing time, which may be composed of multiple drift events within the grid cell. A BotCam event represents 2 separate 15-min BotCam deployments within the grid cell. An AUV event typically represents a standardized sparse-grid survey of three 400-m tracks equidistant from each other within each grid cell, except when seafloor topography and operation risk warrants an alternate survey track. An EK60 event represents 3 N-S and three E-W transects through the grid cell. An ROV event represents a deployment of the ROV into a fish school discovered using the EK60.

GRIDCODE	Cell ID	Hab	Depth_m	Centroid Long	Centroid Lat	Fishing	Bot Cam	AUV	EK 60	EK60 (night)	ROV
J2	13814	HB_H	-294.3	-156° 42.186'	20° 39.679'	4	2	0	0	0	0
J1	13935	HB_H	-253.15	-156° 42.182'	20° 39.949'	4	2	0	0	0	0
I1	14049	HB_H	-300.97	-156° 43.041'	20° 40.232'	9	5	1	0	2	0
I2	14050	HB_H	-239.84	-156° 42.753'	20° 40.228'	9	5	1	0	2	0
E2	14427	HB_H	-199.3	-156° 39.575'	20° 40.998'	7	4	1	1	1	0
E1	14552	HB_H	-228.11	-156° 39.571'	20° 41.269'	8	4	1	1	1	0
D2	15334	HB_H	-152.09	-156° 39.258'	20° 42.890'	11	5	1	1	1	1
D1	15465	HB_H	-145.24	-156° 39.254'	20° 43.161'	12	5	0	1	1	0
F2	15847	HB_H	-145.28	-156° 41.833'	20° 44.008'	3	2	0	0	0	0
B1	15853	HB_H	-133.47	-156° 40.105'	20° 43.985'	1	1	0	0	0	0
B2	15854	HB_H	-173.96	-156° 39.817'	20° 43.981'	2	1	0	0	0	0
C1	15855	HB_H	-149.36	-156° 39.529'	20° 43.977'	13	4	1	1	1	0
C2	15856	HB_H	-154.52	-156° 39.241'	20° 43.973'	14	4	2	1	1	0
G1	15969	HB_L	-115.68	-156° 43.556'	20° 44.302'	8	3	1	1	0	0
G2	15970	HB_H	-148.62	-156° 43.268'	20° 44.298'	8	3	1	1	0	0
F1	15975	HB_H	-162.64	-156° 41.828'	20° 44.279'	3	2	0	0	0	0
O1	13691	HB_H	-310.88	-156° 42.766'	20° 39.415'	5	5	1	1	1	0
O2	13812	HB_H	-295.35	-156° 42.761'	20° 39.686'	4	5	1	1	1	0

Figures

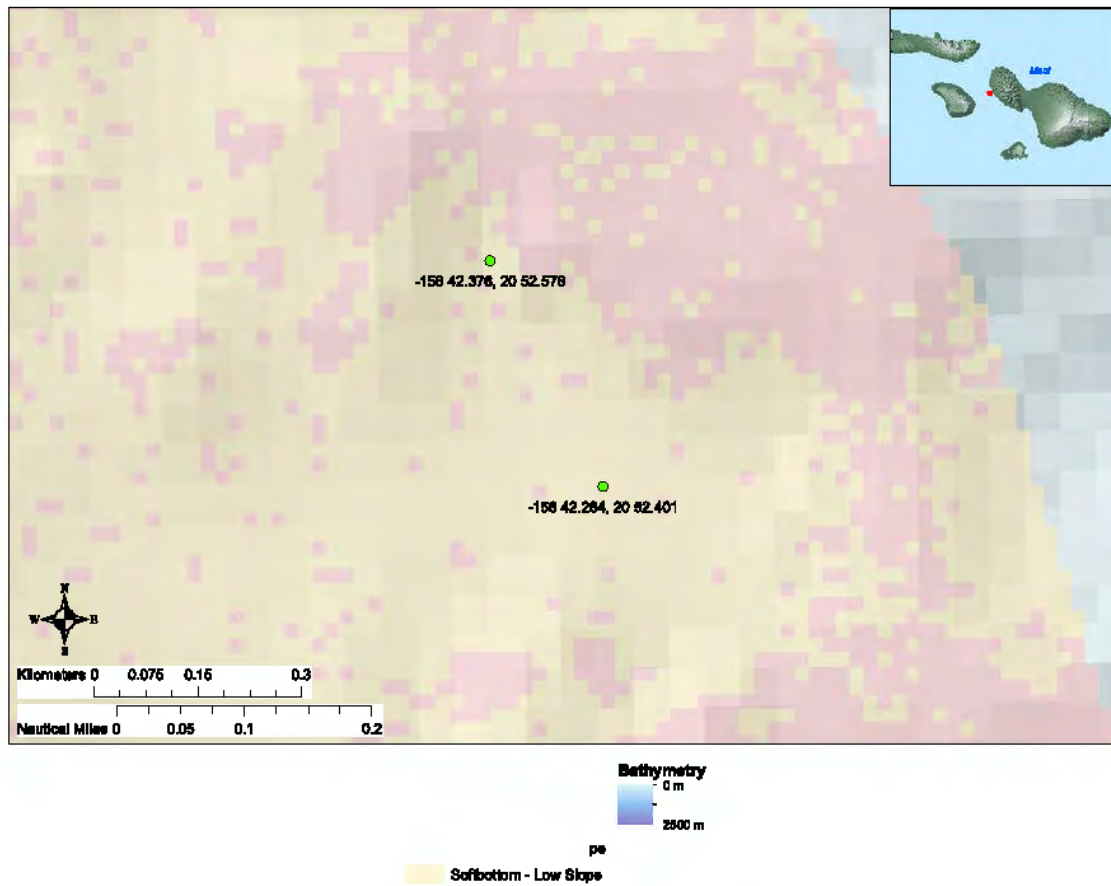


Figure 1. SE-13-06 anchoring location for EK60 acoustic calibration. The anchoring site was chosen within a known large-ship anchoring area, where multi-beam backscatter data indicated soft bottom, where mesophotic coral habitat models predicted a low probability of mesophotic coral, and outside of known spinner dolphin resting habitat.

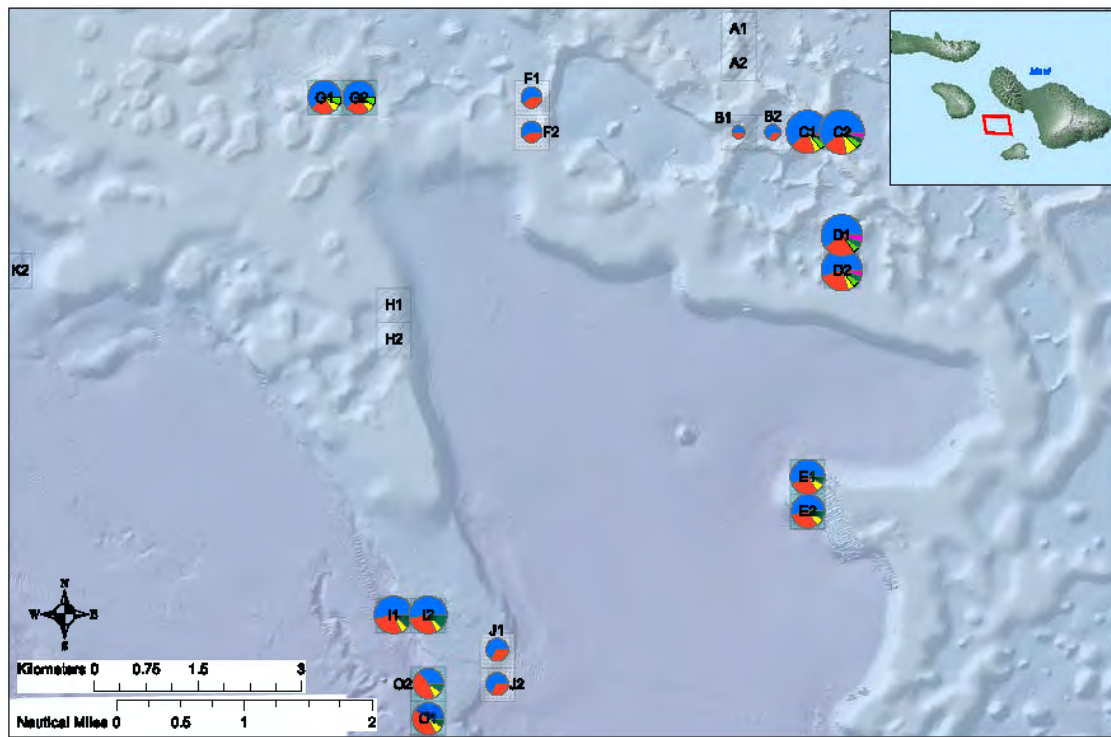


Figure 2. SE-13-06 sampling effort. The goal of SE-13-06 was to resample high biomass grid cells using each of the candidate fishery-independent sampling gears to make comparisons among the gears in terms of catchability and selectivity. Grid cells found to have high Deep-7 bottomfish occurrence were re-sampled. Grid cells found to have low occurrence in all gear types were dropped. The size of each pie chart is proportional to the number of gear deployments (not bottomfish occurrence) in that grid cell. Each gear type is represented by a unique color.

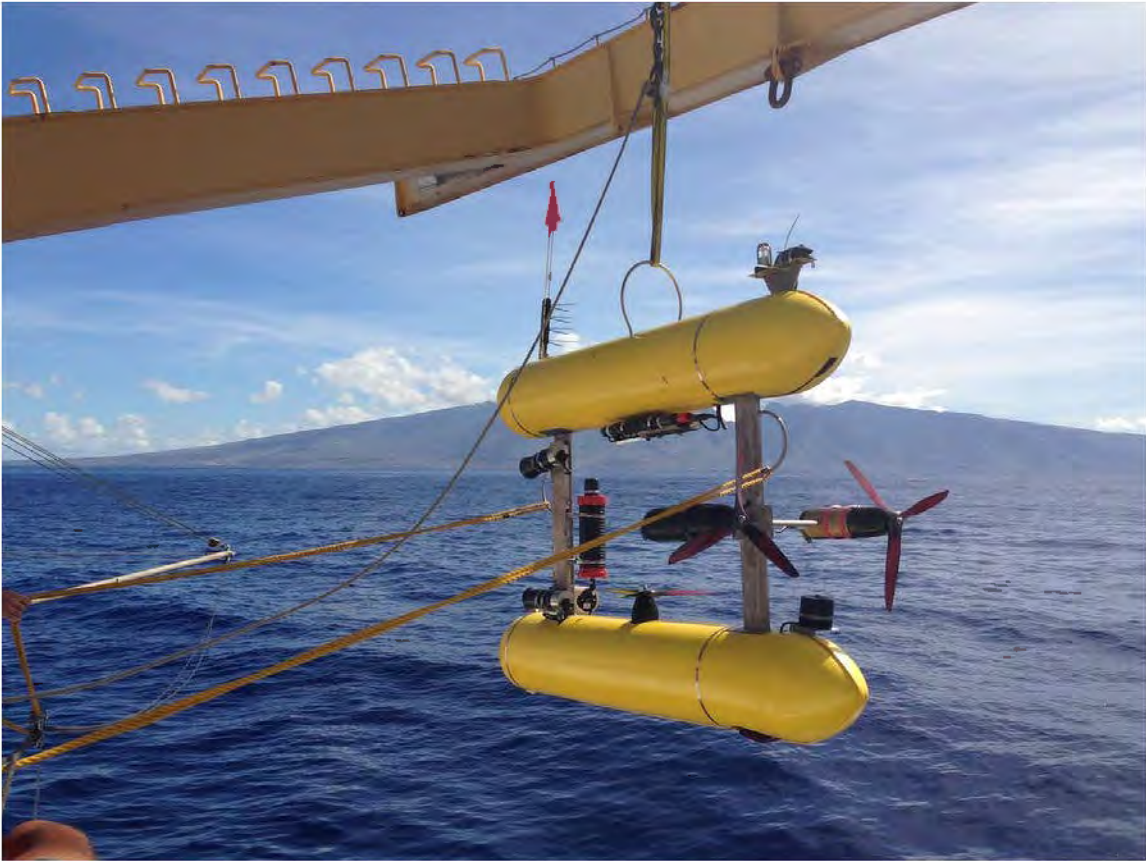


Figure 3. *Popoki 'Eiwa*, the PIFSC/NWFSC collaboratively-operated SeaBED autonomous underwater vehicle (AUV), ready for a dive off Leeward Maui during PIFSC Research Project SE-13-06.



Figure 4. The Phantom ROV gets ready for a dive off Leeward Maui during PIFSC Research Project SE-13-06.



Figure 5. A still image from BotCam stereo-video footage shows an Opakapaka (*Pristipomoides filamentous*) previously tagged during PIFG cooperative research fishing operations. The individual appears healthy and appears to be interacting normally with conspecifics.