HOT 344: Chief Scientist Report
Chief Scientist: Fernando Carvalho Pacheco
R/V *Kilo Moana*
September 15th- September 19th, 2023

Cruise ID: KM 22-14
Vessel: R/V *Kilo Moana*, University of Hawaii
Master of the Vessel: Christopher Amorant
Chief Scientist: Fernando Carvalho Pacheco, University of Hawaii at Manoa
Marine Technicians: Trevor Young (lead), Ben Duncan

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 participants were vaccinated.
- All cruise participants self-isolated according to the HOT Risk Mitigation Plan before the cruise.
- All cruise participants were antigen-tested for COVID-19.

2.0. 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_344_Cruise_plan_operational.pdf

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

1) Station 1, referred to as Station Kahe, is located at 21° 20.6'N, 158° 16.4'W and will be occupied on September 15 for about 3-4 hours.
2) Station 2, referred to as Station ALOHA, is a circle with a six-nautical mile radius centered at 22° 45'N, 158°W. This is the main HOT station and will be occupied from September 16 – September 18.
3) Station 50, the site of WHOTS-19 Mooring (anchor position 22° 46.002'N, 157° 53.958'W), will be occupied for about 3-4 hours on September 18th.
4) Station 6, referred to as Station Kaena, is located off Kaena Point at 21° 50.8'N, 158° 21.8'W, and will be occupied on September 18 for about 2 hours.

3.0. SCIENCE PERSONNEL

Participant	Title	Affiliation	Citizenship
Grieg Steward	Scientist	UH	USA
Julie Thomy	Post-Doc	UH	FRA
Kelsey McBeain	Technician	UH	USA

Catherine Crowley	Graduate Student	U of Connecticut	USA
Raquel Flynn	Graduate Student	UNC	ZAF
Meredit Meyer	Graduate Student	UNC	USA
Huei-Ting Lin (Tina)	Associate Professor	NTU	TWN
Yu-Chen Yen (Karen)	Research specialist	NTU	TWN
Josephine Dianne Deauna	Graduate Student	UH	PHL
Chloe Obara	Graduate Assistant	UH	USA
Reece James	Graduate Student	UH	USA
Natalie Summers	Undergrad Student	UH	USA
Eleanor Bates	Graduate Student	UH	USA
Angelicque White	Scientist	UH	USA
Carolina Funkey	Research Associate	UH	USA
Karin Björkman	Research Specialist	UH	SWE
Brandon Brenes	Graduate Student	UH	USA
Fernando Carvalho Pacheco	Research Associate	UH	BRA
Dan Fitzgerald	Research Associate	UH	USA
Merritt Shepherd	Graduate Student	UH	USA
Tully Rohrer	Research Associate	UH	USA
Blake Watkins	Marine Engineer	UH	USA
Ben Duncan	OTG	UH	USA
Trevor Young	OTG	UH	USA

4.0. GENERAL SUMMARY

Equipment loading occurred on September 14, and departure occurred on September 15 at 0833 (HST). At Station Kahe, the Hawboldt LARS passed the prescribed operational checks and weight cast. The activities at this station included one weight cast and one Hyperpro cast (5yoyo-20m; 180m; ~140m). Regrettably, data issues arose during both Hyperpro deep casts, due to the spliced cable. Following these operations, we conducted one CTD cast to a depth of 1000 meters and one trace metal cast. Upon arriving at Station ALOHA, we deployed the Sediment Trap (ST) array approximately two nautical miles west of the center of ALOHA Station. Additionally, we carried out a 200m CTD cast for Granger's group, followed by a 1000m CTD cast for primary productivity (PP). The PP array deployment proceeded without any complications. Subsequently, the 36-hour CTD burst sampling commenced after a near-bottom CTD cast. We also executed a trace metal cast, three additional CTD casts, and a net tow. Unfortunately, the Hyperpro cast on the second day was canceled due to data glitches displayed on September 15. The PP array was successfully recovered on September 16 without encountering any problems. The Gas Array (GA) was deployed approximately one nautical mile west of the center at Station ALOHA. The GA and ST were recovered on September 18. During our time at station ALOHA, we completed two near-bottom CTD casts, thirteen 1000m CTD casts, and two 200m casts. The 36-hour burst sampling CTD schedule proceeded without interruptions. All rosette samples for the core HOT and ancillary projects, including those for J. Granger, A. White, Huei-Ting Lin, and G. Steward (Sect. 7-8), were collected as planned.

One 5-cycle yoyo CTD cast to 200 m was completed near the WHOTS mooring (Station 50), and one near bottom CTD cast was completed at Station Kaena (Station 6).

Six net tows for the core HOT zooplankton collection were completed, three during the day and three at night. Four total casts were conducted with the Trace Metal CTD. Three VPR tows were conducted at Station ALOHA.

The 300 kHz and the 38 kHz ADCPs, underway fluorometer, transmissometer, thermosalinograph, and the ship's meteorological suite ran without interruption during the cruise. OTG installed new pumps for the underway system on September 16, 2023.

Winds were 14-25 knots from the E-NE, and swell was 3-7 ft. ADCP top 100m currents were 0.5-0.9 knots to the SW. The arrays moved to the southwest and were recovered about 9 nm (GA) and 19 nm (ST) from the center of St. ALOHA. All arrays were retrieved without problems.

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 Christopher Amorant did an excellent job during array recoveries.

6.0. DAILY REPORT OF ACTIVITIES (HST)

Thursday September 14, 2023
0900-1700: Mobilization/loading

Friday, September 15, 2023
0833 - Departed UH Marine Center at Pier 35
0900 - Safety and Science Briefing followed by fire and abandon ship drills
1130 - Arrived Station Kahe
1154-1220 - Hawbolt crane/winch testing and weight cast to 200m (21 20.6301'N,158 16.4264'W)
1228-1307 - Hyperpro cast (5yoyo-20m; 180m; ~140m). Encountered data issues on both deep casts, due to the spliced cable.
1316-1422 - S1C1 CTD cast to 750db. Accidentally fired the first bottle (niskin #1) around 586db during the downcast, resulting in a decision to continue only to 750db instead of the 1020 db to prevent bottle damage. TR and RJ are troubleshooted the non-functional UVP.
1445-1500 - Trace metal cast (all bottles fired).
1505 - Transit to Station ALOHA
2325: Arrived 2NM west of the center of Station ALOHA
2340-0003: Sediment Trap Deployment 2023 22° 45.008'N, 158° 02.195' W

Saturday, September 16, 2023
0042-0112: S2C1, CTD cast to 200 m (JG-1)
0210-0307: S2C2, CTD cast to 1000 m (PP-cast)
0444-0439: Primary Production Deployment (22° 44.9751'N, 158° 01.0337' W)
0510: Begin S2C3 near-bottom CTD cast (PO-1 deep)
0701: At 5 m off the bottom, 22°45.0150'N, 158° 0.009'W
0900: End of Deep Cast.
0925-0948: Trace Metal Cast

1104-1231: S2C4, CTD cast to 1000 m (PO shallow)
1255-1326: Net tow
1330-1356: Hyperpro (Canceled due to glitches on the data, due to the spliced cable).
1418-1523: S2C5, CTD cast to 1000 m (PC/PN)
1530: Transit to Pump Tanks
1650-1812: S2C6, CTD cast to 1000m (PPO4)
1840-1900: Recovered PP array, 22° 41.245'N, 158° 3.268'W. (4.7 nm southwest of the center)
1957-2118: S2C7, CTD cast to 1000 m (BEACH Cast)
2125: Transit to 2nm west of the center.
2212-2236: Net Tow
2240-2309: Net Tow
2323-0018: S2C8, CTD cast to 1000m (Open JG-2)

Sunday, September 17, 2023
0032-0135: VPR tow 1
0156-0255: S2C9, CTD cast to 1000m (Gas Array cast)
0412: Started Gas Array deployment (1nm west of the center)
0434: Deployed Gas Array, 22° 45.0033'N, 158° 01.0228' W
0454-0554: S2C10, CTD cast to 1000m (Open cast - JG-3/SFC)
0603: Transit to pump ship's tank
0757-0901: S2C11, CTD cast to 1000m (PSi cast)
0920-0947: Trace metal cast (EB-3)
1052-1151: S2C12, CTD cast to 1000m (Open cast - JG-4)
1206-1231: Net Tow
1235-1301: Net Tow
1350-1454: S2C13, CTD cast to 1000m (ATP cast)
1505-1615: VPR tow 2
1700-1753: S2C14, CTD cast to 1000m (Open cast- JG-5)
1812-1830: Trace Metal cast (EB)
1956-2105: S2C15, CTD cast to 1000m (HPLC)
2200-2230: Net Tow
2301: Begin S2C16 near-bottom CTD cast (PO-2 Deep)

Sunday, September 18, 2023
0042: At 4m off the bottom, 22°45.004'N, 158° 0.006'W
0232: End of S2C16 (PO-2 Deep)
0350: Transit to Gas Array (~8.5nm SW from the center)
0555-0630: Recovered Gas Array at 22°38.0255'N 158°06.7126'W
0632: Transit to Sediment Traps (~19nm SW from the center)
0743-0805: Recovered Sediment Traps at 22°29.2306'N 158°13.0362'W
0810: Transit to WHOTS-19 (S50C1 ~21 miles away) and stopped 1nm inside the circle for a 200m ctd cast before WHOTS-19(S50C1) cast.
1002-1037: S2C17, CTD cast to 200m (Open)
1045: Transit to WHOTS-19 (S50C1)
1243-1348: S50C1, yo-yo cast near the WHOTS buoy (1/4nm downwind/downcurrent).
1403-1448: VPR tow 3
1450: Ended operations at Station ALOHA. Transit to Kaena Station
2034-2238: S6C1, Kaena near-bottom CTD Cast

2245: Depart for Pier 35

Sunday, September 19, 2023
0800 – Arrive at Pier 35, begin offload

HOT program sub-components:

Investigator	Project	Institution
Angelicque White	Core 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	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
Grieg Steward	Giant viruses in the open ocean: Is large-size adaptive where cells are scarce?	UH
Huei-Ting Lin	Tracking the ocean circulation in the tropical and subtropical Pacific Ocean with anthropogenic 236U, and 14C dating and precise 234U/238U determinations	NTU
Julie Granger Catherine Crowley	Collaborative Research: Evaluating the contribution of small eukaryotes to nitrate-based new production in the North Pacific Subtropical Gyre	University of Connecticut