HOT 338: Chief Scientist Report
Chief Scientist: Fernando Carvalho Pacheco
R/V *Kilo Moana*
July 29th- August 2nd, 2022

Cruise ID: KM 22-08
Vessel: R/V *Kilo Moana*, University of Hawaii
Master of the Vessel: Captain Andrew Chen
Chief Scientist: Fernando Carvalho Pacheco, University of Hawaii
Marine Technicians: Jeff Koch(lead), Nick Mathews

1.0 COVID-19 PREVENTION

Due to the current COVID-19 pandemic, extra precautions were set in place before and during the cruise to prevent the spread of COVID-19 onboard. UNOLS has provided guidelines that were followed on this cruise. A few of the guidelines are found below. The extensive list can be found in the Pandemic Response Plan.

- All science party was vaccinated.
- All cruise participants self-isolated according to the HOT Risk Mitigation Plan before the cruise.
- All cruise participants were Antigen tested for COVID.
- All ancillary participants were PCR tested for COVID.

SCIENTIFIC OBJECTIVES

The cruise objective was to maintain hydrographic and biogeochemical data collection at the Hawaii Ocean Time-series (HOT) stations.

A copy of the detailed cruise plan is available at:
https://hahana.soest.hawaii.edu/hot/crsplan/HOT_338_Operation_Cruise_plan.pdf

Science operations were planned for 4 stations, in the following order:

1) Station 1, referred to as Station Kahe, is located at 21° 20.6'N, 158° 16.4'W.
2) Station 2, referred to as Station ALOHA, is defined as a circle with a 6 nautical mile radius centered at 22° 45'N, 158°W.
3) Station 52, the site of WHOTS-18 Mooring (anchor position 22° 40.021'N, 157° 57.078'W), will be occupied for about 3-4 hours on Aug 1st.
4) Station 6, referred to as Station Kaena, is located off Kaena Point at 21° 50.8'N, 158° 21.8'W, and the station will be occupied on August 1st for about 2 hours.

3.0. SCIENCE PERSONNEL

Participant	Title	Affiliation	Citizenship
Alexandra MacFarland	Graduate Student	BU	USA
Ally Morris	Graduate Student	UH	USA
Blake Watkins	Marine Engineer	UH	USA
Brandon Brenes	Research Associate	UH	USA
Camille Adkison	Graduate Student	UH	USA

Carolina Funkey	Research Associate	UH	USA
Dan Sadler	Research Associate	UH	USA
Eric Shimabukuro	Graduate Student	UH/SCOPE	USA
Fernando Pacheco - Chief Scientist	Research Associate	UH	BRA
Fernando Santiago-Mandujano	Research Associate	UH	USA
James Harris III	Undergraduate student	UH	USA
Jeff Koch	Marine Technician	OTG	USA
Max Gatlin	Undergraduate student	UH	USA
Nicholas Hawco	Scientist	UH	USA
Nick Mathews	Marine Technician	OTG	USA
Ryan Tabata	Research Associate	UH/SCOPE	USA
Sarah Trubovitz	Post Doc	UCS	USA/CA
Syrena Whitner	Graduate Student	UH	USA

4.0. GENERAL SUMMARY

The trace metal van was loaded on July 27th. Equipment loading was conducted on July 28th. The departure was on July 29th at 0820 (HST). At Station Kahe, the Hawboldt LARS passed the prescribed operational checks and weight cast. One weight cast, one Hyperpro cast (5 yoyos to 20m + 2 yoyos to 180m), one CTD cast to 1000 m, one trace metal cast, and a Net Tow (Sarah T.) were conducted.

Upon arrival at Station ALOHA, the WireWalker and the sediment trap arrays were deployed about 3 and 2 miles west , respectively, of the center of the station. A CTD cast was conducted to collect water for the primary productivity array, and subsequently, the primary productivity array was deployed. A minor 14C-spill happened on the back deck during primary productivity array preparation/deployment. The spill was contained following the appropriate measures, see the Appendix below for more information. One trace metal cast, one Plankton Camera, one CTD cast, and one Hyperpro cast were conducted. CTD operations were interrupted after we lost communication with the instrument during S2C4 cast. The CTD wire was re-terminated and CTD operations continued. See Sect. 6.0 for more information. Two of the CTD casts (OPEN + PSi) were combined into one, so we could get back on the schedule. The PP array was recovered without any problems. The Wirewalker and the Sediment Traps array drifted towards the W-SW. The Gas Array was deployed about 4 miles west of the center.

At Station ALOHA, two near-bottom CTD casts, eleven 1000 m CTD casts, one 200m downcast, and one 400m downcast CTD casts were completed, with the 36-hour burst sampling CTD schedule completed with only 3-4 hours interruption after cast 4. One 5-cycle yoyo CTD cast to 200 m was completed near the WHOTS mooring (Station 52) and one near bottom CTD cast was completed at Station Kaena (Station 6).

Five net tows for the core HOT zooplankton collection were completed, two during the day and three during the night. Nine net tows for Sarah Trubovitz were completed, seven during the day and two during the night. Three total casts were conducted with the Trace Metal CTD using the W2 winch. Two Scripps Plankton Camera were deployed.

The 300 kHz and the 38 kHz ADCPs, underway fluorometer, transmissometer, thermosalinograph and the ship's meteorological suite ran without interruption during the cruise.

Winds were 15-22 kts from the E-NE, and swell was 3-6 ft. ADCP top 100-200m currents were 0.5-0.8 kts to the SW. The arrays moved to the west-southwest and the longer-term arrays were recovered about 28 miles from the center of St. ALOHA. The Gas Array line got stuck on the port rudder for a few minutes during recovery, but the line was untangled. The Sediment Trap array was recovered without any problem. The Wirewalker drifted away from KM without any hook on the line, but the Captain was able to hold position, and Blake managed to grab the surface buoy from the stern.

5.0. R/V *Kilo Moana* OFFICERS AND CREW, TECHNICAL SUPPORT

The R/V *Kilo Moana* maintained good ship support for our work. Technical support during this cruise was also good. OTG personnel were available to assist in our work during the cruise. Captain Andrew Chen did an excellent job during array recoveries.

6.0. DAILY REPORT OF ACTIVITIES (HST)

Thursday July 28, 2022
0900-1700: Mobilization/loading

Friday July 29, 2022
0820: Depart from Pier 35
0900: Safety Meeting + Array (Deployment and Recovery Meeting)
1003: Fire and Abandon ship drills + OTG Tour to science crew to review safety equipment
1100: Arrive @ Station Kahe
1110-1159: LARS TESTING + Weight cast to 500 m with 1200 lb weight
1205-1245: Hyperpro Cast (5 yoyos to 20m + 2 yoyos to 180m)
1255-1414: Kahe Station CTD Cast (S1C1)
1439-1511: Sara's Net Tow (2x @surface)
1519-1534: Trace metal cast
1540: Transit to ALOHA Station
2355: Arrived at ALOHA Station

Saturday July 30, 2022
0021: Deployed Wirewalker, 22 44.9401'N , 158 3.3179'W
0108: Deployed Sediment Traps Array, 22 44.0005'N, 158 2.1625
0154-0305: S2C1 1000m CTD cast
0413-0519: Deployed Primary Productivity Array, 22 44.9890'N, 158 01.099'W. ~0433: Minor 14C-spill when one of the samples fell on the back deck of the KM (See Appendix).
0540: S2C2 Near bottom CTD cast
0724: at 10m off the bottom 22 45.0777'N, 158 00.0293'W.
0924: End S2C2
1009-1040: Trace Metal Cast 2
1102-1133: Scripps Plankton Camera 1
1140-1301: S2C3 1000m CTD cast

1319-1356: Hyperpro Cast
1416: S2C4 1000m CTD cast. We lost communication with the CTD during the downcast around 0034 at about 400dbar. The group decided to recover the package for further inspection.
1520: Transit to pump ship's tanks. Jeff reconnected the electrical termination and the CTD passed some on deck tests.
1633: S2C5 1000m repeating PC/PC cast. The CTD failed again at about 190dbar downcast at around 1650. CTD was recovered for another inspection. After some discussion, OTG Jeff decided to check the electrical termination and he found two wires that were not properly isolated. Jeff re-made the electrical termination and the CTD was deployed after recovering PP Array.
1931-1956: PP array recovered, 22 44.2576 'N, 158 7.4551'W.
2020-2140: S2C6 1000m CTD BEACH CAST
2202-2232: Plankton Net Tow (Blake)
2236-2305: Plankton Net Tow (Blake)
2325-0020: S2C7 CTD Cast to 1000m (Open + PSI)

Sunday July 31, 2022

0040-0052: Plankton Net Tow (Sarah)
0158-0259: S2C8 CTD Cast to 1000m (Gas array)
0408-0431: Gas array deployment: 22 44.2807'N 158 03.8571
0453-0557: S2C9 CTD Cast to 1000m (Open)
0614: Transit to pump ship's tanks
0738-0754: Plankton Net Tow (Sarah)
0801-0912: S2C10 CTD Cast to 1000m (PCPN)
0934-1045: Plankton Net Tow (Sarah)
1100-1211: S2C11 CTD Cast to 1000m (PPO4)
1237-1345: Plankton Net Tow (Blake)
1350-1454: S2C12 CTD Cast to 1000m (ATP)
1511-1522: Plankton Net Tow (Sarah)
1701-1806: S2C13 CTD Cast to 1000m (Open)
1825: Transit to pump ship's tanks
1916-1946: Trace metal cast
2007-2111: S2C14 CTD cast to 1000 m (HPLC)
2150-2219: Sarah's Net Tow
2235-2259: Net Tow (Blake)
2305: Transit to the center of Station ALOHA

Monday - August 01, 2022
2348-0303: S2C15 CTD cast to 4790 dbar at 22 44.996'N, 158 0.0128 'W
0319-0500: Optics Cast at 22 45.0256'N 158 00.0302'W
0507: Transit to Gas Array (~13 miles W-SW from the ALOHA center)
0707-0746: Recovered Gas Array at 22 40.0285'N 158 16.6178'W
0748: Transit to Sediment Traps (~11 miles NW from GA and ~27miles W from the ALOHA center)
0908-0930: Recovered Sediment Traps at 22 42.6267'N 158 29.1312'W
0935: Transit to Wire Walker (~0.5 miles away from ST)
0957-1013: Recovered Wire Walker 22 42.5536'N 158 30.0320'W
1016: Transit to WHOTS-18 buoy, Station 52 (~29 miles away)

1256-1335: Hyperpro cast (~1 mile inside the circle)
1340: Transit to Station 52
1412-1512: S52C1, yoyo cast near the WHOTS buoy
1520-1529: Plankton Camera 2
1531-1537: Sarah's Net Tow
1611: Ended operations at Station ALOHA. Transit to Kaena Station
2059-2256: S6C1, Kaena near-bottom CTD Cast
2325: Depart for Pier 35

Tuesday August 2, 2022
0730 – Arrive Pier 35, begin offload

HOT program sub-components:

Investigator	Project	Institution
Angelicque White	Core Biogeochemistry	UH
Dave Karl	SCOPE-biogeochemistry	UH
John Dore	Biogeochemistry QA/QC	MSU
James Potemra	Hydrography	UH
Mike Landry	Zooplankton dynamics	SIO
Ricardo Letelier	Optical measurements	OSU

Ancillary programs:

Matt Church	Diversity and activities of nitrogen-fixing microorganisms	UM/FLBS
Ed DeLong	SCOPE: DNA and Viral DNA collection	UH
Andrew Dickson	CO_2 dynamics and intercalibration	SIO
Paul Quay	$DI^{13}C$	UW
Dan Repeta	SCOPE: DOM collection	WHOI
Angelicque White	SCOPE: C-STAR, UVP, IFCB	UH
Nicholas Hawco Eleanor Bates	Quantifying Iron Turnover in the Upper Ocean via Time-series Measurements at Station ALOHA	UH
Sonya Dyhrman	Physiological ecology of diatom diazotroph associations using metatranscriptome samples.	LDEO
Debbie Lindell	Seasonal Virus Sampling	Technion
Sarah Trubovitz	Integrating genetic-morphologic concepts of diversity in Radiolaria	USC
Jennifer Beatty	In-situ imaging of mesozooplankton in the open ocean.	USC
Alexandra MacFarland	Characterization of Reactive Nitrogen in the North Pacific Atmosphere	BU

Tira Lin	Tracking the ocean circulation in the tropical and subtropical Pacific Ocean with anthropogenic 236U coupled with 234U dating technique	TU

Appendix: A minor 14C-spill happened on the back deck during primary productivity array preparation/deployment on July 30.

The double nylon rings that attach the incubation bottles to the rack was not crimped properly and the 500 mL bottle from set #5 (75 m) filled with seawater and spiked with 14C-bicabornate fell onto the deck and broke while the array was being loaded. Approximately 100ml of the spiked seawater was spilled on the aft deck along with the broken bottle, the rest of the volume fell overboard. This water volume would have contained ~8μCi of 14C- bicarbonate. The team onboard followed the correct procedures to clean the area. From the RAD safely manual: People were warned in the work area of the spill, NoCount® Radioactive Decontaminant Spray Foam was sprayed over the areas (1 x1.5 meters) and covered up with absorbent pads. The pads and all other material used for the cleanup were disposed on the rad waste in the rad van (~0626). The group was also advised to rinse the area with some 10% hydrochloric acid for 5 min followed by sodium bicarbonate, which was then sprayed off the deck with water. The area was covered until the ship returns to port on August 2, 2022. Swipe tests were collected of the contaminated area and the results confirmed that the deck is rad-free. The Captain and the Marine Center were notified about the spill.