



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE/NOAA FISHERIES
Pacific Islands Fisheries Science Center
2570 Dole St. • Honolulu, Hawaii 96822-2396
(808) 983-5300 • Fax: (808) 983-2902

CRUISE REPORT¹

VESSEL: *Oscar Elton Sette*, Cruise 09-02 (SE-70)

CRUISE PERIOD: March 12–April 6, 2009

AREA OF OPERATION: Shakedown sites, Kealakekua Bay, a transect through the central North Pacific along the 158°W meridian from Station Aloha (22 30°N) through 36°N, the waters near Penguin Bank (Fig. 1).

TYPE OF OPERATION: Trawl and conductivity-temperature-depth (CTD) testing operations were conducted at various Shakedown sites near the island of Oahu. The calibration of the Simrad EK60 echosounder's transducers was performed at Kealakekua Bay. Oceanographic operations consisted of CTD casts to 1000 m at Shakedown sites and at predetermined stations along a transect line along the 158°W meridian (Fig. 1). Water samples were collected at predetermined stations using Niskin bottles for later laboratory analysis of chlorophyll *a* and chloropigments. Bioacoustic backscatter and currents were continuously monitored during the entire cruise. Bottom Camera (BotCam) operations were performed at predetermined stations near Penguin Bank (Fig. 1).

ITINERARY:

12 March 0900 – Began 1-day sea trial operations. Embarked Evan Howell, Réka Domokos, Donald Hawn, Eric Cruz, Adrian Ramirez, James Barlow, Wendy Kordesch, Amy Comer, David Hyrenbach, and Luis Vilchis. CTD and Cobb trawl sea trials were performed at Shakedown site (Fig. 1). Conducted CTD trial to depth of 500 m and trawl trial to maximum depth allowed by wire out (~ 700 m). Sea trial for trawl was aborted due to loss of hydraulics. At 2100, 1-day sea trials were completed. Disembarked Evan Howell, Réka Domokos, Donald Hawn, Eric Cruz, Adrian Ramirez, James Barlow, Wendy Kordesch, Amy Comer, David Hyrenbach, and Luis Vilchis.

¹ PIFSC Cruise Report CR-09-007
Issued 1 May 2009



- 14 March At 1000, start of cruise, embarked Evan Howell, Réka Domokos, Donald Hawn, Eric Cruz, Adrian Ramirez, James Barlow, Wendy Kordesch, Amy Comer, David Hyrenbach, and Luis Vilchis. Departed Honolulu and proceeded to Kealakekua Bay. Performed sea trial CTD at 1600 at Shakedown site (Fig. 1). Bioacoustic backscatter and currents were continuously monitored during the entire cruise. Opportunistic seabird, cetacean and marine debris observations were also recorded during daylight hours throughout Leg 1 of the cruise (14–28 March).
- 15 March At 0430, arrived at Kealakekua Bay and began EK-60 calibration operations. EK-60 calibration was completed at 1500. Departed Kealakekua Bay for Shakedown site. At 1610, performed trial CTD cast to a depth of 1000 m to continue testing of CTD equipment at Shakedown site 2 (Fig. 1). At 1630, departed Shakedown site 2 for Station Aloha (Fig. 1).
- 16 March At 0930, performed a CTD cast trial to a depth of 200 m to continue testing of CTD equipment at Shakedown site 3 (Fig. 1). At 1000, departed Shakedown site 3 for Station Aloha. At 1630, arrived at Station Aloha and performed CTD cast to a depth of 1000 m. At 1700, departed Station Aloha for 158°W, 26°N.
- 17 March Arrived 158°W, 26°N at 1700 and performed a CTD cast to a depth of 1000 m and collecting and filtering water. At 2300, performed shallow oblique trawl with a maximum depth of ~ 150 m.
- 18 March Performed acoustic transect operations from 0130 to 0800. At 0800, began deep oblique trawl operations at a maximum depth of ~700 m. Departed station 158°W, 26°N at 1200 to begin CTD transect operations. CTD casts to a depth of 1000 m were made every quarter degrees northward along the 158°W meridian up to 36°N. Water collection and filtration was performed every half degrees.
- 19–22 March Continued CTD operations to 1000 m every quarter degrees along the 158°W transect line, collecting and filtering water samples every 30 half degrees.
- 22 March Arrived at station 158°W, 36°N at 1930 and began shallow oblique trawl operations at a maximum depth of ~ 150 m at 36°N. At 2300, began acoustic transect along the 36°N parallel.
- 23 March At 0100, ended acoustic transect operations and began second shallow oblique trawl trials at a maximum depth of ~ 150m at 36°N. At 0730, began deep oblique trawl operations with a maximum depth of ~700 m at 36°N. From 0330 to 0530, a second acoustic transect along the 36°N parallel was performed. At 0400, performed CTD casts to a depth of

1000 m and collecting and filtering water. At 0730, began deep oblique trawl operations with a maximum depth of ~700 m. Performed an acoustic transect from 1100 to 1300. At 1300, began second deep oblique trawl operations with a maximum depth of ~700 m at 36°N. Performed a second acoustic transect from 1600 to 1730. At 1730, departed station 158°W, 36°N for station 158°W, 32°N. CTD casts to a depth of 1000 m were made along the transit line at 35 45°N and 35 30°N.

- 25 March At 0130, arrived at station 158°W, 32°N and began shallow oblique trawl operations at a maximum depth of ~ 150 m. Performed acoustic transects from 0330 to 0730. At 0730, began deep oblique trawl operations with a maximum depth of ~700 m. Performed acoustic transects from 1100 to 1300. At 1300, began second deep oblique trawl operations with a maximum depth of ~700 m. Performed acoustic transects from 1800 to 1300. At 1300, began second deep oblique trawl operations with a maximum depth of ~700 m at 36°N. Performed acoustic transects from 1600 to 1800. Conducted CTD casts to a depth of 1000 m and water collection and filtration was performed at 1800. At 1930, began second shallow oblique trawl with a maximum depth of ~ 150 m. At 2200, left station 158°W, 32°N and headed for station 158°W, 24°N.
- 26 March At 2100, station 158°W, 24°N was aborted due to a hydraulic leak in the winch's heat exchangers. Began transit to Ford Island to remove heat changers and perform personnel transfer at end of Leg 1.
- 27 March Continued transit to Ford Island.
- 28 March Arrived Ford Island at 2300. End of Leg 1. Disembarked Evan Howell, Réka Domokos, Donald Hawn, Eric Cruz, Adrian Ramirez, James Barlow, Amy Comer, Wendy Kordesch, David Hyrenbach, and Luis Vilchis.
- 29 March In port.
- 30 March At 1000, departed Ford Island and transited to Penguin Bank to begin Leg 2 (Fig 1). Embarked Réka Domokos, Eric Cruz, Wendy Kordesch, Amy Comer, and Mary Donovan. Arrived at Three Fingers region of Penguin Bank and performed first BotCam deployment and operation from 1400 to 1700.
- 31 Mar–5 Apr Performed baited and unbaited BotCam operations concurrent with bioacoustic and ocean current data collection at various sites near Penguin Bank (Fig. 1). BotCam was deployed twice a day, at 1000 and at 1300. Acoustic transects were performed during the rest of the time along a predetermined grid.

6 April Arrived at Ford Island at 0630 to end Leg 2. Disembarked Réka Domokos, Eric Cruz, Wendy Kordesch, Amy Comer, and Mary Donovan.

MISSIONS AND RESULTS:

The mission of this cruise was to perform oceanographic and bioacoustic surveys of a transect through the North Pacific Transition Zone along the 158 W meridian and near Penguin Bank.

This involved six distinct steps outlined below. The original schedule was to complete this mission during March 10–April 6, 2009. This would have allowed 28 sea days to perform the necessary operations. Several mechanical problems with the *Oscar Elton Sette*, however, prevented sea-going operations for several days at the beginning and end of Leg 1 (March 10–11, March 13, March 29), resulting in 24 total available sea days. The mechanical problems included the inoperability of the fast rescue boat at the beginning of Leg 1 (March 10–11), the loss of winch hydraulics due to a problem involving a loose wire cable in the winch hydraulics control box (March 13), and a hydraulic fluid leak from the winch heat exchangers at the end of Leg 1 which forced the cancellation of trawl operations at the last station of Leg 1. Overall, all facets of the scientific mission were completed aside from four trawl and one CTD operations. The reasons for these are described in their respective sections below. The trawl operations were cancelled as a result of an equipment malfunction described above. Because of inclement weather, the chief scientist canceled one CTD station at 35.25°N.

A. Conduct calibrations of the Simrad EK60 echosounder.

Kealakekua Bay was chosen as the area to calibrate the Simrad EK60 echosounder, as this area has proven successful in the past. Calibration of the EK60's transducers was successfully carried out on March 15, 2009. We arrived at the calibration site before sunrise on March 15 and were able to begin operations earlier than expected. The bow and stern anchor were deployed at the onset of the calibration operations. The calibration involves the placement of a metal calibration sphere — with known acoustic characteristics — underneath the ship's hull-mounted transducers and recording the acoustic return from the sphere at positions that cover the entire circle of the transducers' beam. The position of the sphere is controlled by a three-reel electric system with monofilament lines leading from the reels to the sphere.

The calibration sphere was deployed and the signal was used to successfully calibrate the three transducers. Calibration operations were completed within the time allotted in the preliminary cruise plan.

- B. Describe the physical environment of the North Pacific tuna and swordfish fishing grounds through routine CTD casts and continuous acoustic Doppler current profiler (ADCP) and thermosalinograph (TSG) measurements.

ADCP and TSG measurements were successfully collected for the duration of the two legs of this cruise. There were initial problems with the ADCP not being triggered properly with the EK60, but these were rectified during the transit to the calibration site. Conducted a total of 41 CTD casts (Table 1) which consisted of four test casts, one 1000 m cast at Station Aloha (Fig. 1), 35 1000-m casts along a northward transect from 26° to 36°N, and one 1000 m cast associated with a trawl station at 158°W, 32°N on the return trip south (Fig. 1). Depth profiles of temperature, salinity, dissolved oxygen and chlorophyll-*s* were recorded for each CTD up- and down-cast. The four initial CTD test casts were performed in transit to Kealahou Bay and Station Aloha to troubleshoot communication and data quality issues. During CTD operations at 28°N on March 19, the CTD got hung up on the rubber bumper on the side of the ship that caused the wire to come loose from the block on the J frame. The CTD worked its way back into the block by itself, yet inspection of the wire showed that there was scoring damage. The Electronic Technician (ET) re-terminated the connection, yet on the next CTD cast communication was lost during the upcast. The ET re-terminated the CTD wire once more and cleaned the ground wire at the winch housing slip ring. There were no additional operational problems with the CTD for the remainder of the cruise. One CTD station at 158W, 35.25N was canceled due to increased winds and unstable sea conditions.

- C. Assess the influence of the physical dynamics on the density, distribution, and composition of micronekton in the region by monitoring the biological backscatter using the Simrad EK60 echosounder system. Characterize the micronekton faunal composition and densities as the forage base for larger pelagic nekton.

A total of 70 acoustic transects were completed to collect bioacoustic data for the assessment of the density, distribution, and composition of micronekton in the study regions: 57 during the Leg 1 transect to 36°N, and 13 at Penguin Banks.

- D. Assess the influence of the physical dynamics on the biological productivity in the region through CTD-mounted fluorometer measurements and extracted chlorophyll and accessory pigment determinations.

In-situ chlorophyll-*a* measurements were taken using the CTD-mounted fluorometer during each of the 41 CTD casts, 37 of which were to 1000 m deep. There were initial problems with the fluorometer inadequately reading the background chlorophyll-*a* values in oligotrophic waters. The fluorometer measurement range was changed from the factory default to the most sensitive setting in order to read the low background chlorophyll-*a* values. Water samples were collected using Niskin bottles at nine discrete depths at every 0.5° during the 26°-36°N northward transect during Leg 1. One liter (2 liter) subsamples were taken from these water samples and filtered to collect biological samples for later chlorophyll-*a* (HPLC) laboratory measurements.

Filtered samples were stored on the vessel and removed post-cruise to an on-site storage facility until laboratory sampling is possible.

- E. Conduct stern trawl operations targeting the depths of high sonic scattering layers to better our understanding of echosounder signals collected by the EK60 echosounder

A total of 11 out of 15 planned Cobb trawls were conducted during the cruise. Ten of these trawls were at predefined stations along the 158°W southward transect and one during the sea trial. As reported above, the sea trial trawl was aborted early due to the loss of winch hydraulics. The last four trawl stations could not be completed as a result of a hydraulic fluid leak emanating from the winch's heat exchangers. During several trawls, we lost connection with the Netmind sensors. A power recycle of the deck unit fixed this problem. Upon retrieval of the trawl net on deck, biological samples were obtained from the cod end and taken to the wet lab for processing. Samples were sorted and weights and average standard lengths were recorded. Samples were then fixed in 10% Formalin for later additional laboratory analysis.

- F. Conduct bioacoustic surveys with simultaneous BotCam operations to study bottom fish at the Three Fingers region of Penguin Banks.

Operational procedures were developed during the first BotCam operations. Standard operational procedures from a small boat, involving a teetered line from the BotCam to surface buoy, had to be adjusted for the *Sette*. As the teetered line prevented the *Sette* from crossing over the BotCam, no line was used during any of the subsequent deployments. The hydroacoustic release mechanism worked correctly at the end of all deployments. All planned operations were performed without problems during Leg II of the cruise, with the exception of improper ADCP settings that interfered with the EK60 recordings in the upper 30 m of the water column. The problem was not fixed per the chief scientist's decision, as fixing the ADCP settings would have required experimenting with different ADCP settings. This operation could have interfered with the EK60 at all depths, making the entire data useless. As the focus of Leg II was to study bottom fish, the loss of the upper 30 m of bioacoustic recordings were not crucial for the mission.

Due to the failure of a critical generator, as all but one of the other engines were also compromised, the ship had to leave Penguin Banks and pick up a part needed to fix the generator at Hawaii Kai on April 2, 2009. The round trip to Hawaii Kai resulted in the loss of 6 hours of scientific operational time for the cruise.

DATA COLLECTED:

The following forms, logs, charts, and data records were kept and given to the Pacific Islands Fisheries Science Center upon termination of the cruise. These include all data captured onto computer storage media during the cruise. All the records are filed unless otherwise indicated.

- CTD station data log sheets
- Marine Operations Log
- Survey Technician's Log
- SeaBird CTD data files (raw and compressed: DVD-R)
- ADCP data files (DVD-R)
- NetMind data files (DVD-R)
- SCS data files

**SCIENTIFIC
PERSONNEL:**

- Evan Howell, Chief Scientist (Leg I), Pacific Islands Fisheries Science Center (PIFSC), National Marine Fisheries Service (NMFS)
- Réka Domokos, Research Oceanographer/Chief Scientist (Leg II), PIFSC, NMFS
- Donald Hawn, Fishery Biologist, Joint Institute for Marine and Atmospheric Research (JIMAR), University of Hawaii (UH)
- James Barlow, Biological Science Technician, PIFSC, NMFS
- Eric Cruz, Research Assistant, JIMAR, UH
- Adrian Ramirez, Administrative Assistant, JIMAR, UH
- Amy Comer, Cooperating Scientist, Hawaii Pacific University (HPU), JIMAR
- Wendy Kordesch, Cooperating Scientist, UC Santa Cruz, JIMAR
- David Hyrenbach, Cooperating Scientist, HPU, JIMAR
- Luis Vilchis, Cooperating Scientist, UCSD/SIO, JIMAR
- Mary Donovan, Marine Ecosystems Research Specialist, JIMAR, UH

(/s/Evan A. Howell)

Submitted by: _____
Evan A. Howell
Chief Scientist

(/s/Michael P. Seki) for
Approved by: _____
Samuel G. Pooley
Science Director
Pacific Islands Fisheries Science Center

Attachments

Table 1.--List of CTD cast dates, location, and maximum cast depth for Leg 1.

Cast	Date (HST)	Lat	Lon	Depth (m)
1	3/16/09 16:22	22.51	-158.00	1000
2	3/17/09 19:13	26.00	-158.00	1000
3	3/18/09 14:18	26.50	-158.00	1000
4	3/18/09 18:13	26.99	-158.00	1000
5	3/18/09 22:27	27.50	-158.00	1000
6	3/19/09 9:47	28.00	-158.00	1000
7	3/19/09 17:51	28.50	-158.00	1000
8	3/19/09 20:29	28.75	-158.00	1000
9	3/19/09 23:23	29.00	-157.99	1000
10	3/20/09 2:08	29.24	-158.00	1000
11	3/20/09 4:57	29.50	-158.00	1000
12	3/20/09 7:36	29.75	-158.00	1000
13	3/20/09 10:13	29.99	-158.00	1000
14	3/20/09 12:50	30.24	-158.00	1000
15	3/20/09 15:26	30.50	-158.00	1000
16	3/20/09 18:02	30.75	-158.00	1000
17	3/20/09 20:32	31.00	-158.01	1000
18	3/20/09 23:07	31.25	-158.00	1000
19	3/21/09 1:33	31.50	-158.00	1000
20	3/21/09 4:18	31.76	-158.00	1000
21	3/21/09 6:56	31.99	-158.01	1000
22	3/21/09 9:41	32.25	-158.00	1000
23	3/21/09 12:09	32.50	-158.00	1000
24	3/21/09 14:45	32.75	-158.00	1000
25	3/21/09 17:09	32.99	-158.01	1000
26	3/21/09 19:35	33.25	-158.00	1000
27	3/21/09 22:04	33.50	-158.00	1000
28	3/22/09 0:44	33.75	-158.00	1000
29	3/22/09 3:21	33.99	-158.00	1000
30	3/22/09 6:06	34.25	-158.00	1000
31	3/22/09 8:23	34.49	-158.00	1000
32	3/22/09 10:58	34.75	-158.00	1000
33	3/22/09 13:24	34.99	-158.01	1000
34	3/23/09 5:44	36.01	-158.00	1000
35	3/23/09 17:27	35.75	-158.00	1000
36	3/23/09 20:03	35.50	-158.00	1000
37	3/25/09 17:38	31.96	-158.04	1000

Table 2.--List of trawl dates, locations, type, and target depth for Leg 1.

Trawl	Date (HST)	Lat	Lon	Type	Target Depth
1	03/18/2013 21:28	25.98	-158.02	Shallow Oblique	150
2	03/19/2013 08:05	25.97	-158.03	Deep Oblique	700
3	03/23/2013 20:33	36.03	-158.02	Shallow Oblique	150
4	03/24/2013 01:03	36.05	-158.03	Shallow Oblique	150
5	03/24/2013 07:38	36.06	-158.02	Deep Oblique	700
6	03/24/2013 13:00	36.08	-158.01	Deep Oblique	700
7	03/26/2013 01:21	32.01	-158.00	Shallow Oblique	150
8	03/26/2013 07:31	32.02	-158.03	Deep Oblique	700
9	03/26/2013 12:41	32.00	-158.04	Deep Oblique	700
10	03/26/2013 19:39	32.03	-158.03	Shallow Oblique	150

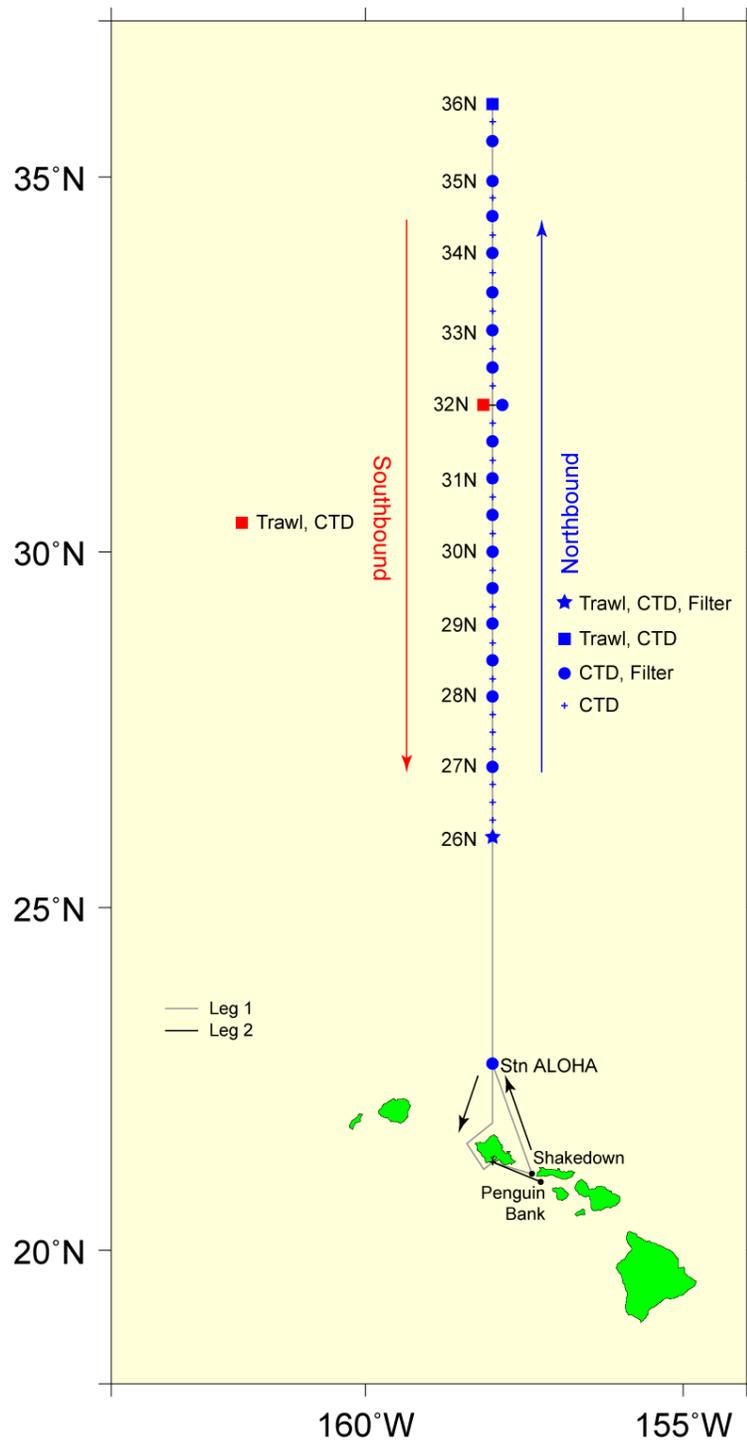


Figure 1.--Map of cruise track line and stations for Legs 1 and 2.