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NATIONAL MARINE FISHERIES SERVICE
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PROJECT REPORT

VESSEL: NOAA Ship *Oscar Elton Sette*, Project SE-24-03

PROJECT PERIOD: March 18–April 14, 2024

AREA OF OPERATION: Operations were conducted in the waters to the south of the Hawaiian Islands from Pearl Harbor to 16.3°N, 160.05°W (Fig. 1).

TYPE OF OPERATION: Conductivity-temperature-depth (CTD) casts to 1000 m depth were conducted outside, at the edge, and at the center of an anticyclonic and a cyclonic open ocean eddy to the south of the Hawaiian archipelago, near 21°N, 159.2°W and 18°N, 159.5°W for the cyclonic and anticyclonic eddy respectively. Replicated 6 foot Isaaks-Kidd Midwater Trawl (IKMT) yo-yo tows down in the top 50 m were conducted at 0830 and 2030 daily at 15 stations, an oblique bongo tow down to ~200 m was conducted at 1100 and 2300 daily at 15 stations, and an oblique Tucker Trawl tow down to ~ 550 m was conducted at 1230 and 0030 daily at 17 stations. Finally, two additional CTDs were conducted at 1500 and 0300 daily to collect water for eDNA analysis. Additionally, opportunistic Tucker, bongo, and IKMT tows were conducted when time allowed. Acoustic backscatter was collected during transit times between stations and the ADCP collected data while we were on station.

ITINERARY:

18 March 0900 Start of project (all times in HST). Embarked Johanna Wren, Joseph O'Malley, Jessica Lee Aquino, Emily Contreras, Donald Kobayashi, Robert McLean, Gabriella Mukai, James Ruzicka, Andrea Schmidt, Jonathan Whitney, Tamara Colon-Nieves and Evotia Maino. Proceeded to first station in the center of a cyclonic eddy to the southwest of O'ahu. Began active acoustics (EK80) data collection. Throughout the project, EK80 data was collected during all transits but secured during station operations.

19 March 0707 Paused EK80 data collection and began Station 1 (center of cyclonic eddy) daytime sampling at 20.44°N, 159.27°W with CTD cast 1 to 1000 m. The CTD computer crashed on the upcast before any bottles were fired. CTD was terminated and brought back to the surface at 0809.

0841 Began IKMT tow 1 yo-yoed between the surface and 58.94 m at 20.42°N, 159.25°W. 0916 IKMT tow 1 completed.

0943 Began bongo tow 1 down to 212.98 m at 20.46°N, 159.28°W. 1013 Bongo tow 1 completed.

1303 Began Tucker tow 1 down to 546.28 m at 20.47°N, 159.25°W. 1301 Tucker tow 1 completed. CTD not functional so the two planned CTDs for eDNA water collection were canceled. Finished station 1 day sampling, reset for station 1 night operations.

Began station 1 night operations. CTD was not functional, but we continued other planned station operations to train deck crew and scientists. 2104 Began IKMT tow 2, the first tow of the sampling cycle, yo-yoed between the surface and 59.91 m at 20.31°N, 159.33°W. 2138 IKMT tow 2 completed.

2152 Began IKMT tow 3, the second tow of the sampling cycle, yo-yoed between the surface and 54.94 m at 20.34°N, 159.32°W. 2230 IKMT tow 3 completed.

2249 Began bongo tow 2 down to 112.1 m at 20.37°N, 159.28°W. 2330 Bongo tow 1 completed.

20 March 0105 Began Tucker tow 2 down to 512.5 m at 20.36°N, 159.26°W. 0352 Tucker tow 2 completed. Finished station 1 night sampling. We hoped the CTD would be fixed so we remained at station 1 for another cycle of day sampling.

Began station 1 day operations. CTD was still not functional, but we continued other planned station operations. 0854 Began IKMT tow 5, the first tow of the sampling cycle, yo-yoed between the surface and 53.09 m at 20.36°N, 159.21°W. 0932 IKMT tow 4 completed.

0944 Began IKMT tow 5, the second tow of the sampling cycle, yo-yoed between the surface and 54.37 m at 20.4°N, 159.19°W. 1019 IKMT tow 5 completed.

1043 Began bongo tow 3 down to 136.99 m at 20.44°N, 159.16°W. 1127 Bongo tow 3 completed. CTD was still not functional and station operations were terminated. The ship returned to Oʻahu for small boat transfer of CTD and generator parts. Commenced EK80 data collection.

21 March 2048 Arrival at station 2, paused EK80 data collection. CTD still not functional. Conducted opportunistic Tucker trawls while waiting instead of conducting regular station operations.

Began Tucker tow 3 down to 600 m at 21.19°N, 158.34°W. 2320 Tucker tow 3 completed.

22 March 0017 Continued Tucker operations with tow 4 down to 700 m at 21.24°N, 158.31°W. 0355 Tucker tow 4 completed.

0400 Continued Tucker operations with tow 5 down to 130 m at 21.44°N, 158.31°W. 0500 Tucker tow 5 completed. Finished opportunistic Tucker night

sampling at station 2.

CTD was still not functional, but we resumed planned day sampling. 0903 Began IKMT tow 6, the first tow of the sampling cycle, yo-yoed between the surface and 68.49 m at 21.23°N, 158.3°W. 0939 IKMT tow 6 completed.

0950 Began IKMT tow 7, the second tow of the sampling cycle, yo-yoed between the surface and 48.68 m at 21.25°N, 158.3°W. 1027 IKMT tow 7 completed.

1051 Began bongo tow 4 down to 216.97 m at 21.27°N, 158.31°W. 1140 Bongo tow 4 completed.

1311 Began Tucker tow 6 down to 900 m at 21.39°N, 158.32°W. 1637 Tucker tow 6 completed. Finished station 2 day sampling, reset for station 2 night operations.

CTD functional so we started a new 24-hour sampling cycle at station 2. 1954 Began station 2 (outside of cyclonic eddy) night sampling at 21.232°N, 158.299°W with a CTD cast 4 to 1012 m. 2047 CTD recovered.

2115 Began IKMT tow 8, the first tow of the sampling cycle, yo-yoed between the surface and 59.26 m at 21.24°N, 158.29°W. 2156 IKMT tow 8 completed. Because the CTD got a late start we only conducted one IKMT tow at this station to make up lost time.

2212 Began bongo tow 5 down to 210 m at 21.28°N, 158.27°W. 2305 Bongo tow 5 completed.

23 March 0003 Began Tucker tow 7 down to 516.74 m at 21.24°N, 158.31°W. 0205 Tucker tow 7 completed.

0247 Began CTD cast 5 at 21.275°N, 158.225°W down to 587 m for eDNA water collection. 0324 CTD completed.

0433 Began CTD cast 6 at 21.285°N, 158.227°W down to 203 m for eDNA water collection. 0452 CTD completed, reset for station 2 day operations.

0712 Began station 2 day sampling at 21.234°N, 158.305°W with CTD cast 7 to 1012 m.

0838 Began IKMT tow 9, the first tow of the sampling cycle, yo-yoed between the surface and 49.77 m at 21.24°N, 158.3°W. 0914 IKMT tow 8 completed.

0930 Began IKMT tow 10, the second tow of the sampling cycle, yo-yoed between the surface and 57.97 m at 21.25°N, 158.34°W. 1004 IKMT tow 10 completed.

1031 Began bongo tow 6 down to 213.1 m at 21.29°N, 158.38°W. 1134 Bongo tow 6 completed.

1228 Began Tucker tow 8 down to 571.54 m at 21.36°N, 158.47°W. 1420 Tucker tow 8 completed.

1515 Began CTD cast 8 at 21.299°N, 158.444°W down to 611 m for eDNA water collection. 1553 CTD completed.

1649 Began CTD cast 9 at 21.285°N, 158.426°W down to 203 m for eDNA water collection. 1707 CTD completed, commenced EK80 data collection, and transited to the next station.

24 March Transited to station 3 during the night. Stopped at 0010 for an opportunistic Tucker tow down to 569.08 m at 20.94°N, 159.09°W. 0210 Tucker tow 9 completed.. The wire out reader on the starboard winch froze numerous times during deployment and retrieval. Winch wire out readings were unreliable. Additionally, the FastCat showed some spikes in temperature and salinity and froze once, possibly due to weird angle of the wire (i.e., potentially pinched).

0713 Arrived at station 3, paused EK80 data collection, and began day sampling at 20.91°N, 159.058°W with CTD cast 10 to 1013 m. 0810 CTD recovered.

0840 Began IKMT tow 11, the first tow of the sampling cycle, yo-yoed between the surface and 66.74 m at 20.91°N, 159.05°W. 0915 IKMT tow 11 completed.

0933 Began IKMT tow 12, the second tow of the sampling cycle, yo-yoed between the surface and 71.08 m at 20.94°N, 159.03°W. 1008 IKMT tow 12 completed.

1034 Began bongo tow 7 down to 212.55 m at 20.97°N, 159°W. 1120 Bongo tow 7 completed. Both cod ends were broken, likely due to repeated knocking into each other, thus no biological sample collected for this tow.

1228 Began Tucker tow 10 down to 568.41 m at 21.02°N, 158.96°W. 1455 Tucker tow 10 completed.

1526 Began CTD cast 11 at 21.065°N, 158.844°W down to 658 m for eDNA water collection. 1601 CTD cast 11 completed.

1658 Began CTD cast 12 at 21.063°N, 158.924°W down to 185 m for eDNA water collection. 1721 CTD cast 12 completed, reset for night operations.

1917 Began night sampling at 20.971°N, 159.009°W with CTD cast 13 to 1012 m. 2005 CTD recovered.

2019 Began IKMT tow 13, the first tow of the sampling cycle, yo-yoed between the surface and 56.1 m at 20.96°N, 159.12°W. 2053 IKMT tow 13 completed.

2103 Began IKMT tow 14, the second tow of the sampling cycle, yo-yoed between the surface and 60.04 m at 20.98°N, 158.99°W. 2137 IKMT tow 14 completed.

2159 Began bongo tow 8 down to 234.01 m at 20.99°N, 158.96°W. 2305 Bongo tow 8 completed. FastCat not working. Rips found along the seam in the bongo net, likely due to strong currents that caused the cod ends to break during daytime operations.

25 March

0009 Began Tucker tow 11 down to 568.77 m at 21.04°N, 158.89°W. 0250 Tucker tow 11 completed. FastCat not working, re-terminated during transit to the next station.

0326 Began CTD cast 14 at 21.088°N, 158.767°W down to 630 m for eDNA water collection. 0407 CTD cast 14 recovered.

0502 Began CTD cast 15 at 21.088°N, 158.76°W down to 175 m for eDNA water collection. 0522 CTD cast 15 recovered.

0533 Began opportunistic Tucker trawl at the end of station 3 before transiting to station 4 down to 606.57 m at 21.09°N, 158.75°W. 0817 Tucker tow 12 completed, commenced EK80 data collection, and transited to the next station.

Slight diversion off course to look for the source of a distress call. Nothing was found and the coast guard took over the search with an aircraft. The diversion did not affect our ability to arrive at our next station on time.

1912 Arrived at station 4, paused EK80 data collection, and began night sampling at 20.348°N, 159.277°W with CTD cast 16 to 1011 m. 2014 CTD cast 16 recovered.

2036 Began IKMT tow 15, the first tow of the sampling cycle, yo-yoed between the surface and 57.99 m at 20.34°N, 159.26°W. 2116 IKMT tow 15 completed.

2125 Began IKMT tow 16, the second tow of the sampling cycle, yo-yoed between the surface and 56.22 m at 20.36°N, 159.27°W. 2200 IKMT tow 16 completed.

2226 Began bongo tow 9 down to 155.06 m at 20.38°N, 159.28°W. 2325 Bongo tow 9 completed. FastCat down again, re-terminated during the next transit. Additionally, the starboard winch wire out sensor froze permanently; ET reconnected during subsequent transit. In the meantime, we counted revolutions of the sensor wheel (assumed to be 1 meter of wire) to estimate wire out; the wire was marked with spray paint at target wire out.

26 March

0035 Began Tucker tow 13 down to 483.84 m at 20.33°N, 159.27°W. 0240 Tucker tow 13 completed. FastCat and wire out meter not working, wire out/net depth estimated by counting revolutions of the wire sensor wheel.

0317 Began CTD cast 17 at 20.228°N, 159.199°W down to 637 m for eDNA water collection. 0347 CTD cast 17 recovered.

0433 Began CTD cast 18 at 20.215°N, 159.151°W down to 202 m for eDNA water collection. 0450 CTD cast 18 completed, reset for day operations.

0715 Began day sampling at 20.354°N, 159.272°W with CTD cast 19 to 1015 m.

0851 Began IKMT tow 17, the first tow of the sampling cycle, yo-yoed between the surface and 109.99 m at 20.36°N, 159.23°W. 0953 IKMT tow 17 completed.

1010 Began IKMT tow 18, the second tow of the sampling cycle, yo-yoed between the surface and 73.77 m at 20.4°N, 159.15°W. 1052 IKMT tow 18 completed.

1112 Began bongo tow 10 down to 175.06 m at 20.43°N, 159.1°W. 1138 Bongo tow 10 completed.

1247 Began Tucker tow 14 down to 549.23 m at 20.49°N, 159.02°W. 1447 Tucker tow 14 completed.

1522 Began CTD cast 20 at 20.554°N, 158.891°W down to 658 m for eDNA water collection. 1601 CTD cast 20 recovered.

1657 Began CTD cast 21 at 20.571°N, 158.86°W down to 203 m for eDNA water collection. 1722 CTD cast 21 completed, commenced EK80 data collection, and transited to the next station.

27 March 0452 Opportunistic bongo sampling before daytime operations. Conducted bongo tow 12 down to 134.38 m at 19.8°N, 159.82°W. 0525 Opportunistic bongo tow 12 completed.

0711 Arrived at station 5, paused EK80 data collection, and began day sampling at 19.794°N, 159.815°W with CTD cast 22 to 1012 m.

0839 Began IKMT tow 19, the first tow of the sampling cycle, yo-yoed between the surface and 52.76 m at 19.8°N, 159.79°W. 0910 IKMT tow 19 completed.

0925 Began IKMT tow 20, the second tow of the sampling cycle, yo-yoed between the surface and 59.29 m at 19.83°N, 159.77°W. 0954 IKMT tow 20 completed. Wire out counter was functional again.

1025 Began bongo tow 11 down to 212.16 m at 19.84°N, 159.74°W. 1112 Bongo tow 11 completed. FastCat was functional again.

1302 Began Tucker tow 15 down to 568.52 m at 19.85°N, 159.6°W. 1510 Tucker tow 15 completed. Tucker deployed with both FastCat and Simrad Cobb trawl net sensor to see if Simrad sensor can be used as a back-up if the FastCat were to malfunction again. Both sensors worked and showed consistent data.

1549 Began CTD cast 23 at 19.864°N, 159.447°W down to 638 m for eDNA water collection. 1630 CTD cast 23 recovered.

1804 Began CTD cast 24 at 19.904°N, 159.381°W down to 206 m for eDNA water collection. 1829 CTD cast 24 completed, reset for night operations.

1934 Began night sampling at 19.888°N, 159.458°W with CTD cast 25 to 1025 m. 2031 CTD cast 25 recovered.

2048 Began IKMT tow 21, the first tow of the sampling cycle, yo-yoed between the surface and 53.97 m at 19.89°N, 159.44°W. 2121 IKMT tow 21 completed.

2139 Began IKMT tow 22, the second tow of the sampling cycle, yo-yoed between the surface and 44.58 m at 19.92°N, 159.41°W. 2214 IKMT tow 22 completed.

2235 Began bongo tow 13 down to 210 m at 19.9477067°N, 159.3593583°W. 2328 Bongo tow 13 completed.

28 March 0017 Began Tucker tow 16 down to 565.37 m at 19.94°N, 159.38°W. 0259 Tucker tow 16 completed.

0330 Began CTD cast 26 at 20.001°N, 159.207°W down to 696 m for eDNA water collection. 0411 CTD cast 26 recovered.

0507 Began CTD cast 27 at 20.028°N, 159.176°W down to 204 m for eDNA water collection. 0530 CTD cast 27 completed.

0550 Began an opportunistic Tucker tow 17 at the end of station 5 before transit to station 6 down to 569.11 m at 20.04°N, 159.16°W. 0826 Tucker tow 17 completed, commenced EK80 data collection, and transited to the next station.

1911 Arrived at station 6, paused EK80 data collection, and began night sampling at 18.958°N, 160.065°W with CTD cast 28 to 1012 m. 2003 CTD cast 28 recovered.

2025 Began IKMT tow 23, the first tow of the sampling cycle, yo-yoed between the surface and 57.38 m at 18.95°N, 160.05°W. 2101 IKMT tow 23 completed.

2114 Began IKMT tow 24, the second tow of the sampling cycle, yo-yoed between the surface and 48.9 m at 18.96°N, 160.01°W. 2159 IKMT tow 24 completed.

2218 Began bongo tow 14 down to 215.93 m at 18.98°N, 159.97°W. 2341 Bongo tow 14 completed.

29 March 0027 Began Tucker tow 18 down to 565.35 m at 19.01°N, 159.93°W. 0310 Tucker tow 18 completed.

0342 Began CTD cast 29 at 19°N, 159.802°W down to 687 m for eDNA water collection. 0414 CTD cast 29 recovered. The filtration pump broke and while the scientists were swapping it out, the ship started resetting for day operations. When the scientists noticed this after 9 nm, the ship stopped and eDNA sampling commenced once the new pump was installed.

0527 Began CTD cast 30 at 18.995°N, 159.957°W down to 203 m for eDNA water collection. 0543 CTD cast 30 completed, reset for day operations.

0712 Began day sampling at 18.993°N, 159.992°W with CTD cast 31 to 1013 m. 0807 CTD cast 31 recovered.

0828 Began IKMT tow 25, the first tow of the sampling cycle, yo-yoed between the surface and 64.64 m at 18.98°N, 159.97°W. 0904 IKMT tow 25 completed.

0915 Began IKMT tow 26, the second tow of the sampling cycle, yo-yoed between the surface and 55.87 m at 18.98°N, 159.93°W. 0957 IKMT tow 26 completed.

1027 Began bongo tow 15 down to 212.91 m at 18.99°N, 159.88°W. 1123 Bongo tow 15 completed.

1246 Began Tucker tow 19 down to 570.93 m at 18.98°N, 159.77°W. 1453 Tucker tow 19 completed.

1548 Began CTD cast 32 at 18.982°N, 159.649°W down to 638 m for eDNA water collection. 1626 CTD cast 32 recovered.

1731 Began CTD cast 33 at 18.975°N, 159.607°W down to 245 m for eDNA water collection. 1750 CTD cast 33 completed, commenced EK80 data collection, and transited to next station.

30 March 0710 Arrived at station 7, paused EK80 data collection, and began day sampling at 18.188°N, 160.321°W with CTD cast 34 to 1011 m. 0800 CTD cast 34 recovered.

0830 Began IKMT tow 27, the first tow of the sampling cycle, yo-yoed between the surface and 57.85 m at 18.19°N, 160.28°W. 0925 IKMT tow 27 completed.

0918 Began IKMT tow 28, the second tow of the sampling cycle, yo-yoed between the surface and 54.25 m at 18.21°N, 160.24°W. 0955 IKMT tow 28 completed. Upon retrieval of the last IKMT, the paravane snagged on the ship and the welds holding one of the arms on broke and the paravane itself bent slightly. Engineering were called and were able to repair it in time for the next IKMT operations.

1023 Began bongo tow 16 down to 275.03 m at 18.24°N, 160.21°W. 1105 Bongo tow 16 completed. FastCat stopped working, so bongo was deployed with TDRs only.

1205 Began Tucker tow 20 down to 567.43 m at 18.25°N, 160.19°W. 1425 Tucker tow 20 completed. FastCat not functional, but Simrad sensor was working well and was be deployed on all subsequent Tucker trawls.

1452 Began CTD cast 35 at 18.208°N, 160.066°W down to 648 m for eDNA water collection. 1526 CTD cast 35 recovered.

1620 Began CTD cast 36 at 18.197°N, 160.049°W down to 204 m for eDNA water collection. 1639 CTD cast 36 completed, reset for night operations.

Identified interference between the EK80 and ADCP which resulted in non-usable EK80 data. Decided to toggle the ADCP and EK80 data collection. While on station, we collect ADCP data only because the ship must see subsurface currents when the gear is in the water. While transiting, the ADCP was secure and we collected EK80 data only. The speed logger, which also

has the potential of interfering with the EK80, was secured during transit but turned on during station operations.

1905 Began night sampling at 18.191°N, 160.261°W with CTD cast 37 to 1012 m. 1947 CTD cast 37 recovered.

2015 Began IKMT tow 29, the first tow of the sampling cycle, yo-yoed between the surface and 53.98 m at 18.19°N, 160.27°W. 2059 IKMT tow 29 completed.

2117 Began IKMT tow 30, the second tow of the sampling cycle, yo-yoed between the surface and 64.63 m at 18.23°N, 160.25°W. 2157 IKMT tow 30 completed.

2213 Began bongo tow 17 down to 129.19 m at 18.25°N, 160.27°W. 2300 Bongo tow 17 completed. Max depth shy of the 210 m target depth because ship speed was too fast and winch payout speed too slow, so we could not hit the 45° wire angle we needed.

2341 Began Tucker tow 21 down to 563.24 m at 18.29°N, 160.25°W.

31 March 0225 Tucker tow 21 completed.

0259 Began CTD cast 38 at 18.305°N, 160.096°W down to 648 m for eDNA water collection. 0328 CTD cast 38 recovered.

0415 Began CTD cast 39 at 18.278°N, 160.07°W down to 202 m for eDNA water collection. 0432 CTD cast 39 completed, secured ADCP, commenced EK80 data collection, and transited to the next station.

1906 Arrived at station 8, paused EK80 data collection, commenced ADCP data collection, and began night sampling at 16.831°N, 160.001°W with CTD cast 40 to 1010 m. 1957 CTD cast 40 recovered.

2058 Began IKMT tow 31, the first tow of the sampling cycle, yo-yoed between the surface and 64.17 m at 16.83°N, 160°W. The tow start time was delayed 30 minutes due to bad weather. 2135 IKMT tow 31 completed.

2144 Began IKMT tow 32, the second tow of the sampling cycle, yo-yoed between the surface and 73.33 m at 16.84°N, 159.99°W. 2222 IKMT tow 32 completed.

2238 Began bongo tow 18 down to 174.35 m at 16.86°N, 159.98°W. 2321 Bongo tow 18 completed.

01 April 0005 Began Tucker tow 22 down to 556.55 m at 16.88°N, 159.95°W. 0223 Tucker tow 22 completed.

0249 Began CTD cast 41 at 16.903°N, 159.893°W down to 632 m for eDNA water collection.

0412 Began CTD cast 42 at 16.882°N, 159.886°W down to 222 m for eDNA water collection. 0428 CTD cast 42 completed, reset for day operations.

0708 Began day sampling at 16.866°N, 160.035°W with CTD cast 43 to 1012 m. 0803 CTD cast 43 recovered.

0812 Began IKMT tow 33, the first tow of the sampling cycle, yo-yoed between the surface and 48.3 m at 16.85°N, 160.03°W. 0846 IKMT tow 33 completed.

0900 Began IKMT tow 34, the second tow of the sampling cycle, yo-yoed between the surface and 55.79 m at 16.87°N, 160.01°W. 0933 IKMT tow 34 completed.

0953 Began bongo tow 19 down to 189.69 m at 16.88°N, 159.99°W. Began following strict 300 m wire out with a 45° wire angle protocol at this station and at all subsequent stations. Note: The ship's bare steerage was ~1.5 knots so we could not slow down more than that while towing, making it difficult to reach a 45° wire angle due to slower than ideal payout speeds. From this point forward, max depth for bongo tows were variable and likely shallower than protocol dictates. 1023 Bongo tow 19 completed.

1102 Began Tucker tow 23 down to 590.26 m at 16.87°N, 160.01°W. The net took almost one hour to equilibrate at target depth. 1338 Tucker tow 23 completed.

1424 Began CTD cast 44 at 16.878°N, 159.928°W down to 629 m for eDNA water collection. 1459 CTD cast 45 completed

1556 Began CTD cast 45 at 16.88°N, 159.934°W down to 223 m for eDNA water collection. 1617 CTD cast 45 completed, secured ADCP, commenced EK80 data collection, and transited to the next station.

02 April 0710 Arrived at station 9, paused EK80 data collection, commenced ADCP data collection, and began day sampling at 16.312°N, 160.054°W with CTD cast 46 to 1010 m. 0804 CTD cast 46 recovered.

0825 Began IKMT tow 35, the first tow of the sampling cycle, yo-yoed between the surface and 57.23 m at 16.3°N, 160.05°W. 0859 IKMT tow 35 completed.

0912 Began IKMT tow 36, the second tow of the sampling cycle, yo-yoed between the surface and 56.35 m at 16.32°N, 160.03°W. 0948 IKMT tow 36 completed.

1004 Began bongo tow 20 down to 186.47 m at 16.33°N, 160°W. 1035 Bongo tow 20 completed.

1106 Began Tucker tow 24 down to 584.7 m at 16.34°N, 159.98°W. 1321 Tucker tow 24 completed.

1354 Began CTD cast 47 at 16.332°N, 159.885°W down to 621 m for eDNA water collection. 1425 CTD cast 47 recovered. CO called an all stop for operations due to immediate need to pump sewage. Second eDNA CTD cancelled for station 9 day operations. Reset for night operations.

1916 Began night sampling at 16.328°N, 159.908°W with CTD cast 48 to 1013 m. 1959 CTD cast 48 recovered.

All operations cancelled due to unsafe weather conditions with winds 15-26 knots with a mixed swell. Transited to next station.

03 April 1913 Arrived at station 10, paused EK80 data collection, commenced ADCP data collection, and began night sampling at 17.311°N, 160.522°W with CTD cast 49 to 1009 m.

2047 Began IKMT tow 37, the first tow of the sampling cycle, yo-yoed between the surface and 59.25 m at 17.31°N, 160.52°W. 2125 IKMT tow 37 completed.

2132 Began IKMT tow 38, the second tow of the sampling cycle, yo-yoed between the surface and 59.72 m at 17.32°N, 160.5°W. 2215 IKMT tow 38 completed.

2227 Began bongo tow 21 down to 146.59 m at 17.34°N, 160.48°W. 2310 Bongo tow 21 completed.

2350 Began Tucker tow 25 down to 597.48 m at 17.36°N, 160.45°W.

04 April 0214 Tucker tow 25 completed.

0258 Began CTD cast 50 at 17.326°N, 160.438°W down to 628 m for eDNA water collection. 0330 CTD cast 50 completed

0423 Began CTD cast 51 at 17.337°N, 160.439°W down to 201 m for eDNA water collection. 0439 CTD cast 51 completed, reset for day operations.

0710 Began day sampling at 17.305°N, 160.527°W with CTD cast 52 to 1010 m. 0801 CTD cast 52 recovered. Winds and swell picked up and we assessed weather conditions for each operation.

0822 Began IKMT tow 39, the first tow of the sampling cycle, yo-yoed between the surface and 66.27 m at 17.3°N, 160.52°W. 0855 IKMT tow 39 completed.

0908 Began IKMT tow 40, the second tow of the sampling cycle, yo-yoed between the surface and 55.4 m at 17.31°N, 160.5°W. 0941 IKMT tow 40 completed.

1004 Began bongo tow 22 down to 228.73 m at 17.32°N, 160.47°W. 1029 Bongo tow 22 completed.

1104 Began Tucker tow 26 down to 587.14 m at 17.33°N, 160.46°W. The net took almost one hour to equilibrate at target depth. 1304 Tucker tow 26 completed.

1340 Began CTD cast 53 at 17.304°N, 160.406°W down to 638 m for eDNA water collection. 1421 CTD cast 53 completed

1521 Began CTD cast 54 at 17.29°N, 160.404°W down to 206 m for eDNA water collection. 1538 CTD cast 54 completed, transited to next station.

Winds throughout the day held around 20–25 knots with a mixed swell.

05 April 0721 Arrived at station 11, paused EK80 data collection, commenced ADCP data collection, and began day sampling at 18.623°N, 160.439°W with CTD cast 55 to 1019 m. 0842 CTD cast 55 recovered.

0845 Began IKMT tow 41, the first tow of the sampling cycle, yo-yoed between the surface and 65.22 m at 18.62°N, 160.4°W. 0919 IKMT tow 41 completed.

0932 Began IKMT tow 42, the second tow of the sampling cycle, yo-yoed between the surface and 72.24 m at 18.64°N, 160.37°W. 1003 IKMT tow 42 completed.

1020 Began bongo tow 23 down to 153.25 m at 18.66°N, 160.36°W. 1048 Bongo tow 23 completed.

1147 Began Tucker tow 27 down to 578.83 m at 18.68°N, 160.33°W. 1422 Tucker tow 27 completed.

1615 Began CTD cast 56 at 18.673°N, 160.143°W down to 639 m for eDNA water collection. Delayed start to the CTD because of weather worsening. 1652 CTD cast 56 recovered.

1759 Began CTD cast 57 at 18.705°N, 160.111°W down to 238 m for eDNA water collection. 1818 CTD cast 57 recovered, reset for night operations.

1936 Began night sampling at 18.704°N, 160.175°W with CTD cast 58 to 1014 m. 2032 CTD cast 52 recovered.

2102 Began IKMT tow 43, the first tow of the sampling cycle, yo-yoed between the surface and 68.61 m at 18.71°N, 160.15°W. 2140 IKMT tow 43 completed.

2152 Began IKMT tow 44, the second tow of the sampling cycle, yo-yoed between the surface and 61.37 m at 18.73°N, 160.12°W. 2233 IKMT tow 44 completed.

2251 Began bongo tow 24 down to 203.16 m at 18.76°N, 160.1°W. 2329 Bongo tow 24 completed.

06 April 0021 Began Tucker tow 28 down to 560.76 m at 18.75°N, 160.13°W. 0152 Tucker tow 28 completed.

0343 Began CTD cast 59 at 18.767°N, 159.977°W down to 637 m for eDNA water collection. 0413 CTD cast 59 completed

0459 Began CTD cast 60 at 18.77°N, 159.954°W down to 208 m for eDNA water collection. 0515 CTD cast 60 completed, transited to next station.

1900 arrived at station 12. Due to the wide direction of waves entering the longline pit, the first CTD of the station was cancelled. Instead, began night sampling at 1952 with IKMT tow 45, the first tow of the sampling cycle,

yo-yoed between the surface and 74.32 m at 19.34°N, 159.98°W. 2045 IKMT tow 45 completed.

2053 Began IKMT tow 46, the second tow of the sampling cycle, yo-yoed between the surface and 67.03 m at 19.36°N, 159.93°W. 2136 IKMT tow 46 completed. Weather improved and regular sampling commenced.

2204 Began bongo tow 25 down to 120.78 m at 19.38°N, 159.87°W. 2300 Bongo tow 25 completed.

2347 Began Tucker tow 29 down to 564.66 m at 19.41°N, 159.79°W.

07 April 0207 Tucker tow 29 completed.

0259 Began CTD cast 61 at 19.448°N, 159.709°W down to 648 m for eDNA water collection. Delayed start to the CTD because of weather worsening.

0426 Began CTD cast 62 at 19.459°N, 159.711°W down to 203 m for eDNA water collection. 0442 CTD cast 62 recovered, reset for day operations.

Weather conditions again delayed the start of the sampling cycle because the longline pit is vulnerable to swells. Instead, began day sampling at 0841 with IKMT tow 47, the first tow of the sampling cycle, yo-yoed between the surface and 56.82 m at 19.37°N, 159.93°W. 0913 IKMT tow 47 completed.

0933 Began IKMT tow 48, the second tow of the sampling cycle, yo-yoed between the surface and 63.35 m at 19.39°N, 159.88°W. 1006 IKMT tow 48 completed. Continued on with net operations until weather conditions improved enough for a CTD.

1029 Began bongo tow 26 down to 160.67 m at 19.41°N, 159.84°W. 1057 Bongo tow 26 completed.

1152 Weather improved enough to conduct CTD cast 63 at 19.42°N, 159.8°W to 1013 m. 1248 CTD cast 63 recovered.

1307 Began Tucker tow 30 down to 600.36 m at 19.41°N, 159.78°W. 1512 Tucker tow 30 completed.

1540 Began CTD cast 64 at 19.435°N, 159.701°W down to 621 m for eDNA water collection. 1627 CTD cast 64 recovered.

1718 Began CTD cast 65 at 19.456°N, 159.688°W down to 203 m for eDNA water collection. 1741 CTD cast 65 recovered, transited to the next station.

08 April 0713 Arrived at station 13, paused EK80 data collection, commenced ADCP data collection, and began day sampling at 19.819°N, 159.968°W with CTD cast 66 to 1014 m. 0811 CTD cast 66 recovered.

0830 Began IKMT tow 49, the first tow of the sampling cycle, yo-yoed between the surface and 58.86 m at 19.82°N, 159.95°W. 0903 IKMT tow 49 completed.

0916 Began IKMT tow 50, the second tow of the sampling cycle, yo-yoed between the surface and 66.56 m at 19.83°N, 159.91°W. 0953 IKMT tow 50 completed.

1010 Began bongo tow 27 down to 226.51 m at 19.86°N, 159.88°W. 1040 Bongo tow 27 completed.

1113 Began Tucker tow 31 down to 582.5 m at 19.88°N, 159.85°W. 1343 Tucker tow 31 completed.

1412 Began CTD cast 67 at 19.918°N, 159.72°W down to 658 m for eDNA water collection. 1450 CTD cast 67 recovered.

1604 Began CTD cast 68 at 19.928°N, 159.678°W down to 206 m for eDNA water collection. 1622 CTD cast 68 recovered, reset for night operations.

1906 Began night sampling at 19.806°N, 160.001°W with CTD cast 69 to 1012 m. 1955 CTD cast 69 recovered.

2012 Began IKMT tow 51, the first tow of the sampling cycle, yo-yoed between the surface and 63.9 m at 19.81°N, 159.99°W. 2058 IKMT tow 51 completed.

2107 Began IKMT tow 52, the second tow of the sampling cycle, yo-yoed between the surface and 63.37 m at 19.84°N, 159.95°W. 2150 IKMT tow 52 completed.

2201 Began bongo tow 28 down to 159.89 m at 19.85°N, 159.91°W. 2257 Bongo tow 28 completed.

2253 Began Tucker tow 32 down to 559.07 m at 19.88°N, 159.84°W.

09 April 0235 Tucker tow 32 completed.

0311 Began CTD cast 70 at 19.938°N, 159.694°W down to 648 m for eDNA water collection. 0344 CTD cast 70 recovered.

0431 Began CTD cast 71 at 19.948°N, 159.675°W down to 228 m for eDNA water collection. 0450 CTD cast 71 recovered, secured ADCP, commenced EK80 data collection, and transited to the next station.

During transit to our next station, the neuston net was deployed from the port side outrigger. The net held steady at speeds up to 7.5 knots, even when on the weather side of the ship. More trouble shooting is needed to devise a method to pull the frame close to the ship to switch out cod ends without retrieving the whole net.

1909 Arrived at station 14, paused EK80 data collection, commenced ADCP data collection, and began night sampling at 20.152°N, 159.498°W with CTD cast 72 to 1012 m. 1952 CTD cast 72 recovered.

2009 Began IKMT tow 53, the first tow of the sampling cycle, yo-yoed between the surface and 55.95 m at 20.16°N, 159.49°W. 2046 IKMT tow 53 completed.

2105 Began IKMT tow 54, the second tow of the sampling cycle, yo-yoed between the surface and 56.92 m at 20.19°N, 159.45°W. 2140 IKMT tow 54 completed.

2154 Began bongo tow 29 down to 140.11 m at 20.23°N, 159.42°W. 2239 Bongo tow 29 completed.

2344 Began Tucker tow 33 down to 567.01 m at 20.23°N, 159.37°W.

10 April 0229 Tucker tow 33 completed.

0301 Began CTD cast 73 at 20.231°N, 159.243°W down to 621 m for eDNA water collection. 0338 CTD cast 73 recovered.

0436 Began CTD cast 74 at 20.254°N, 159.205°W down to 222 m for eDNA water collection. 0453 CTD cast 74 recovered, reset for night operations.

0709 Began day sampling at 20.193°N, 159.419°W with CTD cast 75 to 1014 m. 0811 CTD cast 75 recovered.

0813 Began IKMT tow 55, the first tow of the sampling cycle, yo-yoed between the surface and 61.49 m at 20.19°N, 159.4°W. 0847 IKMT tow 55 completed.

0859 Began IKMT tow 56, the second tow of the sampling cycle, yo-yoed between the surface and 57.21 m at 20.2°N, 159.36°W. 0939 IKMT tow 56 completed.

0951 Began bongo tow 30 down to 220.98 m at 20.23°N, 159.32°W. 1022 Bongo tow 30 completed.

1053 Began Tucker tow 34 down to 585.55 m at 20.24°N, 159.29°W. 1315 Tucker tow 34 completed.

1352 Began CTD cast 76 at 20.219°N, 159.173°W down to 638 m for eDNA water collection. 1429 CTD cast 76 recovered.

1524 Began CTD cast 77 at 20.211°N, 159.161°W down to 226 m for eDNA water collection. 1551 CTD cast 77 recovered.

1632 Began an opportunistic CTD cast 78 at 20.23°N, 159.133°W down to 224 m for eDNA water collection for methods comparisons. 1650 CTD cast 78 recovered, secured ADCP, commenced EK80 data collection, and transited to the next station.

1900 Arrived at station 15, paused EK80 data collection, commenced ADCP data collection, and began night sampling at 20.512°N, 159.046°W with CTD cast 79 to 1012 m. 1950 CTD cast 79 recovered.

2005 Began IKMT tow 57, the first tow of the sampling cycle, yo-yoed between the surface and 54.08 m at 20.52°N, 159.03°W. 2042 IKMT tow 57 completed.

2053 Began IKMT tow 58, the second tow of the sampling cycle, yo-yoed between the surface and 61.23 m at 20.55°N, 158.99°W. 2128 IKMT tow 58

completed.

2141 Began bongo tow 31 down to 155.6 m at 20.57°N, 158.95°W. 2219 Bongo tow 31 completed.

2251 Began Tucker tow 35 down to 567.13 m at 20.6°N, 158.89°W.

11 April 0128 Tucker tow 35 completed.

0242 Began CTD cast 80 at 20.537°N, 158.891°W down to 624 m for eDNA water collection. 0313 CTD cast 80 recovered.

0412 Began CTD cast 81 at 20.568°N, 158.847°W down to 244 m for eDNA water collection. 0430 CTD cast 81 recovered, reset for night operations.

0710 Began day sampling at 20.56°N, 158.941°W with CTD cast 82 to 1014 m. 0816 CTD cast 82 recovered.

0835 Began IKMT tow 59, the first tow of the sampling cycle, yo-yoed between the surface and 56.59 m at 20.57°N, 158.91°W. 0908 IKMT tow 59 completed.

0921 Began IKMT tow 60, the second tow of the sampling cycle, yo-yoed between the surface and 70.41 m at 20.57°N, 158.86°W. 0955 IKMT tow 60 completed.

1011 Began bongo tow 30 down to 220.98 m at 20.23°N, 159.32°W. 1022 Bongo tow 30 completed.

1118 Began Tucker tow 36 down to 611.78 m at 20.58°N, 158.8°W. 1346 Tucker tow 36 completed.

1429 Began CTD cast 83 at 20.538°N, 158.676°W down to 630 m for eDNA water collection. 1509 CTD cast 83 recovered.

1608 Began CTD cast 84 at 20.529°N, 158.638°W down to 215 m for eDNA water collection. 1629 CTD cast 84 recovered, secured ADCP, commenced EK80 data collection, and transited to the next station.

12 April 0711 Arrived at station 16, paused EK80 data collection, commenced ADCP data collection, and began day sampling at 20.954°N, 158.406°W with CTD cast 85 to 1011 m. 0823 CTD cast 85 recovered.

Because of high winds we switched the order of operations around and started with the Tucker tow while we waited for the winds to abate to use the more sensitive gear. 0935 Began Tucker tow 37 down to 560.5 m at 20.94°N, 158.35°W. 1240 Tucker tow 37 completed.

1316 Weather conditions improved enough for us to continue with sampling. Began IKMT tow 61 yo-yoed between the surface and 65.69 m at 20.9°N, 158.13°W. 1347 IKMT tow 61 completed. Weather conditions improved enough for us to continue with sampling. Because of the delay due to windy conditions,

we only conducted one daytime IKMT tow at station 16 to make up time and allow all gear to be able to sample.

1407 Began bongo tow 33 down to 131.95 m at 20.88°N, 158.08°W. 1444 Bongo tow 33 completed.

1514 Began CTD cast 86 at 20.85°N, 158.034°W down to 592 m for eDNA water collection. 1549 CTD cast 86 recovered.

1651 Began CTD cast 87 at 20.838°N, 157.983°W down to 190 m for eDNA water collection. 1711 CTD cast 87 recovered, reset for day operations.

1903 Began night sampling at 20.918°N, 158.245°W with CTD cast 88 to 1013 m. 2014 CTD cast 75 recovered.

2012 Began IKMT tow 62, the first tow of the sampling cycle, yo-yoed between the surface and 62.2 m at 20.91°N, 158.23°W. 2048 IKMT tow 62 completed.

2058 Began IKMT tow 63, the second tow of the sampling cycle, yo-yoed between the surface and 66.03 m at 20.9°N, 158.19°W. 2133 IKMT tow 63 completed.

2147 Began bongo tow 34 down to 185.42 m at 20.89°N, 158.15°W. 2226 Bongo tow 34 completed.

2315 Began Tucker tow 38 down to 560.19 m at 20.86°N, 158.16°W.

13 April 0155 Tucker tow 38 completed.

0247 Began CTD cast 89 at 20.741°N, 158.095°W down to 622 m for eDNA water collection. 0323 CTD cast 89 recovered.

0419 Began CTD cast 90 at 20.712°N, 158.044°W down to 203 m for eDNA water collection. 0437 CTD cast 90 recovered, secured ADCP, commenced EK80 data collection, and transited to the next station.

0800 arrived at station 17 and began opportunistic sampling. Because this was an unpaired station, meaning there was no nighttime sampling, we focused on ichthyoplankton and voucher specimen collections over the shelf drop-off area southeast of O‘ahu towards Penguin Bank. 0811 Began IKMT tow 64, the first tow of the sampling cycle, yo-yoed between the surface and 53.24 m at 20.75°N, 157.81°W. 0842 IKMT tow 64 completed.

0853 Began IKMT tow 65, the second tow of the sampling cycle, yo-yoed between the surface and 51.62 m at 20.71°N, 157.8°W. 0925 IKMT tow 65 completed.

1026 Began a deep Tucker tow 39 down to 711.6 m at 20.7°N, 157.8°W. 1403 Tucker tow 39 completed.. This concluded the sampling for SE2403. Ended ADCP data collection, commenced active acoustics data collection, and began transit back to Pearl Harbor.

April 14 0900 Returned to Pearl Harbor. Ended active acoustics data collection. Disembark Johanna Wren, Joseph O'Malley, Jessica Lee Aquino, Emily Contreras, Donald Kobayashi, Robert McLean, Gabriella Mukai, James Ruzicka, Andrea Schmidt, Jonathan Whitney, Tamara Colon-Nieves and Evotia Maino.

MISSIONS AND RESULTS:

A. Conduct routine conductivity-temperature-depth (CTD) casts to a maximum 1000 m, continuous acoustic Doppler current profiler (ADCP) and thermosalinograph (TSG) measurements along the length of the project track to describe the physical environment in the ocean in the center, edge, and outside of oceanographic features such as eddies and fronts.

1. During this project, we visited two eddies: one cyclonic and one anticyclonic, over 17 stations where each sampling cycle spanned over a 22 h period (Fig. 1). Stations were located near the center (stations 3,7,10,11), edge (stations 2,4,8,11,14), and outside (stations 5,6,9,12,13,16) of each eddy. Two additional stations, one without a functioning CTD (station 1) and one for opportunistic sampling only (station 17), were sampled as well. Station locations were determined daily using near real time remotely sensed sea surface heigh anomaly data with derrived currents from Windy (windy.com; which uses Copernicus data) and NOAA's RADSs Sea Level Anomaly data (Dataset ID: noaacwBLENDEDsshDaily) provided through CoastWatch ShipWatch Service.

2. During the first CTD cast of the cruise on 19 March the ship lost all communication ability with the CTD. The problem was resolved on 22 March, five days into the survey. Because the CTD is an essential piece of equipment, only opportunistic sampling was possible during times when the CTD was not functional, and planned station sampling could only start once the CTD was working. Once fixed, the CTD worked consistently for the remainder of the survey.

3. A total of 87 fully successful CTD casts were conducted (Table 1); 2 casts at each station (29 in total; 15 stations where both day and night sampling took place) to 1000 m and four additional casts at each station to around 650 and 250 m for water collection purposes only for eDNA analysis. Four planned CTD casts (1 1000 m depth cast and 3 eDNA casts) were cancelled due to difficult weather conditions or all-stop to operations due to sewage issues. One opportunistic cast to collect water for methods comparison for eDNA analysis was conducted at station 14 after the last daytime operations finished. During all casts, profiles of temperature, conductivity, and dissolved oxygen were collected on redundant sensors, and profiles of fluorescence were collected by both an open WET Labs and pumped Seapoint fluorometer (Fig. 2-4).

4. ADCP and EK80 were turned on intermittently for the entirety of the project. EK80 collected data only during transits and data collection was stopped during station operations becuase the quality of the data is generally too poor to analyze due to ship noise. Initially the ADCP and speed logger were on continuously. On March 29 interference between the ADCP and the EK80 on all frequencies

was identified. The interference could not be resolved, so starting 31 March, the ADCP and the ship's speed logger were secured during transit when EK80 data were collected and turned back on during station operations because the bridge needed them when gear was in the water.

5. TSG data were collected at a roughly 5-second resolution throughout the survey.

B. Conduct regular CTD-mounted fluorometer measurements and water collection from CTD rosette-mounted Niskin bottles in the shallow scattering layer (approximately 0-200m) at the center, edge, and outside oceanographic features for extracted chlorophyll and nutrient measurements, along with size fractionation of the phytoplankton to assess the influence of the physical dynamics on the biological productivity in and around oceanographic features.

1. A CTD-mounted Wetlabs ECO FLNTURTD fluorometer measured chlorophyll profiles to a depth of 1000 m during 29 CTD casts. Water samples were collected at 10 depths (surface, 20, 35, 50, 65, 80, 100, 125, 150, and 200 m) during these CTDs for analyses of bulk and size fractionated chlorophyll and chlorophyll-a (at 20, 2, and 0.2 μm size fractions), and nutrient analysis (Table 1).

2. Due to delayes in shipping of a new benchtop fluorometer, the chlorophyll filters were stored in a liquid nitrogen dry shipper for post-cruise analysis. Nutrient samples were stored in the scientific freezer for post cruise analysis.

C. Conduct water collection from CTD rosette mounted Niskin bottles at up to 8 pre-determined depths per site in the shallow scattering layer (0-200m) and deep scattering layer (400-600m) to be filtered for environmental DNA (eDNA) metabarcoding to provide community composition of plankton, fish, squid, and mammals in and around oceanographic features.

During day-time and night-time operations at each of the 15 stations, 2 CTD casts were conducted consecutively, collecting water for eDNA analysis, for a total of 58 casts (Table 1). Each cast collected water from 3 depths for a total of 24 l of water each at 6 depths for each sampling cycle (day and night). The collection depths were determined by the depth of the deep and shallow acoustic scattering layer recorded by the EK80 active acoustics system with targets within and below the scattering layers.

D. Monitor the biological backscatter using the Simrad EK80 echosounder system in an effort to assess the relative density, distribution, and composition of micronekton in and around oceanographic features and how that relates to physical dynamics along the project track.

1. Bioacoustic data were collected intermittently during the cruise during transits only. On March 29 interference between the ADCP and the EK80 on all frequencies was identified. The interference could not be resolved by adjusting the trigger jigger, so starting 31 March, the ADCP and the ships speed logger were secured during transit when EK80 data were collected and turned back on during station operations when EK80 data collection was paused. Data were analyzed post-cruise.

2. Acoustic data were used in real time during the cruise to determine sampling depths for eDNA operations as well as opportunistic Tucker trawls.

E. Deploy bongo nets with wire mounted SeaBird CTD in the shallow scattering layer (approximately 0–200m) to assess the influence of physical dynamics on the biomass, distribution, and composition of mesozooplankton and ichthyoplankton in and around oceanographic features.

1. A total of 34 successful bongo tows were conducted at 16 stations using a 200-μm mesh net. To get real time depth, a FastCat CTD was attached to the conducting wire and used during deployments along with temperature depth recorders (Table 2). The TDRs provide depth and temperature along the deployment after the tow. However, the FastCat termination experienced a lot of wear being pulled through the block every time the winch was rotated (4$\times$ per sampling cycle) and had to be reterminated during every transit. On 30 March, Survey Tech ran out of parts for the termination and we decided to stop using the FastCat altogether. Fron then on, depth target was solely determined by ship speed, wire out, and wire angle. The depth of the tow was confirmed after the tow was completed using temperature-depth recorders (TDRs). Our protocol called for a net deployment rate of 50 m per minute, 300 m wire out, and to maintain a 45-degree wire angle during the tow haul back at 20 m per minute. The ship was consistently unable deploy the net at rates higher than 20 m per minute or slow the ship down to bare steerage to allow the net to sink further, resulting in our actual net depths being consistently shallower than the target 210 m depth.

2. Samples from the bongo nets were preserved for bulk and size-fractionated biomass. One net was size-fractioned into 200, 500, 1000, 2000, and 5000 μm fractions and stored in the ship's scientific freezer for post-cruise drying and weighing. The other net was split in half using a Folsom splitter with one half preserved in 95% ethanol and one in 10% formalin for post-cruise genetic analysis (of the ethanol preserved fraction) and identification and measurements using ZooSCAN (formalin preserved fraction). Fish larger than 1 cm found in the samples were removed and stored in the ship's scientific freezer for genetic work post-cruise.

F. Deploy towed equipment, including the 6-foot Isaacs-Kidd Midwater Trawl (IKMT) and 2-meter ring net, in the shallow scattering layer (approximately 0–50m) in an effort to locate areas with eggs and ichthyoplankton larvae.

1. For this effort, the 6 foot Isaaks-Kidd Modwater Trawl (IKMT) net with a 505-μm mesh net was yo-yo towed in the top 50 m of the water column at all 17 stations (Table 3). A total of 65 IKMT tows were successfully completed; 8 daytime tows and 5 nighttime tows. The net mesh size was not small enough to catch any eggs, but did capture larval fish. We focused on the top 50 m of the water column after conversations with Barb Muhling at SWFSC regarding her success in catching bluefin tuna larvae in the Gulf of Mexico at that depth and kept the tow protocol consistent with ongoing ichthyoplankton surveys taking place around the Hawaiian Islands.

2. Because the sampling went faster than expected, we were able to add a replicate tow at almost all stations. However, if we were making up time at any one station, one of the IKMT tows was cut.

3. After initial coarse sorting onboard, we found several tuna larvae in the trawl, but identification to species will had to be conducted post-cruise using DNA methods. These specimen are valuable in determining spawning locations of tunas in the Hawai‘i longline fishing grounds.

4. On 30 March, at station 7, the IKMT frame got snagged on the lip of the ship by the cutout upon retreival. The paravane bent and the welds on one of the arms broke off. Engineering were called and immediately started working on fixing the arm. They were not able to straighten out the paravale itself, but they welded the arm back on so the IKMT was ready for deployment by the next sampling cycle; no sampling opportunity was lost.

5. There were no 2-meter ring net tows

G. Deploy a Cobb trawl (and possibly 10 m^2 Tucker trawl and 10' IKMT) in the shallow scattering layer (approximately 0–250 m) to assess size and composition of micronekton in and around oceanographic features and conduct stomach content analysis on select micronekton for use in size-based ecosystem models.

1. The Cobb trawl was not operable at the time of sailing, so we replaced the Cobb operations with the a 10-meter Tucker Trawl. This was the largest net we had access to and the only gear capable of targeting micronekton successfully. While the Tucker performed successfully during the cruise operations, the catches were small compared to a typical Cobb trawl catch. The amount of water the 10-m Tucker trawl can filter is far less than the Cobb trawl. There was a gap in our size-based sampling strategy left by the lack of Cobb trawling; having an operational Cobb trawl is essential for studying micronekton, the forage of bigeye tuna.

2. A total of 39 Tucker tows were successfully completed; 18 daytime tows and 21 nighttime tows at all 17 stations, including opportunistic sampling between stations (Table 4).

3. The Tucker trawl was used to collect genetic voucher specimens throughout the survey, and opportunistic Tucker trawls were conducted in addition to those conducted at each station. A total of 462 vouchers were collected during the survey.

H. Deploy surface neuston net from boom/outrigger during transits and for targeted stations in an effort to locate areas with fish eggs and larvae, as well as acquire data on floating debris and plastic.

An underway neuston first tested during SE-22-04 was field tested again in order to streamline deployment and recovery. The net was towed from the outrigger on the port side. The net performed well during speeds up to ~7.5 knots but rode optimally at 6 knots. To further improve recovery of the net and to facilitate switching out

cod ends without bringing the net onboard, a pully system attached to the outboard padeye on the gallows would be helpful. Valuable information was gained from the field tests, and the net will be modified before our next cruise.

I. Conduct opportunistic dip net sampling during nighttime CTD operations to collect flying fish and squid specimens for archipelago-wide diet study.

We did not conduct any opportunistic dip net sampling.

SCIENTIFIC PERSONNEL:

Name	Role	Affiliation	Organization
Johanna Wren	Chief Scientist	PIFSC[1]	NMFS[2]
Joseph O'Malley	Operations lead	PIFSC	NMFS
Jessica Lee Aquino	Research Technician	UH[3]	CIMAR[4]
Emily Contreras	Research Associate	UH	CIMAR
Donald Kobayashi	Research Fishery Biologist	PIFSC	NMFS
Robert McLean	Biological Science Technician Fish	PIFSC	NMFS
Gabriella Mukai	Graduate Assistant	UH	CIMAR
James Ruzicka	Research Marine Biologist	PIFSC	NMFS
Andrea Schmidt	Essential Fish Habitat Research Coordinator	UH	CIMAR
Jonathan Whitney	Research Marine Biologist	PIFSC	NMFS
Tamara Colon-Nieves	Research Technician	UH	CIMAR
Evotia Maino	Research Technician	UH	CIMAR

[1] Pacific Islands Fisheries Science Center
[2] National Marine Fisheries Service
[3] University of Hawaii
[4] Cooperative Institute for Marine and Atmospheric Research

TABLES:

Table 1: CTD operations during SE-24-03.

Cast	Station	Time of day	Date and Time (HST)	Longitude (°W)	Latitude (°N)	Depth (m)	Water use
4	2	Night	2024-03-22 19:54:28	158.299	21.232	1012	Nutrients, Chl
5	2	Night	2024-03-23 02:47:14	158.225	21.275	587	eDNA
6	2	Night	2024-03-23 04:33:07	158.227	21.285	203	eDNA
7	2	Day	2024-03-23 07:12:13	158.305	21.234	1012	Nutrients, Chl
8	2	Day	2024-03-23 15:14:40	158.444	21.299	611	eDNA
9	2	Day	2024-03-23 16:49:16	158.426	21.332	203	eDNA
10	3	Day	2024-03-24 07:13:13	159.058	20.910	1013	Nutrients, Chl
11	3	Day	2024-03-24 15:26:26	158.844	21.065	658	eDNA
12	3	Day	2024-03-24 16:58:19	158.924	21.063	185	eDNA
13	3	Night	2024-03-24 19:17:18	159.009	20.971	1012	Nutrients, Chl
14	3	Night	2024-03-25 03:26:00	158.767	21.088	630	eDNA
15	3	Night	2024-03-25 05:02:00	158.760	21.088	175	eDNA
16	4	Night	2024-03-25 19:12:21	159.277	20.348	1011	Nutrients, Chl
17	4	Night	2024-03-26 03:16:59	159.199	20.228	637	eDNA
18	4	Night	2024-03-26 04:33:00	159.151	20.215	202	eDNA
19	4	Day	2024-03-26 07:15:09	159.272	20.354	1015	Nutrients, Chl
20[b]	4	Day	2024-03-26 15:22:06	158.891	20.554	658	eDNA
21	4	Day	2024-03-26 16:56:43	158.860	20.571	203	eDNA
22	5	Day	2024-03-27 07:11:24	159.815	19.794	1012	Nutrients, Chl
23	5	Day	2024-03-27 15:49:02	159.447	19.864	638	eDNA
24	5	Day	2024-03-27 18:03:49	159.381	19.904	206	eDNA
25	5	Night	2024-03-27 19:34:03	159.458	19.888	1025	Nutrients, Chl
26	5	Night	2024-03-28 03:30:00	159.207	20.001	696	eDNA
27	5	Night	2024-03-28 05:07:15	159.176	20.028	204	eDNA
28	6	Night	2024-03-28 19:10:46	160.065	18.958	1012	Nutrients, Chl
29	6	Night	2024-03-29 03:41:59	159.802	19.000	687	eDNA
30	6	Night	2024-03-29 05:27:00	159.957	18.995	203	eDNA
31	6	Day	2024-03-29 07:11:47	159.992	18.993	1013	Nutrients, Chl
32	6	Day	2024-03-29 15:47:39	159.649	18.982	638	eDNA
33	6	Day	2024-03-29 17:31:13	159.607	18.975	245	eDNA
34	7	Day	2024-03-30 07:09:30	160.321	18.188	1011	Nutrients, Chl
35	7	Day	2024-03-30 14:52:04	160.066	18.208	648	eDNA
36	7	Day	2024-03-30 16:19:47	160.049	18.197	204	eDNA
37	7	Night	2024-03-30 19:04:41	160.261	18.191	1012	Nutrients, Chl
38	7	Night	2024-03-31 02:58:36	160.096	18.305	648	eDNA
39	7	Night	2024-03-31 04:15:09	160.070	18.278	202	eDNA
40	8	Night	2024-03-31 19:06:18	160.001	16.831	1010	Nutrients, Chl
41	8	Night	2024-04-01 02:49:09	159.893	16.903	632	eDNA
42	8	Night	2024-04-01 04:11:42	159.886	16.882	222	eDNA
43	8	Day	2024-04-01 07:07:51	160.035	16.866	1012	Nutrients, Chl
44	8	Day	2024-04-01 14:23:46	159.928	16.878	629	eDNA
45	8	Day	2024-04-01 15:56:01	159.934	16.880	223	eDNA
46	9	Day	2024-04-02 07:09:59	160.054	16.312	1010	Nutrients, Chl
47	9	Day	2024-04-02 13:53:58	159.885	16.332	621	eDNA

Table 1: CTD operations during SE-24-03. *(continued)*

Cast	Station	Time of day	Date and Time (HST)	Longitude (°W)	Latitude (°N)	Depth (m)	Water use
48	9	Night	2024-04-02 19:16:00	159.908	16.328	1013	Nutrients, Chl
49	10	Night	2024-04-03 19:13:11	160.522	17.311	1009	Nutrients, Chl
50	10	Night	2024-04-04 02:58:02	160.438	17.326	628	eDNA
51	10	Night	2024-04-04 04:23:14	160.439	17.337	201	eDNA
52	10	Day	2024-04-04 07:09:31	160.527	17.305	1010	Nutrients, Chl
53	10	Day	2024-04-04 13:39:58	160.406	17.304	638	eDNA
54	10	Day	2024-04-04 15:20:47	160.404	17.290	206	eDNA
55	11	Day	2024-04-05 07:21:10	160.439	18.623	1019	Nutrients, Chl
56	11	Day	2024-04-05 16:14:52	160.143	18.673	639	eDNA
57	11	Day	2024-04-05 17:59:12	160.111	18.705	238	eDNA
58	11	Night	2024-04-05 19:35:59	160.175	18.704	1014	Nutrients, Chl
59	11	Night	2024-04-06 03:42:35	159.977	18.767	637	eDNA
60	11	Night	2024-04-06 04:59:14	159.954	18.770	208	eDNA
61	12	Night	2024-04-07 02:58:55	159.709	19.448	648	eDNA
62	12	Night	2024-04-07 04:26:00	159.711	19.459	203	eDNA
63	12	Day	2024-04-07 11:52:13	159.800	19.420	1013	Nutrients, Chl
64	12	Day	2024-04-07 15:39:38	159.701	19.435	621	eDNA
65	12	Day	2024-04-07 17:18:10	159.688	19.456	203	eDNA
66	13	Day	2024-04-08 07:13:29	159.968	19.819	1014	Nutrients, Chl
67	13	Day	2024-04-08 14:12:08	159.720	19.918	658	eDNA
68	13	Day	2024-04-08 16:04:22	159.678	19.928	206	eDNA
69	13	Night	2024-04-08 19:06:11	160.001	19.806	1012	Nutrients, Chl
70	13	Night	2024-04-09 03:11:00	159.694	19.938	648	eDNA
71	13	Night	2024-04-09 04:31:18	159.675	19.948	228	eDNA
72	14	Night	2024-04-09 19:08:37	159.498	20.152	1012	Nutrients, Chl
73	14	Night	2024-04-10 03:01:24	159.243	20.231	621	eDNA
74	14	Night	2024-04-10 04:35:52	159.205	20.254	222	eDNA
75	14	Day	2024-04-10 07:09:23	159.419	20.193	1014	Nutrients, Chl
76	14	Day	2024-04-10 13:52:01	159.173	20.219	638	eDNA
77	14	Day	2024-04-10 15:23:36	159.161	20.211	226	eDNA
78	14	Day	2024-04-10 16:32:14	159.133	20.230	224	eDNA
79	15	Night	2024-04-10 19:00:15	159.046	20.512	1012	Nutrients, Chl
80	15	Night	2024-04-11 02:42:28	158.891	20.537	624	eDNA
81	15	Night	2024-04-11 04:11:55	158.847	20.568	244	eDNA
82	15	Day	2024-04-11 07:10:29	158.941	20.560	1014	Nutrients, Chl
83	15	Day	2024-04-11 14:28:56	158.676	20.538	630	eDNA
84	15	Day	2024-04-11 16:08:09	158.638	20.529	215	eDNA
85	16	Day	2024-04-12 07:11:10	158.406	20.954	1011	Nutrients, Chl
86	16	Day	2024-04-12 15:14:00	158.034	20.850	592	eDNA
87	16	Day	2024-04-12 16:51:12	157.983	20.838	190	eDNA
88	16	Night	2024-04-12 19:02:41	158.245	20.918	1013	Nutrients, Chl
89	16	Night	2024-04-13 02:47:05	158.095	20.741	622	eDNA
90	16	Night	2024-04-13 04:19:27	158.044	20.712	203	eDNA

[a] Cast 1-3 were failed casts while getting the CTD operational.

[b] Bottle #1 did not fire

Table 2: Start time and locations for IKMT tows during SE-24-03

Tow	Station	Time of day	Date and Time (HST)	Longitude (°W)	Latitude (°N)	Max Depth (m)
1	1	Day	2024-03-19 08:41:00	159.25	20.42	58.94
2	1	Night	2024-03-19 21:04:00	159.33	20.31	59.91
3	1	Night	2024-03-19 21:52:00	159.32	20.34	54.94
4	1	Day	2024-03-20 08:54:00	159.21	20.36	53.09
5	1	Day	2024-03-20 09:44:00	159.19	20.40	54.37
6	2	Day	2024-03-22 09:03:00	158.30	21.23	68.49
7	2	Day	2024-03-22 09:50:00	158.30	21.25	48.68
8	2	Night	2024-03-22 21:15:00	158.29	21.24	59.26
9	2	Day	2024-03-23 08:38:00	158.30	21.24	49.77
10	2	Day	2024-03-23 09:30:00	158.34	21.25	57.97
11	3	Day	2024-03-24 08:40:00	159.05	20.91	66.74
12	3	Day	2024-03-24 09:33:00	159.03	20.94	71.08
13	3	Night	2024-03-24 20:19:00	159.12	20.96	56.10
14	3	Night	2024-03-24 21:03:00	158.99	20.98	60.04
15	4	Night	2024-03-25 20:36:00	159.26	20.34	57.99
16	4	Night	2024-03-25 21:25:00	159.27	20.36	56.22
17	4	Day	2024-03-26 08:51:00	159.23	20.36	109.99
18	4	Day	2024-03-26 10:10:00	159.15	20.40	73.77
19	5	Day	2024-03-27 08:39:00	159.79	19.80	52.76
20	5	Day	2024-03-27 09:25:00	159.77	19.83	59.29
21	5	Night	2024-03-27 20:48:00	159.44	19.89	53.97
22	5	Night	2024-03-27 21:39:00	159.41	19.92	44.58
23	6	Night	2024-03-28 20:25:00	160.05	18.95	57.38
24	6	Night	2024-03-28 21:14:00	160.01	18.96	48.90
25	6	Day	2024-03-29 08:28:00	159.97	18.98	64.64
26	6	Day	2024-03-29 09:15:00	159.93	18.98	55.87
27	7	Day	2024-03-30 08:30:00	160.28	18.19	57.85
28	7	Day	2024-03-30 09:18:00	160.24	18.21	54.25
29	7	Night	2024-03-30 20:15:00	160.27	18.19	53.98
30	7	Night	2024-03-30 21:17:00	160.25	18.23	64.63
31	8	Night	2024-03-31 20:58:00	160.00	16.83	64.17
32	8	Night	2024-03-31 21:44:00	159.99	16.84	73.33
33	8	Day	2024-04-01 08:12:00	160.03	16.85	48.30
34	8	Day	2024-04-01 09:00:00	160.01	16.87	55.79
35	9	Day	2024-04-02 08:25:00	160.05	16.30	57.23
36	9	Day	2024-04-02 09:12:00	160.03	16.32	56.35
37	10	Night	2024-04-03 20:47:00	160.52	17.31	59.25
38	10	Night	2024-04-03 21:32:00	160.50	17.32	59.72
39	10	Day	2024-04-04 08:22:00	160.52	17.30	66.27
40	10	Day	2024-04-04 09:08:00	160.50	17.31	55.40
41	11	Day	2024-04-05 08:45:00	160.40	18.62	65.22
42	11	Day	2024-04-05 09:32:00	160.37	18.64	72.24
43	11	Night	2024-04-05 21:02:00	160.15	18.71	68.61
44	11	Night	2024-04-05 21:52:00	160.12	18.73	61.37
45	12	Night	2024-04-06 19:52:00	159.98	19.34	74.32

Table 2: Start time and locations for IKMT tows during SE-24-03 *(continued)*

Tow	Station	Time of day	Date and Time (HST)	Longitude (°W)	Latitude (°N)	Max Depth (m)
46	12	Night	2024-04-06 20:53:00	159.93	19.36	67.03
47	12	Day	2024-04-07 08:41:00	159.93	19.37	56.82
48	12	Day	2024-04-07 09:33:00	159.88	19.39	63.35
49	13	Day	2024-04-08 08:30:00	159.95	19.82	58.86
50	13	Day	2024-04-08 09:16:00	159.91	19.83	66.56
51	13	Night	2024-04-08 20:12:00	159.99	19.81	63.90
52	13	Night	2024-04-08 21:07:00	159.95	19.84	63.37
53	14	Night	2024-04-09 20:09:00	159.49	20.16	55.95
54	14	Night	2024-04-09 21:05:00	159.45	20.19	56.92
55	14	Day	2024-04-10 08:13:00	159.40	20.19	61.49
56	14	Day	2024-04-10 08:59:00	159.36	20.20	57.21
57	15	Night	2024-04-10 20:05:00	159.03	20.52	54.08
58	15	Night	2024-04-10 20:53:00	158.99	20.55	61.23
59	15	Day	2024-04-11 08:35:00	158.91	20.57	56.59
60	15	Day	2024-04-11 09:21:00	158.86	20.57	70.41
61	16	Day	2024-04-12 13:16:00	158.13	20.90	65.69
62	16	Night	2024-04-12 20:12:00	158.23	20.91	62.20
63	16	Night	2024-04-12 20:58:00	158.19	20.90	66.03
64	17	Day	2024-04-13 08:11:00	157.81	20.75	53.24
65	17	Day	2024-04-13 08:53:00	157.80	20.71	51.62

Table 3: Start time and locations for bongo tows during SE-24-03.

Tow	Station	Time of day	Date and Time (HST)	Longitude (°W)	Latitude (°N)	Max Depth (m)
1	1	Day	2024-03-19 09:43:00	159.28	20.46	212.98
2	1	Night	2024-03-19 22:49:00	159.28	20.37	112.10
3	1	Day	2024-03-20 10:43:00	159.16	20.44	136.99
4	2	Day	2024-03-22 10:51:00	158.31	21.27	216.97
5	2	Night	2024-03-22 22:12:00	158.27	21.28	210.00
6	2	Day	2024-03-23 10:31:00	158.38	21.29	213.10
7	3	Day	2024-03-24 10:34:00	159.00	20.97	212.55
8	3	Night	2024-03-24 21:59:00	158.96	20.99	234.01
9	4	Night	2024-03-25 22:26:00	159.28	20.38	155.06
10	4	Day	2024-03-26 11:12:00	159.10	20.43	175.06
11	5	Day	2024-03-27 10:25:00	159.74	19.84	212.16
12	5	Night	2024-03-27 04:52:00	159.82	19.80	134.38
13	5	Night	2024-03-27 22:35:00	NA	NA	210.00
14	6	Night	2024-03-28 22:18:00	159.97	18.98	215.93
15	6	Day	2024-03-29 10:27:00	159.88	18.99	212.91
16	7	Day	2024-03-30 10:23:00	160.21	18.24	275.03
17	7	Night	2024-03-30 22:13:00	160.27	18.25	129.19
18	8	Night	2024-03-31 22:38:00	159.98	16.86	174.35
19	8	Day	2024-04-01 09:53:00	159.99	16.88	189.69
20	9	Day	2024-04-02 10:04:00	160.00	16.33	186.47
21	10	Night	2024-04-03 22:27:00	160.48	17.34	146.59
22	10	Day	2024-04-04 10:04:00	160.47	17.32	228.73
23	11	Day	2024-04-05 10:20:00	160.36	18.66	153.25
24	11	Night	2024-04-05 22:51:00	160.10	18.76	203.16
25	12	Night	2024-04-06 22:04:00	159.87	19.38	120.78
26	12	Day	2024-04-07 10:29:00	159.84	19.41	160.67
27	13	Day	2024-04-08 10:10:00	159.88	19.86	226.51
28	13	Night	2024-04-08 22:01:00	159.91	19.85	159.89
29	14	Night	2024-04-09 21:54:00	159.42	20.23	140.11
30	14	Day	2024-04-10 09:51:00	159.32	20.23	220.98
31	15	Night	2024-04-10 21:41:00	158.95	20.57	155.60
32	15	Day	2024-04-11 10:11:00	158.81	20.58	194.75
33	16	Day	2024-04-12 14:07:00	158.08	20.88	131.95
34	16	night	2024-04-12 21:47:00	158.15	20.89	185.42

Table 4: Start time and locations for Tucker tows during SE-24-03.

Tow	Station	Time of day	Date and Time (HST)	Longitude (°W)	Latitude (°N)	Max Depth (m)
1	1	Day	2024-03-19 13:03:00	159.25	20.47	546.28
2	1	Night	2024-03-19 01:05:00	159.26	20.36	512.50
3	2	Night	2024-03-21 20:48:00	158.34	21.19	600.00
4	2	Night	2024-03-21 00:17:00	158.31	21.24	700.00
5	2	Night	2024-03-21 04:00:00	158.31	21.44	130.00
6	2	Day	2024-03-22 13:11:00	158.32	21.39	900.00
7	2	Night	2024-03-22 00:03:00	158.31	21.24	516.74
8	2	Day	2024-03-23 12:28:00	158.47	21.36	571.54
9	3	Night	2024-03-24 00:10:00	159.09	20.94	569.08
10	3	Day	2024-03-24 12:28:00	158.96	21.02	568.41
11	3	Night	2024-03-24 00:09:00	158.89	21.04	568.77
12	3	Night	2024-03-24 05:33:00	158.75	21.09	606.57
13	4	Night	2024-03-25 00:35:00	159.27	20.33	483.84
14	4	Day	2024-03-26 12:47:00	159.02	20.49	549.23
15	5	Day	2024-03-27 13:02:00	159.60	19.85	568.52
16	5	Night	2024-03-27 00:17:00	159.38	19.94	565.37
17	5	Night	2024-03-27 05:50:00	159.16	20.04	569.11
18	6	Night	2024-03-28 00:27:00	159.93	19.01	565.35
19	6	Day	2024-03-29 12:46:00	159.77	18.98	570.93
20	7	Day	2024-03-30 12:05:00	160.19	18.25	567.43
21	7	Night	2024-03-30 23:41:00	160.25	18.29	563.24
22	8	Night	2024-03-31 00:05:00	159.95	16.88	556.55
23	8	Day	2024-04-01 11:02:00	160.01	16.87	590.26
24	9	Day	2024-04-02 11:06:00	159.98	16.34	584.70
25	10	Night	2024-04-03 23:50:00	160.45	17.36	597.48
26	10	Day	2024-04-04 11:04:00	160.46	17.33	587.14
27	11	Day	2024-04-05 11:47:00	160.33	18.68	578.83
28	11	Night	2024-04-05 00:21:00	160.13	18.75	560.76
29	12	Night	2024-04-06 23:47:00	159.79	19.41	564.66
30	12	Day	2024-04-07 13:07:00	159.78	19.41	600.36
31	13	Day	2024-04-08 11:13:00	159.85	19.88	582.50
32	13	Night	2024-04-08 22:53:00	159.84	19.88	559.07
33	14	Night	2024-04-09 23:44:00	159.37	20.23	567.01
34	14	Day	2024-04-10 10:53:00	159.29	20.24	585.55
35	15	Night	2024-04-10 22:51:00	158.89	20.60	567.13
36	15	Day	2024-04-11 11:18:00	158.80	20.58	611.78
37	16	Day	2024-04-12 09:35:00	158.35	20.94	560.50
38	16	Night	2024-04-12 23:15:00	158.16	20.86	560.19
39	17	Day	2024-04-13 10:26:00	157.80	20.70	711.60

FIGURES:

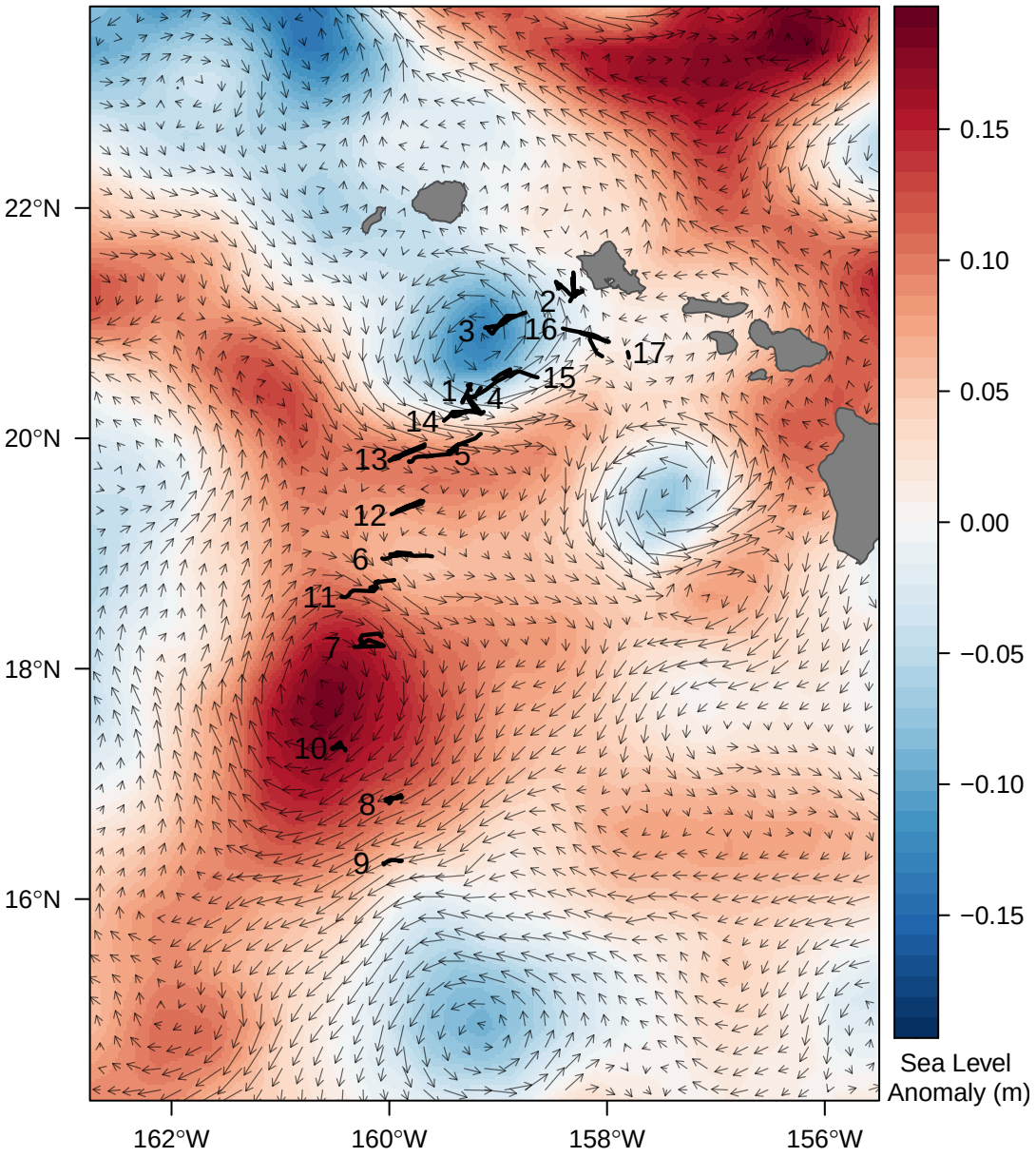

Figure 1: SE2403 Station Locations. Color shading shows sea level anomaly with geostrophic currents plotted as arrows for 2 April 2024.

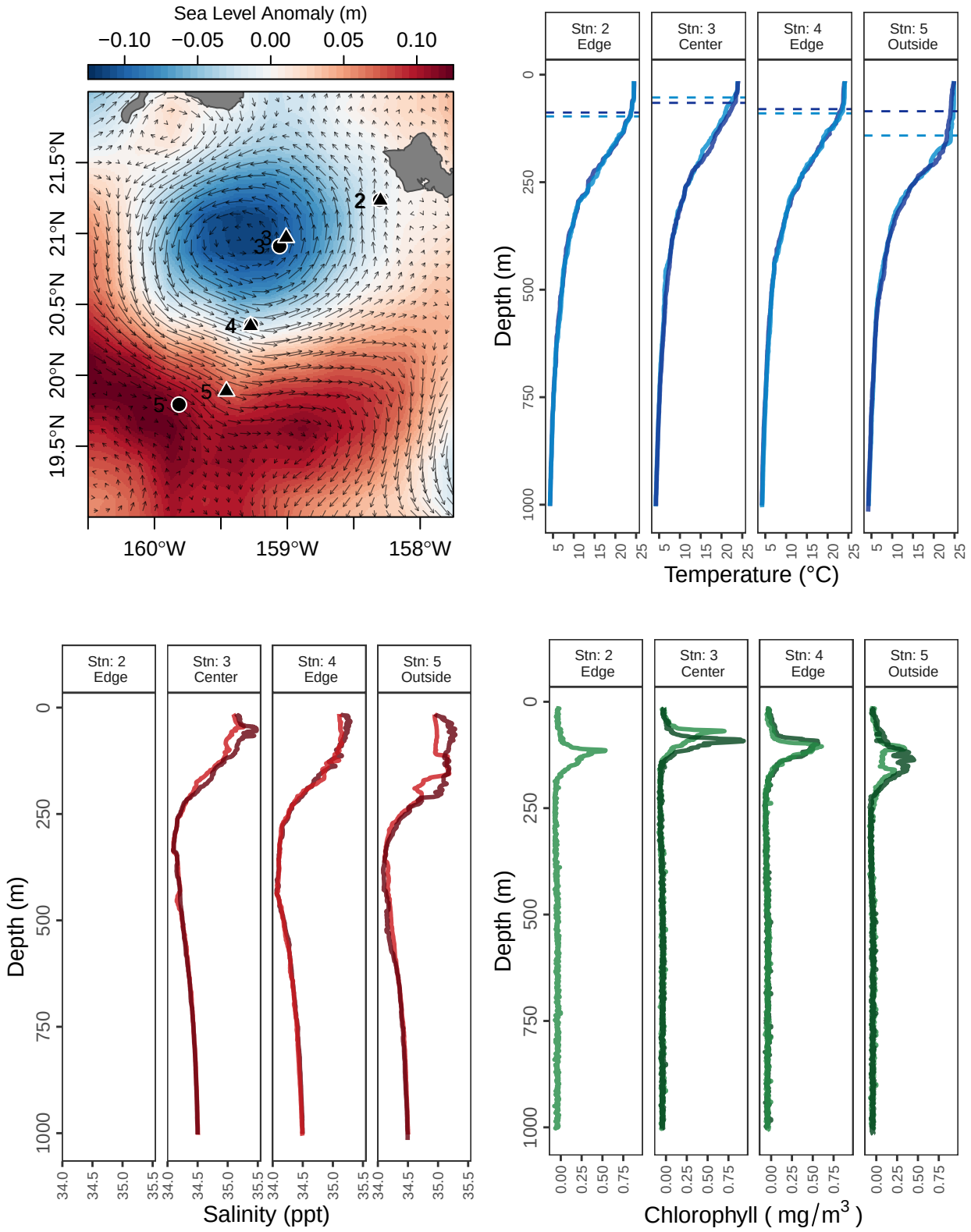

Figure 2: Cyclonic eddy 1 station locations and CTD data. A is a map of sampling locations and shading is sea level anomaly with geostrophic currents plotted as arrows for 24 March 2024. CTD depth profiles for (B) temperature, (C) salinity, and (D) chlorophyll. Light lines are daytime sampling and dark lines are night time sampling. Dashed horizontal lines mark the bottom of the mixed layer.

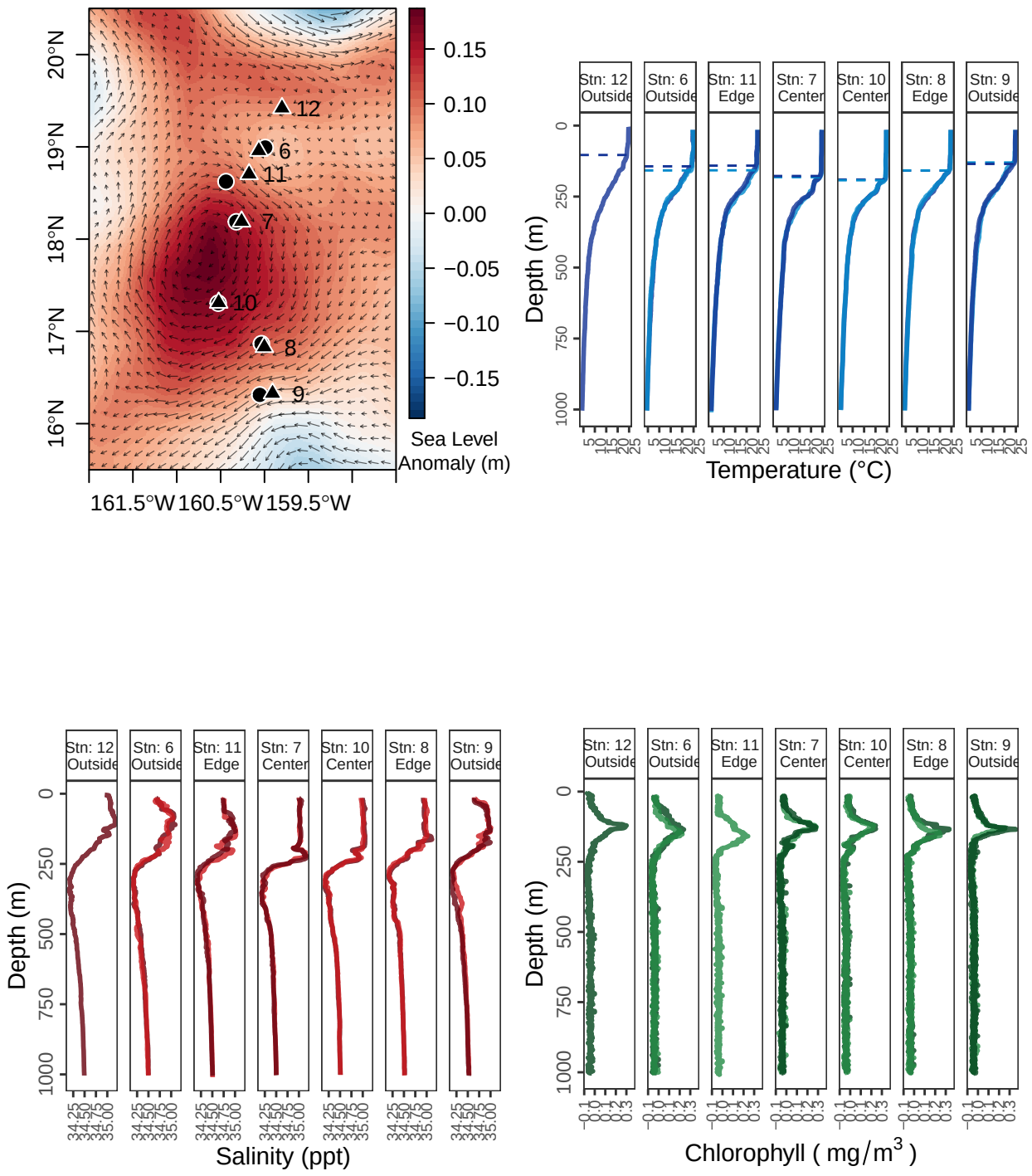

Figure 3: Anticyclonic eddy station locations and CTD data. A is a map of sampling locations and shading is sea level anomaly with geostrophic currents plotted as arrows for 3 April 2024. CTD depth profiles for (B) temperature, (C) salinity, and (D) chlorophyll. Light lines are daytime sampling and dark lines are night time sampling. Dashed horizontal lines mark the bottom of the mixed layer.

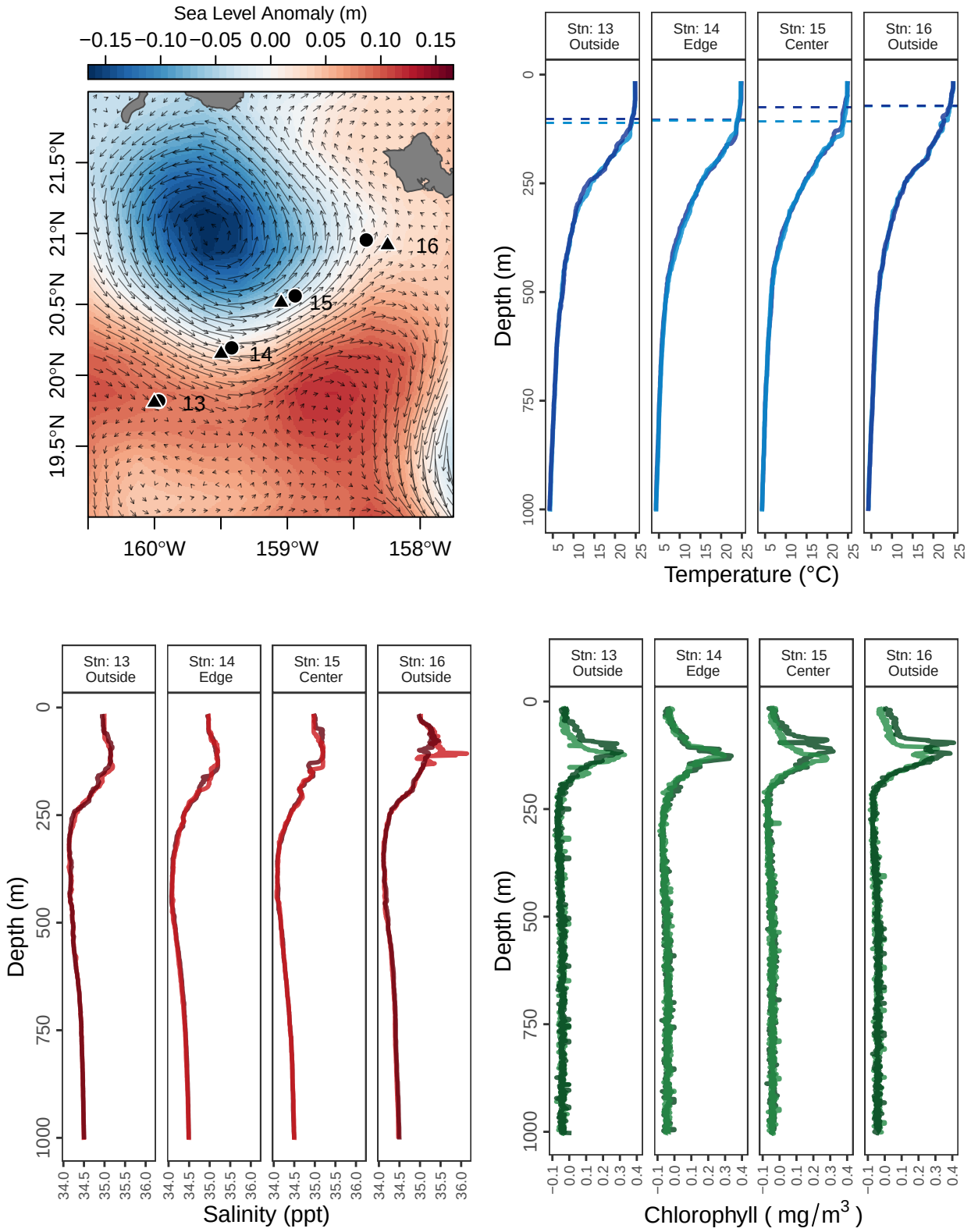

Figure 4: Cyclonic eddy 2 station locations and CTD data. A is a map of sampling locations and shading is sea level anomaly with geostrophic currents plotted as arrows for 10 April 2024. CTD depth profiles for (B) temperature, (C) salinity, and (D) chlorophyll. Light lines are daytime sampling and dark lines are night time sampling. Dashed horizontal lines mark the bottom of the mixed layer.

Submitted by: _____

Johanna L. K. Wren, Ph.D.
Chief Scientist

Approved by: LITTNAN.CHARLES.LOUIS.1100552074 Digitally signed by LITTNAN.CHARLES.LOUIS.1100552074 Date: 2024.09.10 10:56:26 -10'00' _____

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