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CRUISE REPORT¹

VESSEL: NOAA Ship *Oscar Elton Sette*, Cruise SE-11-04

CRUISE PERIOD: 1 July – 13 July 2011

AREA OF OPERATION: The lee coast of the island of Hawaii (Fig. 1)

TYPE OF OPERATION: An ocean glider was deployed off the Kona coast of Hawaii. Conductivity-temperature-depth (CTD) casts were deployed to a depth of 1000 m; acoustic transects, mid-water net trawls, and marine mammal observations were conducted at stations along a sampling grid. Surface temperature and salinity data were collected continuously.

ITINERARY:

1 July 1430 Start of cruise. Embarked Evan Howell, Donald Kobayashi, Réka Domokos, Phoebe Woodworth, Noriko Shoji, Amy Comer, Aimee Hoover, Johanna Wren, Megan Duncan, John Denton, Patricia Bruno, Becky Moylan, Laura Lilly, Jonathan Davis, Jamie Barlow, Allan Ligon, Marie Hill, Laurie Richmond, and Jennie Mowatt. Proceeded to Station 1 at 21°10'N, 156°30'W.

2 July Arrived at Station 1 at 21°10'N, 156°30'W at 0230. Conditions were deemed too rough for operations. Proceeded to alternate Station 1 at 19°40'N, 156°30'W. Arrived at Station 1 at 0500. At 0600 began preparations for Ocean Glider launch. Launched Ocean Glider at 0800. Deployed 17-ft Safe Boat for marine mammal observations at 1000. Performed acoustic transect from 1100 to 1300 followed by CTD #1 to a depth of 1000 m at 1300. Retrieved small boat at 1700 followed by

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acoustic transect starting at 1700. Performed CTD #2 to a depth of 1000 m at 1930 followed by oblique Trawl #1 at 2100.

- 3 July Performed Trawl #2 at 0100. Once completed, steamed to Station #2 at 19°40'N, 156°20'W. Arrived at Station #2 at 0600 and performed CTD #3 to a depth of 1000 m. Deployed small boat for marine mammal observations at 0730 followed by acoustic transect beginning at 0900 and headed towards Station #3 at 19°40'N, 156°10'W. Arrived at Station #3 and performed CTD #4 to a depth of 1000 m. At 1400, the small boat went into Honokohau harbor for fuel. Retrieved small boat at 1630 and steamed to Station #4 at 19°40'N, 156°05'W. Performed acoustic transect at 1700 followed by Trawl #3 at 2100. CTD #5, to a depth of 1000 m, was conducted at 2300.
- 4 July Performed Trawl #4 at 0100 and once completed steamed to Station #5 at 19°50'N, 156°10'W. Arrived at Station #5 at 0600 and conducted CTD #6 to a depth of 1000 m at 0600. Deployed small boat for marine mammal observations at 0730. Performed acoustic transect to Station #6 at 19°55'N, 156°05'W. CTD #7, to a depth of 1000 m was conducted at 1030. Retrieved small boat at 1400 due to rough weather. Steamed to Station #7 at 20°00'N, 156°00'W. Performed CTD #8 to a depth of 1000m at 1800 followed by Trawl #5 at 2100.
- 5 July Performed Trawl #6 at 0100 and once completed steamed to Station #8 at 20°00'N, 155°55'W. Performed CTD #9 to a depth of 1000 m at 0600 and once completed deployed the small boat for marine mammal observations at 0730. Began acoustic transect at 0800 followed by additional acoustic transect at 1600. Small boat was retrieved at 1630 followed by an acoustic transect at 1700. Trawl #7 was performed at 2100.
- 6 July Trawl #8 was performed at 0000 and once completed the ship steamed to Honokohau Harbor for personnel transfer and refueling. At 0800, the small boat was deployed for personnel transfer and refueling. Disembarked Laurie Richmond, Jennie Mowatt and Marie Hill. Embarked Allen Shimada and Jessica Aschettino. Once passengers were on board, small boat was redeployed at 1000 for marine mammal observations and ship steamed to Station #9 at 19°30'N, 156°10'W. CTD #10, to a depth of 1000 m, was performed at 1300 and once completed ship steamed to Station #10 at 19°20'N, 156°10'W. CTD #11, to a depth of 1000 m, was performed at 1800 followed by Trawl #9 at 2100 and acoustic transect at 2300.
- 7 July Trawl #10 was performed at 0100 and once completed the ship steamed to Station #11 at 19°20'N, 156°20'W where CTD #12 was conducted at 0600. An acoustic transect was performed at 0700 and following that the small boat was deployed for marine mammal observations at 0800. The

ship then steamed to Station #12 at 19°20'N, 156°40'W. CTD #13, to a depth of 1000 m, was performed at 1300. The small boat was recovered at 1630 followed by an acoustic transect at 1700 and Trawl #11 at Station #13 (19°20'N, 156°30'W) at 2300.

- 8 July Trawl #12 was performed at 0100. The small boat was deployed for marine mammal observations at 0730. The ship then steamed to Station #14 at 19°30'N, 156°20'W. CTD #14, to a depth of 700 m was performed at 1400 and once completed the ship steamed to Station #15 at 19°30'N, 156°30'W. CTD #15 was performed to a depth of 1500 m at 1600. The small boat was recovered at 1630 followed by an acoustic transect at 1700 and Trawl #13 at 2300.
- 9 July Trawl #14 was performed at 0100. At 0800, the small boat was deployed for personnel transfer and refueling. Embarked Michael Seki. Once passenger was on board, small boat was redeployed at 0900 for marine mammal observations and ship steamed back to Station #13 at 19°20'N, 156°30'W where CTD #16 was performed to a depth of 200 m at 1730. An acoustic transect was conducted at 1330 as the ship steamed to Station #16 at 19°20'N, 155°55'W where Trawl #15 was performed at 2100.
- 10 July Trawl #16 was performed at 0100 and after completion CTD #17, to a depth of 1000 m, was conducted at 0600, and small boat was deployed for marine mammal observations at 0730. The ship then steamed to Station #17 at 19°20'N, 156°00'W where CTD #18 was performed to a depth of 1000 m at 1230. The small boat was recovered at 1630. The ship steamed to Station #18 at 19°30'N, 156°00'W and CTD #19 was performed to a depth of 1000 m at 1845 followed by an acoustic transect. Trawl #17 was conducted at 2100 and was followed by an acoustic transect at 2330.
- 11 July Trawl #18 was performed at 0100 and after completion the ship then steamed to Station #19 at 19°30'N, 156°15'W. CTD #20 was performed to a depth of 1000 m at 0600. After completion of the CTD, a small boat was deployed for marine mammal observations at 0730, and the ship then steamed to Station #20 at 19°40'N, 156°15'W. CTD #21, to a depth of 1000 m, was performed at 1230 and following completion the ship steamed to Station #21 (replicate of Station #5) at 19°50'N, 156°10'W. The small boat was recovered at 1630 and CTD #22 was performed to a depth of 1000 m at 1800. Trawl #19 was conducted at 2100 and was followed by an acoustic transect at 2330.
- 12 July Trawl #20 was performed at 0100 and after completion the ship then steamed to Station #22 at 19°50'N, 156°20'W. CTD #23 was performed to a depth of 1000 m at 0600. After completion of the CTD, a small boat was deployed for marine mammal observations at 0730, and the ship then steamed to Station #23 at 19°50'N, 156°30'W. CTD #24 was performed to

a depth of 1000 m at 1330. The ship then steamed to Station #24 at 20°00'N, 156°20'W. The small boat was recovered at 1630 and CTD #25 was performed to a depth of 1000 m at 1830. Trawl #21 was conducted at 2100 and was followed by an acoustic transect at 2330.

13 July Trawl #22 was performed at 0000 and after completion the ship then steamed back to Ford Island. 1400 returned to Ford Island, Pearl Harbor. Disembarked Evan Howell, Donald Kobayashi, Michael Seki, Allen Shimada, Jessica Aschettino, Réka Domokos, Phoebe Woodworth, Noriko Shoji, Amy Comer, Aimee Hoover, Johanna Wren, Megan Duncan, John Denton, Patricia Bruno, Becky Moylan, Laura Lilly, Jamie Barlow, and Allan Ligon. End of cruise.

MISSIONS AND RESULTS:

- A. Collect oceanographic data from routine CTD casts, continuous acoustic Doppler current profiler (ADCP), and thermosalinograph (TSG) measurements along a predefined grid off the leeward coast of Hawaii.

A total of 25 CTD casts were conducted, with 22 casts to a depth of 1000 m, 2 casts to a depth of 500 m and 1 cast to a depth of 200 m. Twenty-three of the 25 casts were conducted using the full SBE CTD/Rosette system providing temperature, salinity, oxygen, and fluorometry profiles. A leak in the starboard J-frame resulted in movement of the CTD/Rosette system to the port side of the ship. During this transition period two of the 25 casts were conducted using the SBE19 portable CTD system providing temperature, salinity and fluorometry profiles. (Table 1). ADCP and TSG data were successfully collected continuously along the survey grid.

- B. Perform CTD-mounted fluorometer measurements and laboratory determination of nutrients, chlorophyll and accessory pigment determinations from water samples collected during CTD operations.

Water samples were collected from all 23 casts conducted using the Rosette system (Table 1). Nutrient samples were taken and frozen for later laboratory analysis. One- and two-liter water samples were filtered at sea for analysis of chlorophyll-*a* and chloropigments, respectively. Chloropigment samples were retained on glass filters after filtration, wrapped in tin foil and stored in liquid nitrogen for later analysis. Chlorophyll samples were retained on glass filters and extracted in 10 ml of 90% acetone for a 24-48-h extraction period. All chlorophyll-*a* samples were processed after extraction using a Turner 10-AU fluorometer aboard the ship.

- C. Monitor biological backscatter during trawl operations or along predefined transects using the Simrad EK60 echosounder system. This will be used to help characterize the micronekton faunal composition and densities as the forage base for larger pelagic nekton.

A total of 71 acoustic transects were conducted to collect bioacoustic data on micronekton during the cruise (Table 2). The 200 kHz frequency was inoperable, limiting echosounder data collection to 38, 70, and 120 kHz frequencies.

- D. Conduct stern trawl operations at select stations, targeting the depths of high sonic scattering layers to better our understanding of echosounder signals collected by the EK60 echosounder.

A total of 22 trawl tows were conducted targeting the sound scattering layers to 200 m depth during the night period covering 2100–0300. Trawl operations were constrained to shallow night operations due to mechanical overheating. Samples were successfully retained from 20 tows. Samples were lost from two tows: (1) once from a zipper malfunction causing the cod end to break away during retrieval, resulting in an approximate 50% loss of sample; and (2) a second time due to numerous cookie cutter shark bites in the cod end, which resulted in a 100% loss of sample.

- E. Deploy University of Hawaii seaglider for oceanographic monitoring.

The University of Hawaii seaglider was successfully deployed on July 3, 2011 and as of August 18, 2011, is still diving and transmitting temperature, salinity, and fluorometry data.

- F. Conduct daytime visual surveys for cetaceans from a small boat platform to help develop habitat envelope models in the Kona region.

A total of 70 field hours of effort was conducted, covering over 900 km total distance (Table 3).

SCIENTIFIC PERSONNEL:

Evan Howell, Chief Scientist, Pacific Islands Fisheries Science Center (PIFSC), National Marine Fisheries Service (NMFS)

Donald Kobayashi, Research Fishery Biologist, PIFSC, NMFS

Phoebe Woodworth, Research Oceanographer, PIFSC, NMFS

Réka Domokos, Research Oceanographer, PIFSC, NMFS

Noriko Shoji, Supervisory Natural Resource Management Specialist, PIFSC, NMFS

Amy Comer, Research Associate, Joint Institute of Marine and Atmospheric Research (JIMAR), University of Hawaii (UH)

Aimee Hoover, Cooperating Scientist, PIFSC, NMFS

Johanna Wren, Cooperating Scientist, UH

Megan Duncan, Cooperating Scientist, UH
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Patricia Bruno, Cooperating Scientist, PIFSC, NMFS
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Samuel G. Pooley
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Table 1.--Date, time, and location of 1000-m CTD casts conducted during cruise SE-11-04. The Samples Collected column lists the analyses water samples were collected during the cast. Redundant sensors collected conductivity, temperature, dissolved oxygen, and fluorescence data during each cast.

Station	CTD Cast	Date and Time	Latitude (°N)	Longitude (°W)	Cast Depth (m)	Samples Collected
1	1	02 July 1332	19.67	156.49	1000	HPLC, Nutr, Chl
1	2	02 July 1951	19.62	156.53	1000	HPLC, Nutr, Chl
2	3	03 July 0620	19.66	156.32	1000	HPLC, Nutr, Chl
3	4	03 July 1302	19.67	156.07	1000	HPLC, Nutr, Chl
4	5	04 July 0017	19.67	156.16	1000	HPLC, Nutr, Chl
5	6	04 July 0611	19.83	156.16	1000	HPLC, Nutr, Chl
6	7	04 July 1228	19.92	156.08	1000	HPLC, Nutr, Chl
7	8	04 July 1811	20	156.16	1000	HPLC, Nutr, Chl
8	9	05 July 0619	20.01	155.99	1000	HPLC, Nutr, Chl
9	10	06 July 1330	19.49	156.19	1000	HPLC, Nutr, Chl
10	11	06 July 1808	19.33	156.16	1000	HPLC, Nutr, Chl
11	12	07 July 0614	19.39	156.33	1000	HPLC, Nutr, Chl
12	13	07 July 1211	19.33	156.66	1000	HPLC, Nutr, Chl
14	14	08 July 1400	19.5	156.33	500	None
15	15	08 July 1700	19.5	156.5	1000	None
13	16	09 July 1732	19.33	156.49	200	HPLC, Nutr, Chl
16	17	10 July 0625	19.33	155.92	500	HPLC, Nutr, Chl
17	18	10 July 1222	19.33	156	1000	HPLC, Nutr, Chl
18	19	10 July 1842	19.5	156	1000	HPLC, Nutr, Chl
19	20	11 July 0620	19.5	156.24	1000	HPLC, Nutr, Chl
20	21	11 July 1217	19.67	156.25	1000	HPLC, Nutr, Chl
21	22	11 July 1812	19.83	156.17	1000	HPLC, Nutr, Chl
22	23	12 July 0606	19.83	156.34	1000	HPLC, Nutr, Chl
23	24	12 July 1304	19.83	156.5	1000	HPLC, Nutr, Chl
24	25	12 July 1821	20	156.33	1000	HPLC, Nutr, Chl

Table 2.--Date, time, and location of acoustic transects conducted during cruise SE-11-04.

Acoustic Transect	Date and Time	Latitude (°N)	Longitude (°W)
1	02 July 1046	19.63	156.53
2	02 July 1640	19.63	156.53
3	02 July 2116	19.68	156.48
4	03 July 2342	19.7	156.45
5	03 July 0105	19.66	156.49
6	03 July 0338	19.68	156.43
7	03 July 0817	19.65	156.3
8	03 July 1645	19.73	156.11
9	03 July 2101	19.66	156.17
10	04 July 0141	19.68	156.1
11	04 July 0408	19.61	156.2
12	04 July 0727	19.85	156.16
13	04 July 1632	20.08	156.18
14	04 July 1916	19.65	156.16
15	04 July 2059	19.96	156.21
16	05 July 0102	19.96	156.21
17	05 July 0336	20	156.16
18	05 July 0657	20.01	155.98
19	05 July 0828	20.02	156.16
20	05 July 1047	20	156.18
21	05 July 1128	19.86	156.03
22	05 July 1349	19.8	156.11
23	05 July 1634	19.91	156.03
24	05 July 2059	20.01	155.95
25	06 July 2357	20.05	156
26	06 July 0224	19.95	156
27	06 July 1013	19.65	156.07
28	06 July 1433	19.5	156.18
29	06 July 1649	19.41	156.18
30	06 July 2056	19.28	156.13
31	07 July 2317	19.36	156.2
32	07 July 0052	19.28	156.15
33	07 July 0323	19.38	156.17
34	07 July 0806	19.3	156.35
35	07 July 1320	19.31	156.67
36	07 July 1700	19.36	156.48

Acoustic Transect	Date and Time	Latitude (°N)	Longitude (°W)
37	07 July 2100	19.36	156.51
38	07 July 2325	19.3	156.56
39	08 July 0045	19.31	156.51
40	08 July 0321	19.4	156.56
41	08 July 1005	19.33	156.5
42	08 July 1858	19.55	156.46
43	08 July 2051	19.5	156.45
44	08 July 2314	19.53	156.53
45	09 July 0049	19.43	156.5
46	09 July 1003	19.68	156.06
47	09 July 1241	19.83	156.35
48	09 July 1329	19.83	156.43
49	09 July 2151	19.31	155.91
50	10 July 0048	19.31	155.91
51	10 July 0838	19.36	156
52	10 July 1117	19.23	156
53	10 July 1352	19.33	155.98
54	10 July 1642	19.46	156
55	10 July 1801	19.53	156
56	10 July 1939	19.51	156
57	10 July 2100	19.53	156
58	10 July 2326	19.45	155.96
59	11 July 0056	19.53	156.01
60	11 July 0324	19.45	156
61	11 July 0918	19.5	156.18
62	11 July 1315	19.68	156.25
63	11 July 1939	19.85	156.18
64	11 July 2029	19.88	156.21
65	11 July 2056	19.86	156.2
66	11 July 2318	19.8	156.15
67	12 July 0052	19.86	156.2
68	12 July 0347	19.8	156.21
69	12 July 1616	20.03	156.33
70	12 July 2059	19.98	156.36
71	13 July 0000	19.98	156.38

Table 3.--Time and locations of surface water samples taken for total chlorophyll and chlorophyll- α analysis in the proximity of the chlorophyll front.

Date	Vessel	Begin effort	End effort	Effort time	Distance surveyed (km)
07/02/2011	17-ft Safeboat	10:29	16:01	05:41	84.98
07/03/2011	17-ft Safeboat	08:22	16:07	07:58	78.34
07/04/2011	17-ft Safeboat	08:03	13:27	05:36	66.14
07/05/2011	17-ft Safeboat	08:02	16:03	08:09	89.23
07/06/2011	17-ft Safeboat	10:07	16:07	06:01	69.61
07/07/2011	17-ft Safeboat	07:57	15:58	08:01	116.88
07/08/2011	17-ft Safeboat	07:52	15:14	07:22	81.03
07/09/2011	17-ft Safeboat	10:06	14:40	04:34	55.80
07/10/2011	17-ft Safeboat	07:56	16:01	08:23	81.92
07/11/2011	17-ft Safeboat	07:48	16:05	08:17	80.16
07/09/2011	<i>Sette</i>	15:15	17:05	01:55	38.34
07/12/2011	<i>Sette</i>	07:57	12:15	04:17	45.37
07/13/2011	<i>Sette</i>	07:23	9:00	01:37	24.26

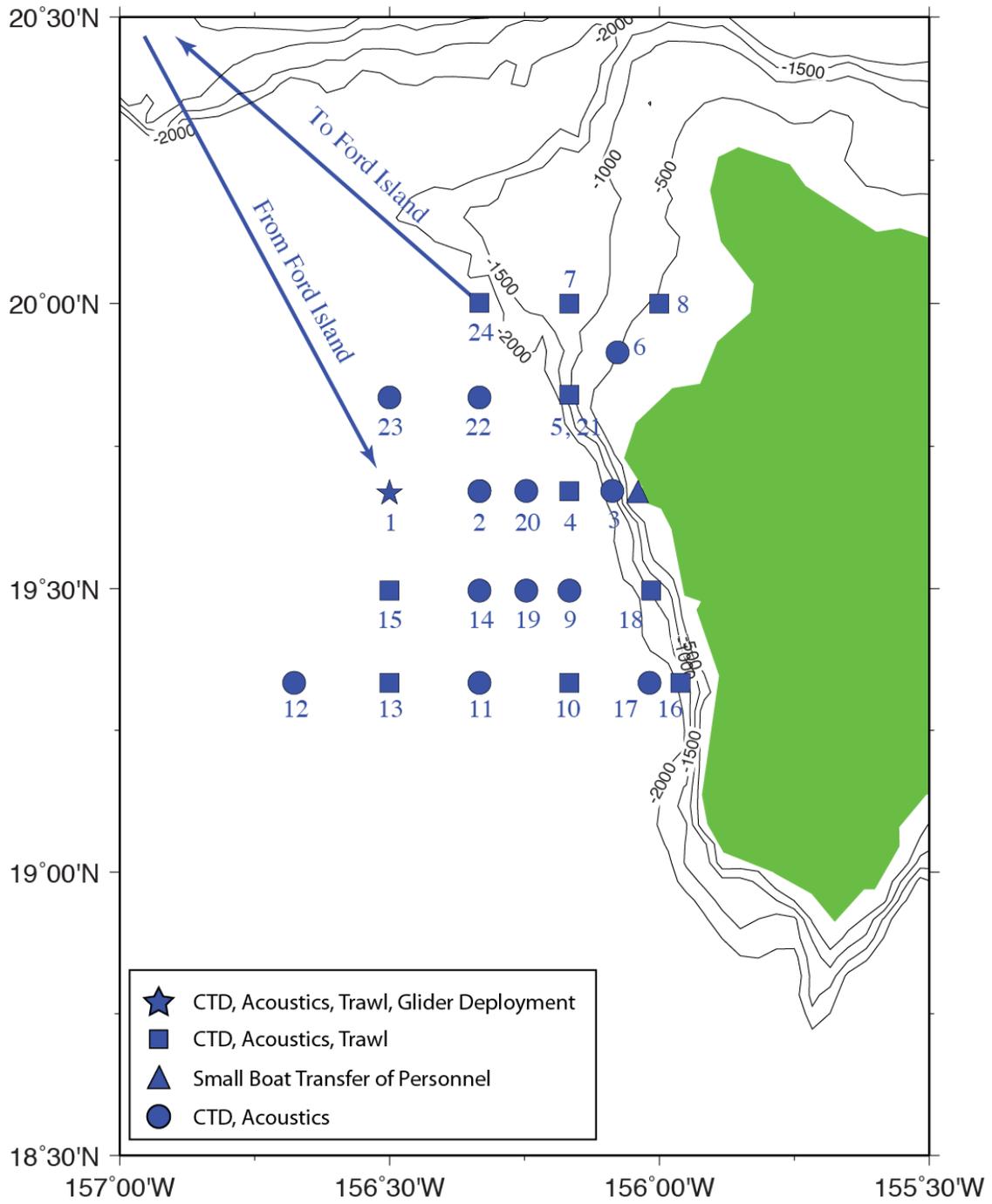


Figure 1.--Map of operations during *Oscar Elton Sette* cruise SE-11-04.