

HOT 346: Chief Scientist Report

Chief Scientist: Dan Sadler

R/V Kilo Moana

November 4 – 8, 2023

Cruise ID: KM 23-17

Vessel: *R/V Kilo Moana*, University of Hawaii

Master of the Vessel: Captain David C. Martin

Chief Scientist: Dan Sadler, University of Hawaii

Marine Technicians: Trevor Young, Benjamin 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 which 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.
- All cruise participants were Antigen tested for COVID.
- All ancillary participants were PCR tested for COVID.

2.0 SCIENTIFIC OBJECTIVES

The cruise objective was to maintain a collection of hydrographic and biogeochemical data 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_346_Cruise_plan_Operational_Revised_11022023.pdf

Science operations were planned for 3 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 50, the site of WHOTS-19 Mooring (anchor position 22° 46.002'N, 157° 53.958'W).

3.0. SCIENCE PERSONNEL

Participant	Title	Affiliation	Citizenship
Hunter Adams	MATE intern	TAMU	USA
Kurt Castro	Graduate Student	MIT	USA
Mattia Da Fieno	Undergrad Student	UH	USA
Skye Davis	Undergrad Student	UH	USA
Dan Fitzgerald	Research Associate	UH	USA
Carolina Funkey	Research Associate	UH	USA
Tatiana Gamez	Research Technician	UH	USA
Andrew Hirzel	Post-doc	UH	USA
Kelsey Maloney	Research Associate	UH	USA
Fernando Carvalho Pacheco	Research Associate	UH	BRA
Dan Sadler	Chief Scientist	UH	USA
Merritt Shepherd	Graduate Student	UH	USA
Eric Shimabukuro	Research Associate	UH	USA
Tully Rohrer	Research Associate	UH	USA
Logan Tegler	Post-doc	UH	USA
Olivia Turner	Undergrad Student	UH	USA
Marlon Velasco	Undergrad Student	UH	USA
Blake Watkins	Marine Engineer	UH	USA
Jenn Willson	MATE intern	UW	USA
Dine Yoo	Undergrad Student	UH	KOR
Ben Duncan	OTG	UH	USA
Trevor Young	OTG	UH	USA

4.0. GENERAL SUMMARY

Equipment loading was conducted on November 3rd, and the cruise departed on November 4th at 0801 (HST). At Station Kahe, the Hawboldt LARS system passed the prescribed operational checks and weight cast. A Hyperpro cast, near bottom CTD cast and Trace Metal rosette cast were completed before proceeding to Station ALOHA.

On arrival at Station ALOHA, the sediment traps were deployed 2 nm SW of station center, as the currents were expected to carry them towards the NW. Consulting with the captain, we decided to postpone the Primary Production experiment until later in the cruise due to expected bad weather. 30-40 knot winds were forecast during the sunset recovery period as a front passed through Station ALOHA. The gas array deployment was cancelled due to the weather. High winds and a large swell produced ship motions that were unsafe for deployment from the open stern. The captain put all over the side work on Weather Hold and closed all outside decks from 0300 – 1300 on November 6th. The ship's dynamic positioning (DP) system wasn't able to hold station under the demanding conditions.

CTD operations resumed after the bridge managed to maintain correct ship orientation for operations without the use of DP. This required slow progress ahead at 0.5 to 1.5 knots to keep the proper wire angle. Winds began to ease overnight on November 6th and the primary production array was rescheduled and completed on November 7th.

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The floating arrays were recovered about 6 miles west of Station ALOHA. Given the sustained strong winds, we were surprised they remained close to the station.

To make up for lost time due to weather, 2 CTD casts were cancelled but all samples were re-distributed to other casts. The second deep cast was cancelled to allow time for the primary production experiment.

At Station ALOHA, one near bottom CTD casts, and eleven 1000 m CTD casts. A Yo-Yo CTD cast, comprising four cycles down to 200 dbar and one cycle extending to 1020 dbar was completed near the WHOTS mooring (Station 50).

Four net tows for the core HOT zooplankton collection were completed: two during the day and two at night.

Hyperpro operations were conducted at Station ALOHA during the primary production experiment and next to the WHOTS mooring. Each operation consisted of 2 deep casts to 185 m, and a 5 cycle Yo-Yo cast to 20 m.

Four trace-metal cast were completed.

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

Winds during the cruise reached 30-40 knots from the east as the weather front passed Station ALOHA, producing local seas of 10-12 feet.

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

The R/V *Kilo Moana* continues to be our favorite ship for HOT cruises. The efforts by the UH Marine Center to staff and retain an experienced crew really paid off on this cruise. Having folks familiar with our work generates a lot of confidence operating under challenging conditions. It was key that the captain and mates figured out how to handle the ship out of DP during CTD casts, which speaks to their seamanship. We would have lost another 24 hours of science with a less experienced crew.

Technical support during this cruise was also very good. OTG personnel were available to assist in our work during the cruise. They were flexible and accommodating. Special thanks to Trevor for repairing our VPR battery charger which allowed completion of the VPR work.

6.0. DAILY REPORT OF ACTIVITIES (HST)

November 4, 2023

0801 Departed Pier 35
 0833 Safety briefing
 0900-0937 Weight cast
 1200-1222 Hyperpro casts
 1229-1325 S1C1 CTD cast to 50m off bottom testing altimeter
 1400-1440 Trace metal cast
 1450 Begin transit to St. ALOHA
 2234 Arrived at Station ALOHA
 2255-2322 Deployed sediment trap array at 22° 45.2725'N, 158° 02.3593'W
 2347 Begin S2C1 1000m CTD cast

November 5, 2023

0101 End S2C1
 0116-0419 VPR cast
 0454-0839 S2C2 PO1 Near Bottom CTD cast
 0912-0940 Traced Metal Cast
 1056-1232 S2C3 PO2 1000m CTD cast
 1259-1321 Net Tow
 1325-1359 Hyperpro Cast
 1402-1510 S2C4 PC/PN CTD cast to 1000m
 1521 Transit to pump tanks
 1648 Begin S2C5 PPO4 CTD cast to 1000m
 1756 End of S2C5
 1944-2109 S2C6 BEACH CTD Cast to 1000m
 2202-2258 Net tow x 2
 2311- 0015 S2C7 CTD cast to 1000m

November 6, 2023

0029-0157 VPR cast
 0210-0315 S2C8 Gas Array CTD cast to 1000m
 0320 Transit to gas array deployment site
 0432 Operations suspended due to heavy weather
 1300-1409 S2C9 P*Si* 1000m CTD cast
 1425-1650 VPR cast
 1749-1856 S2C10 ATP CTD cast to 1000m
 1928-1951 Trace Metal cast
 2005 Transit to pump tanks
 2207-2324 S2C11 HPLC CTD cast to 1000m

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0154-0256 S2C12 Primary Production CTD cast to 1000m
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0415 Deployed PP array at 22° 43.8594'N, 158° 05.2112'W
 0420 Pump Tanks
 0523-0835 VPR cast
 0852-1112 VPR cast
 1135-1214 Trace metal cast
 1223 Hyperpro cast
 1305 Net tow
 1330 Transit to WHOTS
 1415-1548 S50C1 WHOTS CTD cast to 1000m
 1615 Transit to sediment traps
 1726-1752 Recovered sediment traps at 22° 42.2484'N, 158° 09.6354'W
 1800 Transit to PP array
 1837-1854 PP array recovered at 22° 43.2109'N, 158° 06.2732'W
 1902 Transit to VPR starting position
 1927-2148 VPR cast
 2203 Transit to Honolulu Pier 35

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1001 Arrive Pier 35

HOT program sub-components:

Investigator	Project	Institution
Angelique 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

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Andrew Dickson	CO ₂ dynamics and intercalibration	SIO
Paul Quay	DI ¹³ C	UW
Angelicque White	SCOPE: C-STAR, UVP, IFCB	UH
Nicholas Hawco Logan Tegler Tatiana Gamez	Quantifying Iron Turnover in the Upper Ocean via Time-series Measurements at Station ALOHA	UH
Allison Coe Kurt Castro	Prochlorococcus ecotype diversity in the mesopelagic	MIT
Debbie Lindell	Seasonal Virus Sampling	Technion
Andrew Hirzel	Video Plankton Recorder	UH
Chris Sabine	Water for carbon system quality assurance	UH
Donn Viviani	Water for UH lab course	UH