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National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Pacific Islands Fisheries Science Center
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CRUISE REPORT¹

VESSEL: NOAA Ship *Oscar Elton Sette*, Cruise SE-13-07

PROJECT PERIOD: August 18 – September 5, 2013

AREA OF OPERATION: At Johnston Atoll and offshore waters between Johnston Atoll and Oahu (see Fig. 2).

TYPE OF OPERATION: The NOAA Ship *Oscar Elton Sette* was engaged in support for the Fisheries Research and Monitoring Division (FRMD), Life History Program (LHP) of the National Marine Fisheries Service (NMFS), Pacific Islands Fisheries Science Center (PIFSC). The primary missions involved the handline sampling of deep-slope bottomfish adults from Johnston Atoll and the collection of pelagic stage juvenile bottomfish via midwater Cobb trawl hauls conducted adjacent to and distant from Johnston Atoll and the collection of larval billfish via 1.8-m surface Isaacs-Kidd (IK) tows. Oceanographic data was collected via conductivity-time-depth (CTD) casts in order to describe the physical, chemical, and biological environments associated with Johnston Atoll and specifically in association with the midwater Cobb trawl hauls. Surface Isaacs-Kidd (IK) midwater tows for billfish larvae and drifting night-light stations will be conducted on a time-available basis.



ITINERARY:

¹ PIFSC Cruise Report CR-13-006
Issued 25 November 2013

18 August	Embarked scientific personnel: Chief Scientist Robert Humphreys; PIFSC scientists Jamie Barlow, Eric Breuer, Louise Giuseffi, and Eric Mooney; JIMAR scientist Meagan Sundberg and contracted fisherman Eddie Ebisui III; Hawaii Pacific University graduate student Cassandra Pardee; and Monterey Bay Aquarium staff aquarists Justin Kantor and Thomas Knowles. Departed Pearl Harbor, Oahu at 1130; transited to Johnston Atoll.
19–20 August	Transited to Johnston Atoll.
21 August	Arrived Johnston Atoll at 0700. Commenced bathymetric survey of bottomfish grounds (100–400-m depth contours) followed by daylight handline bottomfish sampling from small boat and surface IK tows from <i>Sette</i> . In the evening conducted 1000-m depth CTD cast followed by one midwater Cobb trawl haul.
22 August	Conducted early morning bathymetric survey of bottomfish grounds (100–400 m depth contours) followed by daylight handline bottomfish sampling from the two small boats and surface IK tows from <i>Sette</i> . In the evening conducted 1000-m depth CTD cast followed by one midwater Cobb trawl haul.
23–26 August	Conducted early morning bathymetric survey of bottomfish grounds (100–400-m depth contours) followed by daylight handline bottomfish sampling from the two small boats and the <i>Sette</i> . Discontinued daylight surface IK tows for the remainder of the cruise. In the evening conducted 1000-m depth CTD cast followed by one midwater Cobb trawl haul.
27 August	Conducted early morning bathymetric survey of bottomfish grounds (100–400-m depth contours) followed by an all-day (daylight and evening) handline bottomfish sampling exclusively from the <i>Sette</i> . No evening CTD cast or Cobb trawl was conducted.
28–30 August	Conducted early morning bathymetric survey of bottomfish grounds (100–400-m depth contours) followed by daylight handline bottomfish sampling from the two small boats and the <i>Sette</i> . In the evening conducted 1000-m depth CTD cast followed by one midwater Cobb trawl haul.
31 August	Conducted early morning bathymetric survey of bottomfish grounds (100–400-m depth contours) followed by daylight handline bottomfish sampling from the two small boats and the <i>Sette</i> till 1200. <i>Sette</i> officers and crew, including scientists, paid a visit to Fish & Wildlife Service staff stationed on Johnston Island

	during the afternoon. Afterwards, the <i>Sette</i> departed Johnston Atoll in the early evening and began transit back to Ford Island, Oahu.
1 September	Transited to Oahu. In the evening conducted CTD cast followed by one midwater Cobb trawl haul. Afterwards, resumed transit to Oahu.
2 September	In the early morning conducted one midwater Cobb trawl haul then resumed transit to Oahu. In the evening conducted CTD cast followed by one midwater Cobb trawl haul. Afterwards, resumed transit to Oahu.
3 September	In the early morning conducted one midwater Cobb trawl haul then resumed transit to Oahu. In the evening conducted CTD cast followed by one midwater Cobb trawl haul. Afterwards, resumed transit to Oahu.
4 September	In the early morning conducted one midwater Cobb trawl haul then resumed transit to Oahu. In the evening conducted drifting night-light station offshore of Kahe Point, Oahu.
5 September	Arrive dockside at Ford Island, Oahu at 0945 to end the cruise. Disembarked Humphreys, Barlow, Breuer, Ebisui, Giuseffi, Kantor, Knowles, Mooney, and Sundberg.

MISSIONS AND RESULTS:

- A. Conduct daylight handline sampling survey in the 100–400-m depth zone around Johnston Atoll to target collection of $n = 50$ adult specimens of each of the designated Hawaii “Deep-7” bottomfish species. These and other caught non-Deep-7 bottomfish specimens were processed to extract muscle tissue samples for DNA-based population connectivity comparisons between Johnston Atoll and the Hawaiian Archipelago.
 1. Handline fishing operations were conducted off the two NOAA small boats (SE-4 and SE-6) and the *Sette*. Each of the small boats fished only one line during bottomfishing operations while the *Sette* fished 2–3 lines. The fishing gear utilized on the PIFSC small boat (SE-4) consisted of an Electromate battery powered rod-and-reel while the *Sette* small boat (SE-6) used a battery-powered Henry Ching line reel. The *Sette* handline fishing reels differed from those of the small boats as they were equipped with hydraulic reels far more powerful in terms of retrieval rate than the battery-powered Henry Ching reel used on SE-6. Fishing bait consisted of Monterrey Bay squid that was thawed, skinned, and cut into strips prior to use. Palu bags consisting of minced squid remains that were spewed into the water at fishing depths were used during bottomfishing operations from the two small boats but were not from the *Sette*. The two NOAA small boats were

typically launched starting at 0800 h and retrieved by mid-afternoon. For some two hours preceding the morning launch of the small boats, a bathymetric survey 2 conducted aboard the *Sette* to search for bottom features and acoustic fish signs that might indicate productive bottom-fishing grounds.

2. A total of 11 bottomfish hook-and-line fishing days (Figure 1 and Table 1) were conducted at Johnston Atoll targeting the collection of Hawaii Bottomfish Management Unit Species (BMUS), specifically the Deep-7 bottomfish complex.
3. A total of 570 fish were caught during handline operations at Johnston Atoll. The species composition and abundance of the catch for the BMUS Deep-7 bottomfish complex consisted of 148 gindai, *Pristipomoides zonatus*; 52 opakapaka, *Pristipomoides filamentosus*; 46 onaga, *Etelis coruscans*; 35 hapu'upu'u, *Hyporthodus quernus*, 7 ehū, *Etelis carbunculus*, and 1 lehi, *Aphareus rutilans*. No catch of the other Deep-7 species kalekale, *Pristipomoides sieboldii* was obtained. The catch distribution of Deep-7 bottomfish species around Johnston Atoll is shown in Figure 1 and Table 1.
4. The catch of non-Deep-7 BMUS bottomfish species consisted of 182 yellowtail kalekale, *Pristipomoides auricilla*; 23 black ulua, *Caranx lugubris* and 3 kahala, *Seriola dummerili*. No catches of the other non-Deep-7 BMUS that includes uku (*Aprion virescens*), white ulua (*Caranx ignobilis*), taape (*Lutjanus kasmira*), butaguchi (*Pseudocaranx dentex*) and kahala, *Seriola dumerili* were obtained. Catch by area around Johnston Atoll of the non-Deep-7 BMUS appears in Table 1.
5. The capture depths associated with the Deep-7 and non-Deep-7 species were primarily across a depth distribution of 115–140 fathoms (210–255 m). The bottom was typically highly inclined, hard and rocky and caused the loss of many fishing weights during bottomfish operations.
6. The remaining fish species caught during bottomfishing operations consisted of 41 lemon-spot ulua, *Caranx orthogrammus*; 11 Almaco amberjack, *Seriola rivirolana*; 6 unidentified scabbardfish (Gempylidae); 5 rainbow runner, *Elegatis bipinnulata*; 4 Randall's snapper, *Randallichthys filamentosus*; 2 golden rovers, *Erythrocles scintillans*, 2 menpachi ulua, *Caranx sexfasciatus*; 1 unidentified amberjack, *Seriola* sp. and 1 deep-sea moi, *Polymixia berndti*. Catch by area for these species appears in Table 1.
7. Fin clip samples taken from species of BMUS Deep-7 bottomfish, BMUS non-Deep-7 bottomfish and other bottomfish were preserved in 95% undenatured ethanol for future DNA-based studies. Sample size collections by species consisted of n = 68 *Pristipomoides auricilla*, n = 62 *Pristipomoides zonatus*, n = 52 *Pristipomoides filamentosus*, n = 44 *Etelis coruscans*, n = 34 *Hyporthodus quernus*, n = 7 *Etelis carbunculus*, n = 4 *Randallichthys filamentosus*, and n = 1 *Aphareus rutilans*.

8. A previous research cruise conducted by the then NOAA Ship *Townsend Cromwell* (TC-84-06) during November 1984 similarly devoted 12 days of bottomfishing effort although fishing was confined to only the large NOAA vessel itself. Bottomfish catch results from TC-84-06 showed a similar pattern to our SE-13-07 catch results with the two eteline snapper species, *P. zonatus* (n = 232) and *P. auricilla* (n = 82), as the #1 and #3 most common species captured, respectively. What differed, however, was the very high number (n = 126) of hapu'upu'u *H. quernus* captured during TC-84-06. This appears at odds with the greater effort expended during SE-17-03 to target Deep-7 species, particularly *H. quernus*, through the addition of daily fishing efforts from two small fishing boats and the onboard expertise of a local MHI commercial bottomfisher.
 10. Shark interactions with deployed bottomfish hook-and-line gear were a daily occurrence experienced by the two small fishing boats and the *Sette*. Shark interactions frequently consisted of aggressive attacks directed on the hook-and-line gear; presumably attracted by hooked fish and/or squid bait. These interactions occurred throughout the water column whether the hook-and-line gear was fishing on the bottom or in the water column during retrieval including just below the surface. These interactions resulted in damaged and lost hooks and bottomfish weights and an undetermined number of hooked bottomfish presumably lost to shark feeding. In one instance on August 31, 3 sharks were observed from alongside the *Sette* devouring an embolized hapu'upu'u *H. quernus* floating at the surface. Details of these shark interactions were recorded from all three vessels on a daily basis and these compiled written observations appear in Table 2. An underwater still/video camera attached to a pole was hand-held deployed off the port side of the *Sette* during bottomfish line retrievals to photo document these interactions and to help identify the species involved in these interactions. Based on their body morphology, the species involved in the observed interactions appears to be the Galapagos shark, *Carcharhinus galapagensis*. However, many of these shark interactions, particularly those that occurred at depth and were therefore, unobservable and the species involved could not be determined.
- B. Conduct nightly one midwater Cobb trawl haul in waters offshore of Johnston Atoll. Trawl operations will target successive depth zones of 175 m, 100 m, and 25 m for 1-h at each of these depth zones during each trawl haul. During the return leg from Johnston Atoll to Ford Island, two nighttime trawl hauls will be performed on particular nights. Pelagic phase larvae and juveniles of the Hawaii BMUS Deep-7 bottomfish species will be targeted; collected specimens will provide information on distribution, transport, pelagic duration, and they will also be used in DNA-based population connectivity studies between Johnston Atoll and the Hawaiian Archipelago. Locations and other associated data for each of these trawls appear in Table 3.
1. Fifteen nighttime midwater Cobb trawls were conducted and successfully completed during this cruise. Nine Cobb trawls were conducted 10–25 nm offshore from Johnston Atoll while the remaining six trawls were conducted

during three nights (two per night) at locations distant from Johnston Atoll while the ship was transiting back to Oahu. Trawl hauls were conducted beginning around 1900 h and typically ended by 2300 h. When a second night trawl was conducted, trawl operations began around 0130 h and typically concluded by 0530 h. Trawl hauls were run at 3 kts speed and the direction of each trawl was determined by the bridge based on prevailing wind and currents. The Cobb trawl was equipped with an inner finer mesh liner, which funneled into a 1-m ring net of 0.5-mm nylon mesh. The posterior end of this netting was fitted to a zippered black canvas bag that concentrated the catch and was subsequently removed after the net had been retrieved and washed down on deck. Upon removal of the canvas bag codend, the catch was poured into a large metal bucket, the water strained from the catch, and the total catch weighed. The catch was then brought into the Ship's Wet Lab, sorted into groupings composed of gelatinous zooplankton, miscellaneous zooplankton, crustaceans, cephalopods, mesopelagic fish, and shore fish, and weighed separately. The shore fish category was composed of pelagic stage individuals of reef fish, bottomfish, and included epipelagic fish species and leptocephali larvae. All shore fish specimens sorted from the trawl were retained and preserved in 95% undenatured ethanol. Most cephalopods were composed of various squid species and were retained frozen. The remainder of the catch (primarily mesopelagic fishes, crustaceans, and zooplankton) was discarded.

2. Bottomfish larvae and other larvae considered to be insular or neritic in origin (shore fish) were of primary importance for retention during sorting of the catch. Care was needed in separating and recognizing the pelagic stages of eteline snappers from closely resembling apogonids; the etelines distinguishable by having one rather than two dorsal fins. At-sea sorting of the Cobb trawl catch after each haul yielded a total of only 2 eteline snapper pelagic stage individuals. One of the specimens was collected in a trawl haul in the vicinity of Johnston Atoll while the other specimen was collected distant from Johnston Atoll while the ship was in transit to Oahu. The shore fish component of the catch in the vicinity of Johnston Atoll was very small compared to the other components (mesopelagic fish, cephalopods, crustaceans, gelatinous zooplankton, and miscellaneous zooplankton) and far less than typical catches obtained 25–75 nm leeward of the MHI (SE-11-06 and SE-12-06). Furthermore, the total catch by weight was typically ~ 50% less than similar trawl hauls conducted on leeward waters off the MHI. The mesopelagic fish and cephalopods typically dominated by numbers and/or weight in trawl hauls off Johnston Atoll. Only off the north side of Johnston Atoll did the catch of shore fish show a slight increase primarily due to the increased appearance of larval stage reef fish species. The catches associated with the six Cobb trawl hauls conducted during the transit back to Oahu and distant from Johnston Atoll were dominated by catches of mesopelagic fish. Although shore fish remained a small component of these trawl catches, we noted a greater variety of reef associated fish families that also had individuals of larger size.

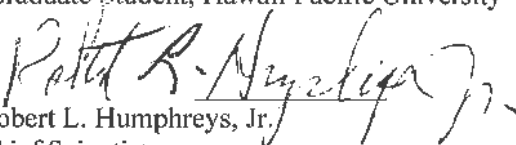
3. During Cobb trawl operations a total of 14 cookie-cutter sharks (*Isistius brasiliensis*) were captured either in the canvas codend or farther up in the trawl webbing. Marine aquarists Justin Kantor and Tommy Knowles of the Monterey Bay Aquarium brought onboard a large captivity tank and oxygen aeration systems to attempt maintaining live specimens for transfer back to the aquarium. Ten of the captured cookie-cutter sharks were retrieved dead from the trawl net while 4 were alive upon capture and placed into the captivity tank. These latter attempts did not succeed as none of the sharks survived longer than 1 day.
 4. No electronic trawl sensor system was available to monitor trawl net tow depth in real-time. In lieu of this capability, time-depth recorders (TDR) was placed at the center of the foot rope and the head rope on each Cobb trawl haul prior to deployment. During trawl hauls, a trigonometric function was used incorporating ship's speed to predict the required amount of trawl wire out in order to reach the three targeted depth ranges. Post-trawl TDR results were then used to fine tune target depths on future trawls by adjusting for length of trawl wire deployed and also the amount of time typically needed (8–9 min) for the net to equilibrate after the targeted wire out depth was reached. The use of dual TDRs also provided information on the vertical opening of the net which typically indicated a difference of ~10 m between the head and foot rope.
- C. The ship will collect oceanographic data from routine conductivity-temperature-depth (CTD) casts, continuous acoustic Doppler current profiler (ADCP), and thermosalinograph (TSG) measurements while at Johnston Atoll and during the return leg from Johnston Atoll to Ford Island. CTD casts will be conducted once each night at the location immediately prior to the start of the first midwater Cobb trawl of the evening. The CTD cast measurements will also include fluorometer measurements and laboratory determination of nutrients, chlorophyll and accessory pigment determinations from water samples collected from sample bottles mounted on the CTD rosette. These data will be used to assess the influence of the physical dynamics on the biological productivity in the region.
1. A total of 12 CTD casts were performed during the cruise (see Table 3) to obtain vertical profile data to ascertain the physical characteristics and oceanography associated with the early-life pelagic stage of bottomfish species. Each CTD cast was deployed to 1,000-m depth and conducted in association and prior to each nightly pair of midwater Cobb trawl hauls during the cruise. During each CTD cast, Niskin bottles were deployed to collect water samples during the ascent phase at depths of 200 m, 150 m, 125 m, 100 m, 80 m, 65 m, 50 m, 35 m, 20 m, and the surface. These water samples were filtered, stored in 90% acetone in a freezer for 24–48 hours, and then measured for fluorescence with a Turner Designs 10AU™ Field and Laboratory Fluorometer to isolate for chlorophyll-a. Oxygen sensors were also attached to the CTD rosette to measure oxygen concentration. Specific locations and other details for each CTD cast appears in Table 4.

2. The CTD casts conducted while at Johnston Atoll showed little variation in surface temperatures (27.7–27.9°C) and salinities (35.0–35.1 psu). Chlorophyll-a maximum values (0.1811–0.2542 µg/L) derived from analyses of Nansen water bottle sampling were associated with a vertical depth range of 100–125 m.
- D. Conduct daylight 1.8-m Isaacs-Kidd (IK) tows in surface waters adjacent to daytime bottomfish sampling operations while at Johnston Atoll. Tows will target larval stage billfish. They will also be conducted on a time-available basis.
1. A total of four 1.8-m Isaacs-Kidd (IK) plankton tows were conducted during daylight morning hours. The IK net dimensions consisted of a net mouth width of 1.8 m and total length of 10 m. The anterior mesh size of the net consisted of 5-mm mesh webbing along the anterior 8 m portion of the net while the posterior 2 m of net consisted of 0.5-mm mesh nylon plankton netting. All tows were approximately 1-h duration at 3.0–3.5 kts speed and were operated from the mid-ship port side J-frame. The four IK tows were all conducted during the early afternoon portion of the day. No surface slicks were targeted as these were not observed during our stay at Johnston Atoll. No billfish larvae were obtained; furthermore, a total lack of fish larvae was captured during all these tows. Based on these results during our first two days at Johnston Atoll, subsequent IK surface tows were suspended and the time utilized to conduct additional bottomfishing operations from the Sette.
- E. Drifting night-light dip-netting operations off the port-side longline pit will be conducted when weather and current conditions are calm on a time available basis.
1. Night light operations were usually not feasible while at Johnston Atoll due to winds and current experienced in offshore waters. One drifting night light operation (station 33) was conducted on August 21–22 in-between Cobb trawl hauls. Myctophids and pelagic stage pomacentrids were the primary fish dip-netted at the surface around the submerged light. A second and final drifting night-light station was held off leeward Oahu the night prior to our return to Ford Island. Pelagic stage reef fish were observed around the light and a number of these were dip-net collected and saved as specimens.

**SCIENTIFIC
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Table 1. Handline fishing operations conducted on *Oscar Elton Sette* Cruise SE-13-07. Positions are in decimal degrees.²

Station #	Date 2013 (HST)	Start Latitude °N	Start Longitude °W	Vessels	Specimens Landed
1	08/21	16° 43.33	169° 22.01	SE-6	3-CAOR 2-ELBI 2-HYQU 9-PRAU 1-PRFI 5-PRZO
6	08/22	16° 41.881	169° 20.790	SE-4	2-CAOR 2-ETCO 1-PRFI 2-PRZO
6	08/22	16° 41.752	169° 20.858	SE-6	5-CAOR 3-ETCO 2-HYQU 11-PRFI 3-PRZO
11	08/23	16° 42.322	169° 20.832	SE-4	2-ETCA 3-PRAU 2-PRZO
11	08/23	16° 42.109	169° 23.839	SE-6	1-CALU 3-ETCO 1-HYQU 17-PRAU 1-PRFI 2-PRZO 1-RAFI 1-SERI
11	08/23	16° 41.90	169° 20.77	<i>Sette</i>	1-CAOR 1-HYQU
15	08/24	69° 41.463	169° 33.956	SE-4	1-CAOR 2-ETCO 6-PRAU 2-PRFI 4-PRZO
15	08/24	16° 40.901	169° 34.082	SE-6	1-CAOR 1-ELBI 1-POBE 15-PRAU 9-PRFI 5-PRZO
15	08/24	16° 39.23	169° 34.04	<i>Sette</i>	1-CALU

² Species abbreviations are as follows: CALU = *Caranx lugubris* (black ulua); CAOR = *Carangoides orthogrammus* (lemon-spot ulua); CASE = *Caranx sexfasciatus* (menpachi ulua); ELBI = *Elegatis bispinnulata* (rainbow runner); ERSC = *Erythrocles scintillans* (golden rover); ETCA = *Etelis carbunculus* (ehu); ETCO = *Etelis coruscans* (onaga); HYQU = *Hyporthodus quernus* (hapu'upu'u); POBE = *Polymixia berndti* (deep-sea moi); PRAU = *Pristipomoides auricilla* (yellowtail kalekale); PRFI = *Pristipomoides filamentosus* (opakpaka); PRZO = *Pristipomoides zonatus* (gindai); RAFI = *Randallichthys filamentosus* (Randall's snapper); SEDU = *Seriola dummeri* (kahala); SERI = *Seriola rivolana* (Almoco jack); SESP = *Seriola* sp. (unidentified amberjack); UNGE = unidentified gempylids (scabbardfish).

Station #	Date 2013 (HST)	Start Latitude °N	Start Longitude °W	Vessels	Specimens Landed
					3-CAOR 1-ETCO 4-PRFI 2-PRZO
19	08/25	16° 41.334	169° 34.073	SE-4	1-CALU 1-CAOR 1-HYQU 14-PRAU 1-RAFI
19	08/25	16° 42.406	169° 33.997	SE-6	2-CALU 5-ETCO 1-HYQU 17-PRAU 10-PRZO
20	08/25	16° 39.27	169° 34.23	Sette	1-CAOR 1-HYQU 2-PRAU 3-PRFI 2-PRZO
23	08/26	16° 47.551	169° 29.106	SE-4	2-CALU 3-ETCO 2-HYQU 2-PRAU 9-PRZO 1-SEDU
23	08/26	16° 47.409	169° 27.570	SE-6	1-APRU 5-CALU 3-CAOR 1-ETCA 2-ETCO 2-HYQU 2-PRAU 9-PRZO 1-RAFI 4-SERI
24	08/26	16° 47.565	169° 28.924	Sette	1-CALU 1-ETCO 1-HYQU 3-PRAU 8-PRZO
27	08/27	16° 40.701	169° 34.169	Sette	2-CALU 2-CAOR 2-CASE 1-ERSC 2-ETCO 6-UNGE 5-HYQU 23-PRAU 2-PRFI 19-PRZO 1-SEDU 4-SERI

Station #	Date 2013 (HST)	Start Latitude °N	Start Longitude °W	Vessels	Specimens Landed
28	08/28	16° 47.511	169° 29.152	SE-4	1-CALU 1-CAOR 1-ETCO 5-PRAU 13-PRZO
28	08/28	16° 47.526	169° 29.212	SE-6	2-ETCA 9-ETCO 2-PRAU 3-PRZO 1-RAFI 1-SEDU
29	08/28	16° 47.513	169° 28.653	Sette	1-CALU 1-CAOR 4-HYQU 1-PRAU 4-PRZO
35	08/29	16° 41.123	169° 24.461	SE-4	3-ETCO 5-PRAU 8-PRFI 5-PRZO
35	08/29	16° 41.027	169° 24.778	SE-6	1-CAOR 2-ELBI 1-ERSC 1-ETCA 2-ETCO 14-PRAU 4-PRFI 4-PRZO
36	08/29	16° 41.168	169° 22.223	Sette	4-CALU 12-CAOR 1-ETCO 2-HYQU 13-PRAU 5-PRFI 10-PRZO
39	08/30	16° 45.497	169° 24.221	SE-4	1-CALU 1-CAOR 1-ETCA 2-HYQU 9-PRAU 7-PRZO
39	08/30	16° 43.396	169° 21.909	SE-6	1-CALU 1-CAOR 6-HYQU 6-PRAU 1-PRFI 11-PRZO 2-SERI
40	8/30	16° 41.346	169° 34.338	Sette	2-ETCO 7-PRAU 2-PRZO
43	08/31	16° 39.316	169° 33.486	SE-4	3-PRAU

Station #	Date 2013 (HST)	Start Latitude °N	Start Longitude °W	Vessels	Specimens Landed
					2-PRZO
43	08/31	16° 39.749	169° 34.439	SE-6	1-CAOR 2-ETCO 4-PRAU 1-PRZO 1-SESP
44	08/31	16° 39.136	169° 34.017	<i>Sette</i>	2-ETCO 2-HYQU 4-PRZO

Table 2. Observations of shark interactions recorded from onboard the *Sette* and NOAA small boats during deep-water bottomfishing operations around Johnston Atoll during SE-13-07.

Day	Date 2013	No Shark Sightings	Shark(s) Sighted But no Interaction	Fish/Gear Damaged or Lost at Depth Apparently by Sharks	Fish/Gear Damaged Lost; Shark(s) Confirmed	Frenzied Shark Activity by Multiple Sharks Attacking Gear/Fish	COMMENTS (SE-4 is the <i>Sette</i> small boat; SE-6 the PIFSC's small boat)
Wednesday	August 21			SE-6: ~6 fish lost at depth	SE-6: yes, 50% of catch estimated to have been shark predated	SE-6: Frenzied activity at surface and below	SE-6 Fishing only
Thursday	August 22			SE-6: Yes; SE-4 fish lost at depth presumably by sharks		SE-4: 3-4 sharks at surface attacking gear/fish	SE-4 and SE-6 fishing
Friday	August 23		SE-6: Yes, 2 sharks sighted; SE-4: 4 sharks sighted at surface	SE-4: Yes, at depth			SE-4 and SE-6 fishing
Saturday	August 24	SE-6: Yes; SETTE: Yes	SE-4: Scalloped Hammerhead sighted	SE-4: Last 2 hooks at depth apparently by sharks	SE-6: Shark attacks hooked fish at surface.		SE-4 and SE-6 fishing: 1 st day of bottomfishing for SETTE
Sunday	August 25		SE-4: 1 incident of just seeing a shark; SE-6: 3 shark sightings	SE-4: 2 loses at depth presumed to be sharks; SE-6: 1 event at depth presumably shark attacks gear at depth	SE-4: 2 confirmed incidences; SETTE: Shark (Galapagos?) took whole and swam around the ship near the surface with the hooks and bait streaming behind the shark		SE-4, SE-6, and SETTE fishing
Monday	August 26	SETTE: Yes	SE-6: two sharks sighted	SE-6: Shark attacked rig at depth	SE-4: Five instances of sharks seen attacking the rig/fish		SE-4, SE-6, and SETTE fishing
Tuesday	August 27			SETTE: 3 instances of lost hooks presumably due to sharks	SETTE: 3 gempylids and 1 <i>Seriola</i> sp. Hooked were shark bitten upon retrieval; one shark seen chasing fishing rig near surface during retrieval.		SETTE fishing only
Wednesday	August 28		SETTE: 1 shark sighted at surface, later 6	SE-4: 1 hooked fish presumably eaten by a shark; SE-6: 1	SE-6: 1 onaga bitten in half but remained on hook, 1 hooked fish		SE-4, SE-6, and SETTE fishing

Day	Date 2013	No Shark Sightings	Shark(s) Sighted But no Interaction	Fish/Gear Damaged or Lost at Depth Apparently by Sharks	Fish/Gear Damaged Lost; Shark(s) Confirmed	Frenzied Shark Activity by Multiple Sharks Attacking Gear/Fish	COMMENTS (SE-4 is the Setze small boat; SE-6 the PIFSC's small boat)
			sharks sighted at surface around the ship	fish taken at depth apparently by a shark; SETTE: 2 hooks missing, presumably bitten by sharks at depth.	taken at surface, 1 shark hooked		
Thursday	August 29		SE-4: 1 shark sighting; SE-6: shark sighted at surface multiple times (>10) throughout the day; SE-6: Sharks following the boat multiple times; SETTE: shark sighted 2x near surface	SE-6: Fish heads only retrieved from fishing lines, unspecified number of times.	SE-4: Sharks hooked, once coming practically into the boat, and 3x stealing fish off the hook in plain sight; SETTE: sharks taking fish off hooks 2x.	SE-6: Feeding frenzy at surface next to boat 5x during the day.	SE-4, SE-6, and SETTE fishing
Friday	August 30		SE-4: 2 shark sightings; SETTE: 4 shark sightings	SE-4: 1 lost hook incident; SE-6: 2 lost hook incidences; SETTE-4 lost hook and/or fish incidences	SE-4: one incident where shark attacked fish at the surface; SE-6: 3 incidences of sharks attacking hooks/fish near the surface; SETTE: 2 incidences of shark hooked fish at surface	SE-6: 2 incidents where sharks were in a frenzy attacking the gear/hooked fish and even the outboard motor	SE-4, SE-6, and SETTE fishing
Saturday	August 31		SE-6: Sharks circled boat	SE-4: Presumed shark stole fish at depth; SE-6: 3 instances were presumably stolen fish; SETTE: 2 instances at depth.	SE-4: Shark was hooked and brought to surface; SE-6: Sharks followed fish to surface; SETTE: 3 instances within sight of surface	SE-6: one instances of feeding frenzy by sharks at surface; SETTE: 1 instance where 3 sharks attacked hapu'upu'u from hook at surface and devoured it.	SE-4, SE-6, and SETTE fishing

Table 3. Midwater Cobb trawl stations conducted on *Oscar Elton Sette* Cruise SE-13-07. Positions are in degrees and decimal minutes. Tow time at each of three depth ranges was 60 minutes after an initial 8–9 minutes for equilibration of the net after reaching each targeted depth.

Station No.	Date 2013 (HST)	Start Position Latitude °N	Start Position Longitude °W	Target depths (m)	Headrope TDR depth ranges (m)	Wire out (m)	Start & End HST (trawl doors in-out)
5	08/21	16° 44.328	169° 13.621	175, 100, 25	162–181, 96–108, 19–23	500, 300, 100	1930–2303
10	08/22	16° 40.486	169° 17.950	175, 100, 25	166–210, 119–138, 32–45	500, 300, 100	1901–2238
14	08/23	16° 38.938	169° 28.032	175, 100, 25	170–190, 106–115, 29–34	500, 300, 100	1904–2241
18	08/24	16° 48.202	169° 51.118	175, 100, 25	151–172, 78–94, 17–21	500, 300, 100	1911–2246
22	08/25	16° 44.925	169° 49.898	175, 100, 25	146–171, 88–99, 23–30	500, 300, 100	1904–2239
26	08/26	16° 57.533	169° 30.140	175, 100, 25	154–190, 108–120, 28–38	500, 300, 100	1925–2301
34	08/28	16° 56.355	169° 34.833	175, 100, 25	153–192, 107–113, 32–42	500, 300, 100	1917–2257
38	08/29	16° 43.146	169° 17.896	175, 100, 25	181–213, 108–130, 24–35	500, 300, 100	1918–2300
42	08/30	16° 43.143	169° 18.688	175, 100, 25	152–199, 107–112, 26–31	500, 300, 100	1906–2244
46	09/01	18° 06.125	165° 57.579	175, 100, 25	166–193, 108–120, 29–33	500, 300, 100	1856–2240
47	09/02	18° 20.405	165° 20.572	175, 100, 25	148–178, 100–109, 25–29	500, 300, 100	0150–0531
49	09/02	19° 01.082	163° 41.626	175, 100, 25	160–202, 113–127, 28–35	500, 300, 100	1934–2313
50	09/03	19° 11.424	163° 10.710	175, 100, 25	142–177, 98–108, 28–37	500, 300, 100	0145–0533
52	09/03	20° 02.695	161° 03.818	175, 100, 25	148–190, 106–132, 32–44	500, 300, 100	1900–2237
53	09/04	20° 16.404	160° 26.926	175, 100, 25	156–168, 92–103, 24–27	500, 300, 100	0148–0602

Table 4. Conductivity-Temperature-Depth (CTD) stations conducted on *Oscar Elton Sette* Cruise SE-13-07. Positions are in degrees and decimal minutes.

Cast No.	Station No.	Date 2013 (HST)	Start Position Latitude °N	Start Position Longitude °W	Target Depth Range of Cast (m)	Niskin Water Bottle Sampling Depths (m)
1	4	08/21	16° 45.882	169° 22.644	0-1,000	200, 150, 125, 100, 80, 65, 50, 35, 20, 0
2	9	08/22	16° 43.009	169° 18.504	0-1,000	200, 150, 125, 100, 80, 65, 50, 35, 20, 0
3	13	08/23	16° 42.337	169° 20.444	0-1,000	200, 150, 125, 100, 80, 65, 50, 35, 20, 0
4	17	08/24	16° 47.121	169° 48.932	0-1,000	200, 150, 125, 100, 80, 65, 50, 35, 20, 0
5	21	08/25	16° 44.488	169° 47.218	0-1,000	200, 150, 125, 100, 80, 65, 50, 35, 20, 0
6	25	08/26	16° 50.461	169° 26.438	0-1,000	200, 150, 125, 100, 80, 65, 50, 35, 20, 0
7	33	08/28	16° 56.240	169° 32.831	0-1,000	200, 150, 125, 100, 80, 65, 50, 35, 20, 0
8	37	08/29	16° 42.565	169° 19.280	0-1,000	200, 150, 125, 100, 80, 65, 50, 35, 20, 0
9	41	08/30	16° 42.933	169° 20.079	0-1,000	200, 150, 125, 100, 80, 65, 50, 35, 20, 0
10	45	09/01	18° 05.346	165° 58.175	0-1,000	200, 150, 125, 100, 80, 65, 50, 35, 20, 0
11	48	09/02	18° 50.310	164° 05.400	0-1,000	200, 150, 125, 100, 80, 65, 50, 35, 20, 0
12	51	09/03	19° 48.281	161° 39.483	0-1,000	200, 150, 125, 100, 80, 65, 50, 35, 20, 0

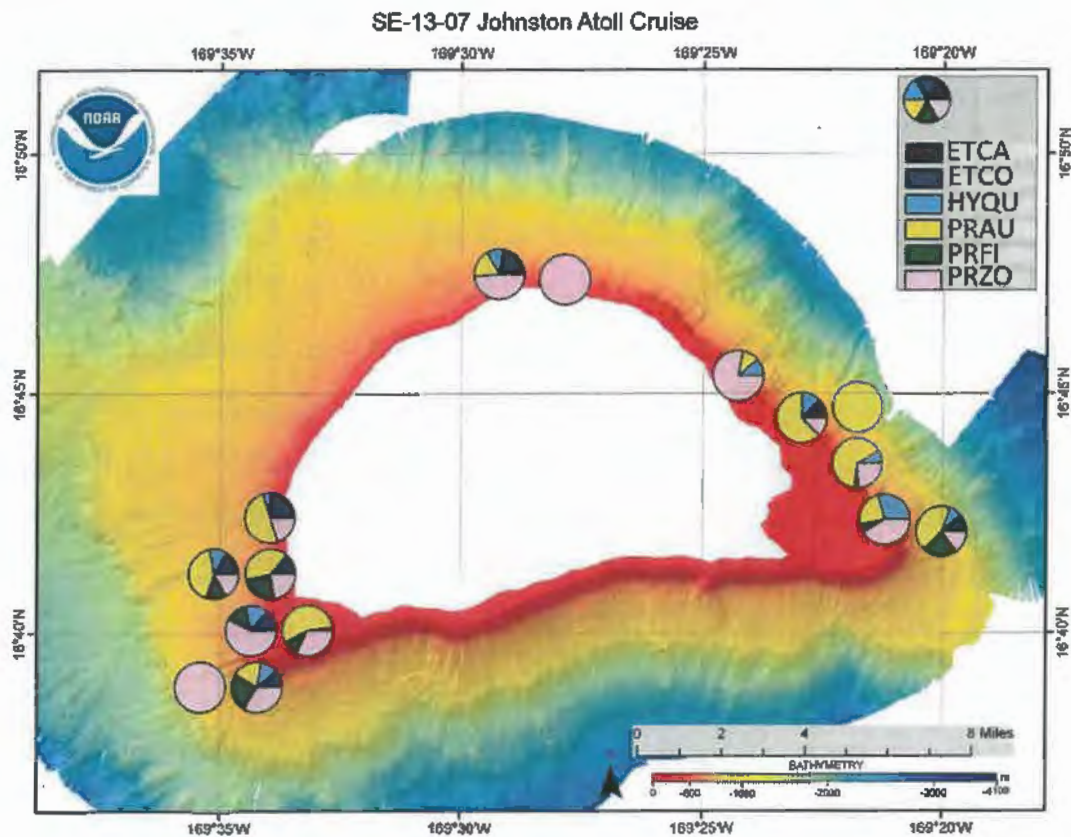


Figure 1. Spatial distribution of most abundant bottomfish species caught during bottomfishing along 100–400-m depth contours at Johnston Atoll during *Oscar Elton Sette* project SE-13-07. Species abbreviations as in Table 1.

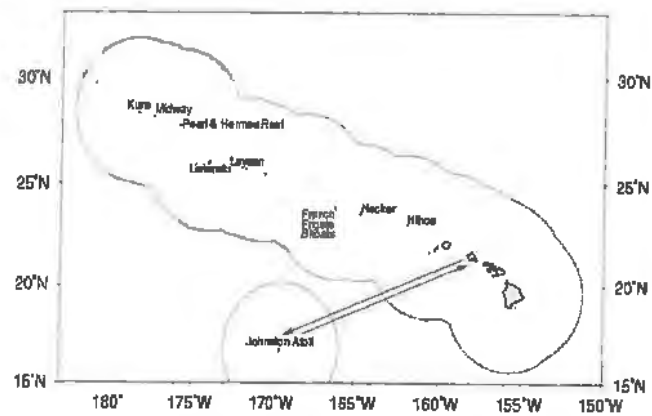


Figure 2. Cruise operations and station locations for *Oscar Elton Sette* Cruise SE-13-07 along offshore leeward waters of the main Hawaiian Islands (MHI).