HOT 348: Chief Scientist Report

Chief Scientist: Fernando Carvalho Pacheco

R/V *Kilo Moana*

December 26 – 31, 2023

Cruise ID: KM 23-22
Vessel: R/V *Kilo Moana*, University of Hawaii
Master of the Vessel: Captain Christopher Amorant
Chief Scientist: Fernando Carvalho Pacheco, University of Hawaii at Manoa
Marine Technicians: Lance Frymire (Lead), Ben Duncan

1.0 COVID-19 PREVENTION

Extra precautions were set in place before the cruise to prevent the spread of COVID-19 onboard. UNOLS has provided guidelines and some were followed on this cruise.

- All science party was vaccinated.
- All cruise participants were antigen-tested for COVID-19.

2.0 SCIENTIFIC OBJECTIVES

The cruise objective was to maintain a 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_348_Draft_Cruise_plan.pdf

Science operations were planned for four stations in the following order:

1) Station 1, referred to as Station Kahe, is at 21° 20.6'N, 158° 16.4'W.
2) Station 2, called Station ALOHA, is a circle with a six nautical mile radius centered at 22° 45'N, 158°W.
3) Station 50, the site of WHOTS-19 Mooring (anchor position 22° 46.002'N, 157° 53.958'W).
4) Station 6, referred to as Station Kaena, is located off Kaena Point at 21° 50.8'N, 158° 21.8'W.

3.0. SCIENCE PERSONNEL

Participant	Title	Affiliation	Citizenship
Edoardo Sena	Undergraduate	UH	USA
Klara Sobotikova	Graduate Student	HPU	CZE
Logan North	Undergraduate	UH	USA
Alexandrya Robinson	Undergraduate	UH	USA
Nerissa Fisher	Post-Doc	UH	USA
Andrew Hirzel	Post-Doc	UH	USA
Karin Björkman	Scientist	UH	SWE
Brandon Brenes	Graduate Student	UH	USA
Dan Fitzgerald	Research Associate	UH	USA
Carolina Funkey	Research Associate	UH	USA
Fernando Carvalho Pacheco	Chief Scientist	UH	BRA
Dan Sadler	Research Associate	UH	USA
Merritt Shepherd	Research Assistant	UH	USA
Blake Watkins	Marine Engineer	UH	USA
Ben Duncan	OTG	UH	USA
Lance Frymire	OTG	UH	USA

4.0. GENERAL SUMMARY

The loading of equipment was completed on December 22 (Vans and baskets) and 26 , and the cruise set sail at 1210 PM (HST). At Station Kahe, the Hawboldt LARS system successfully underwent operational checks and completed a weight cast. Before heading to Station ALOHA, we also conducted a weight cast and a CTD cast.

Upon reaching Station ALOHA, we deployed the sediment trap (ST) array approximately three nautical miles west of the station's center. In addition, a 1000-meter CTD cast was performed for primary productivity (PP), with the PP array deployment being set up around two nautical miles west of the center. This array drifted about four nautical miles west-northwest and was retrieved at dusk on December 27. The gas array (GA) was deployed around one nautical mile southwest of the center at dawn on December 29. Drifting seven nautical miles west-northwest, it was recovered the following day, December 30, before dawn. The ST array drifted twenty nautical miles northwest and was also retrieved on December 30. While at Station ALOHA, we conducted two near-bottom CTD casts and thirteen 1000-meter CTD casts. The 36-hour continuous CTD sampling proceeded without interruptions. We successfully collected all rosette samples for the core Hawaii Ocean Time-series (HOT) and related projects, including those for B. Brenes and N. Hawco, and D. Lindell (Sections 7-8).

Seven Video Plankton Recorder (VPR) casts and two HyperPro casts were successfully performed at Station ALOHA. Additionally, six net tows for the core HOT zooplankton collection were completed: three during daylight hours and three at night.

Near the WHOTS mooring (Station 50), we completed a 5-cycle yoyo CTD cast down to 200 meters, and at Station Kaena (Station 6), a near-bottom CTD cast was conducted.

The 300 kHz and 38 kHz Acoustic Doppler Current Profilers (ADCPs), underway fluorometer, transmissometer, thermosalinograph, and the ship's meteorological suite operated continuously throughout the cruise.

Regarding weather conditions, at Kahe, wind speeds were 7-10 knots from the north, increasing to 16-20 knots from the northeast on December 28 at Station ALOHA before easing down to 10-15 knots from the east-southeast on December 29, and reaching 15-17 knots from the east on December 30. Swell heights ranged from 10-17 feet from the northwest. Despite these conditions, all arrays were retrieved successfully. From December 28 to 29, the ADCP recorded top currents of 0.2-0.3 knots towards the northwest, and on December 30, the current was at 0.3 knots towards the southwest.

Throughout the cruise, we observed a recurring issue with the CTD rosette being pulled upward during downcasts, mirroring a problem previously encountered during HOT-347. This phenomenon appeared to be linked to ship heave, raising concerns about the functionality of the Hawboldt heave compensation system. Furthermore, we experienced unanticipated winch vibrations during CTD recoveries and deployments, indicating potential issues for investigation. Furthermore, a malfunction occurred with one of the water makers, leading to the immediate need for temporary water conservation measures lasting several hours. This situation also resulted in the contamination of all supply lines with saltwater, leaving us without access to potable water for a few hours.

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 excellent. OTG personnel were available to assist in our work during the cruise. Captain Christopher Amorant did a fantastic job during array recoveries despite the 10-17-ft swells.

6.0. DAILY REPORT OF ACTIVITIES (HST)

December 26, 2023

1210	Departed UH Marine Center at Pier 35
1246	Safety briefing + Abandon ship drills
1500	Arrived at Station Kahe
1513-1651	Hawboldt crane/winch testing and weight cast to 500m (21°20.5852'N, 158°16.3486'W)
1615-1729	S1C1 CTD cast to 1020db
1735	Begin transit to St. ALOHA

December 27, 2023

0123	Inside Station ALOHA
0152	Arrived 3nm west from the Aloha Center
0206-0224	Deployed Sediment Trap array (22 44.9819N, 158 03.3160W)
0253-0401	S2C1 1000m CTD cast
0500-0523	Deployed Primary Production(22 45.0537N, 158 02.1927W)
0603-0900	VPR Tow 1 (3h)
0905	Transit to Pump Tanks
1122-1145	Net tow 1
1202-1246	Hyperpro
1316-1615	VPR Tow 2 (3h)
1620	Transit to Pump Tanks
1803-1823	Recovered PP array, 22 46.2067N, 158 03.4'946W. (3.7 nm wnw from the center)
1830	Transit to SE of ALOHA for VPR 3
1928- 2150	VPR Tow 3 (2h)
2205-2258	Net Tow 2 & 3
2300	Transit to SE of ALOHA for VPR 4
2340	VPR Tow 4 (3h)

December 28, 2023

0254	End of VPR Tow 4
0300	Transit to pump tanks
0445	S2C2 near-bottom CTD cast (PO-1 deep)
0634	At 10 m off the bottom (4805 dbar)
0836	End of the Deep cast (22 44.9983N, 157 59.9698W)
1038-1231	S2C3, CTD cast to 1000 m (PO shallow)
1245	Transit to pump tanks
1417-1541	S2C4, CTD cast to 1000 m (PPO4)
1647-1752	S2C5, CTD cast to 1000 m (PCPN)
1800	Transit to ~2nm W of the ALOHA center
2003-2126	S2C6, CTD cast to 1000 m (BEACH)
2249-2349	S2C7, CTD cast to 1000 m (Open)

December 29, 2023

0000	Transit to pump tanks
0148-0259	S2C8, CTD cast to 1000 m (Gas Array)
0400-0422	Deployed Gas Array (22 44.8056N, 158 00.9366W)
0449-0543	S2C9, CTD cast to 1000 m (Open)
0600	Transit to pump tanks
0755-0900	S2C10, CTD cast to 1000 m (Psi)
0917-1045	VPR Tow 5 (2h)
1051-1151	S2C11, CTD cast to 1000 m (Open)
1205-1233	Net Tow 4
1238-1303	Net Tow 5
1356-1456	S2C12, CTD cast to 1000 m (ATP)
1517-1637	VPR Tow 6 (2h)
1648-1754	S2C13, CTD cast to 1000 m (Open)
1800	Transit to pump tanks
1959-2111	S2C14, CTD cast to 1000 m (HPLC)
2201-2223	Net Tow 6
2251	S2C15 near-bottom CTD cast (PO-2 deep)

December 30, 2023

0032	At 10 m off the bottom (4805 dbar, payout= 4945, 22 44.9895N, 157 59.9890W)
0245	End of the Deep cast (22 44.9842N, 157 59.9881W)
0430-0504	Gas-array recovery (22 46.3370’ N, 158 07.1603’ W) about 7nm W-NW from center.
0507	Transit to Sediment Trap Array (~13 nm NW)
0640-0720	Sediment trap recovery (22 56.3689N, 158 18.7866W) about 20nm NW from center
0725	Transit to Transit to WHOTS (~23nm)
1038-1140	S50C1 CTD yo-yo to 200 m. 5 yoyo completed
1200-1245	Hyperpro cast
1303-1500	VPR Tow 7 (2h)
1520	Transit to Station Kaena
2030	Arrived at Station Kaena
2040	S6C1, near-bottom CTD cast
2138	At 15 m off the bottom (2455 dbar, 21 50.7483N, 158 21.6641W)
2237	End of the Deep cast (22 44.9842N, 157 59.9881W)
2300	Transit to Pier 35

December 31, 2023

0836	Arrive at Pier 35

HOT program sub-components:

Investigator	Project	Institution
Angelicque White	Core Biogeochemistry	UH
Dave Karl	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
Andrew Dickson	CO_2 dynamics and intercalibration	SIO
Paul Quay	$DI^{13}C$	UW
Angelicque White	UVP	UH
Nicholas Hawco	Quantifying Iron Turnover in the Upper Ocean via Time-series Measurements at Station ALOHA	UH
Debbie Lindell	Seasonal Virus Sampling	Technion
Andrew Hirzel	Video Plankton Recorder	UH
Brendon Brenes	Water collection for FCM analysis	UH