

HOT-349: Chief Scientist Report

Chief Scientist: Tully Rohrer

R/V *Kilo Moana*

April 1 – 5, 2024

Cruise ID: KM 24-02

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

Master of the Vessel: Captain Eric Pomeroy

Chief Scientist: Tully Rohrer, University of Hawaii at Manoa

Marine Technicians: Lance Frymire (Lead), James Harris

1.0 COVID-19 PREVENTION

Extra precautions were set in place before the cruise to prevent the spread of COVID-19 onboard, as per UNOLS guidelines.

- All of the science party were vaccinated.
- All cruise participants were antigen-tested for COVID-19 on loading day.

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_349_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
Karin Björkman	Research Specialist	UH	SWE
Brandon Brenes	Graduate Student	UH	USA
Mattia Da Fieno	Research Assistant	UH	USA
Paige Dillen	Graduate Student	UH	USA
Dan Fitzgerald	Research Associate	UH	USA
Zakariya Hasan	Undergraduate Student	UH	CAN
Sean Valencia Monte	Undergraduate Student	UH	USA
Fernando Carvalho Pacheco	Research Associate	UH	BRA
Alexandrya Robinson	Undergraduate Student	UH	USA
Tully Rohrer	Chief Scientist	UH	USA
Dan Sadler	Research Associate	UH	USA
Merritt Shepherd	Research Assistant	UH	USA
Mackenzie Thielmann	Undergraduate Student	UH	USA
Emily Josefina Velasquez	Undergraduate Student	UH	USA
Blake Watkins	Marine Engineer	UH	USA
Angelicque White	Scientist	UH	USA
Lance Frymire	OTG	UH	USA
James Harris	OTG	UH	USA

4.0. GENERAL SUMMARY

Due to the Good Friday holiday, loading took place on Thursday, March 28th. All baskets, instruments, hand-carry gear, and the Seamac winch were loaded on board the ship. A vendor was not able to procure some paint/anti-skid materials to finish the Kilo Moana's 01 deck in time for loading, so the work was completed over the weekend. Crane picks to the 01 deck were left for Monday morning and departure was pushed from 0900 to 1030 to accommodate.

All science personnel were aboard by 0900 on Monday, April 1st. As the 1030 departure slot approached, it became clear that the loading of the 01 deck would not be complete in time. The Captain rescheduled the departure with Aloha Tower, but the next departure slot was not until 1300. Soon after 1300, the ship dropped its mooring lines, but Aloha Tower requested that the ship hold for harbor traffic. HOT-349 eventually got underway at 1352.

Given that the Captain and many of the crew had never seen the HOT science program at sea, we elected to continue with all of the standard operations at Station Kahe even though that would mean arriving to Station ALOHA too late for the Primary Productivity array CTD cast. At Station Kahe, the weight test cast was performed, followed by a Hyperpro cast and a 1000m CTD cast. The Hyperpro was performed too late for useful data but was deemed valuable for testing a new cable and training graduate student Paige Dillen on the instrument's operation. We departed for Station ALOHA at 2000.

Upon reaching Station ALOHA at 0330 on April 2nd, we opted not to deploy the sediment trap array. As anticipated, weather conditions consisted of 9 ft seas and 26 kt winds already with the forecast showing building swell and winds by the planned recovery day on Thursday. The delayed departure made deployment of the Primary Productivity array logistically impossible, but it's also likely that even HOT-349 Chief Scientist report

had we made it to Station ALOHA on time, we would have cancelled its deployment due to the seas (forecast to be rougher by the planned recovery time around 1830 that day).

We were able to continue with CTD operations as scheduled, and successfully collected almost all rosette samples for the core Hawaii Ocean Time-series (HOT) and related projects, including those for B. Brenes, P. Dillen, and D. Lindell. S2C7 would have been the Gas Array cast, but was modified to an open cast because the array deployment was cancelled. In addition, as S2C7 was in the air for deployment, the ship's dynamic positioning system lost its ability to hold station. The rosette was returned to deck and after troubleshooting, the cast was performed successfully albeit on a ~35 minute delay. S2C14 (PO-2 deep cast) became a 1000m cast due to the sea conditions and the risk of exceeding the safe working load of the wire during snap loading when the package was near bottom (safe working limit = 5000 lbs).

Despite these operational modifications, it's important to note that it would not have been possible to work in this sea state without the Hawboldt winch/crane system. Tagging a rosette without a docking head system would have been risky to personnel, and a winch system without a quality heave compensation system would have likely exceeded the working limit of the wire even on 1000m casts. We saw maximum tension spikes to 4700 lbs, and the heave compensation system indicated at times that it was moving the winch as fast as it could to keep up with the ship's pitch. Thus, both experience and equipment suggest that HOT-349 was the maximum sea state for workable CTD conditions.

Four Video Plankton Recorder (VPR) casts and one HyperPro cast were successfully performed at Station ALOHA. Additionally, three net tows for the core HOT zooplankton collection were completed: two during daylight hours and one at night. We did not perform the WHOTS mooring Hyperpro, and B. Watkins dropped a total of three planned net tows due to the rough seas.

Near the WHOTS mooring (Station 50), we completed a 5-cycle yoyo CTD cast down to 200 meters, stopping at 25m on the ascent to reduce snap-loading of the wire in the near-surface depths.

At Station Kaena (Station 6), the typical near-bottom CTD cast was modified to a 1000m cast like the PO-2 deep cast.

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. During the maintenance period prior to the cruise, the filter trap on the intake port of the uncontaminated seawater system broke off and was not replaced. Despite this, no issues with clogging or debris were noted.

At Station Kahe, wind speeds were 16 knots from the east. At Station ALOHA, April 2nd was 25 knots from the east, increasing that evening to range from 26-31 kts for the remainder of the cruise, with gusts as high as 34. Swell heights ranged from 8 to 13 feet from the north. Station ALOHA currents were 0.8-1.2 knots towards the northwest.

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 excellent. OTG personnel were available to assist in our work during the cruise and were in near constant communication with HOT watch leaders about operational conditions. Captain Eric Pomeroy was eager to learn about the program and generous with his time and communication, and we look forward to many more successful HOT cruises in the future.

6.0. DAILY REPORT OF ACTIVITIES (HST)

April 1, 2024

09:00 All science personnel aboard
 10:30 Original departure time passed, ship's work not complete. Rescheduled for 13:00
 13:00 Mooring lines cast off, Aloha Tower requests ship hold position for harbor traffic
 13:52 Departed Pier 35
 14:45 Fire/Abandon ship drills
 16:34 Arrive Station Kahe
 17:01-17:45 Begin Weight Cast and Hawboldt safety test
 17:57-18:25 Hyperpro casts (training for Paige Dillen/cable testing)
 18:42-19:55 S1C1, Kahe Cast
 20:00 Depart for Station ALOHA

April 2, 2024

03:30 Arrive ALOHA Circle
 04:32 Begin S2C1, PO Deep Cast
 06:25 Reached cast deepest point, 10 m off bottom
 08:31 End S2C1
 10:48-12:07 S2C2, PO Shallow Cast
 12:24-13:11 Net Tows (2)
 13:20-14:04 Hyperpro
 14:13 Begin S2C3, PCPN Cast
 14:33 Rain on Station
 15:21 End S2C3
 15:28 Transit to pump tanks
 16:57-18:05 S2C4, PPO4 Cast
 19:58-21:16 S2C5, BEACH Cast
 22:11-22:31 Net Tow (1)
 22:58-23:57 S2C6, Open Cast, B. Brenes

April 3, 2024

00:20 Begin VPR Tow #1
 01:03 Rain on station
 01:35 End VPR Tow
 01:55 Begin S2C7, Open Cast
 01:58 CTD deployment aborted due to ship losing dynamic positioning control
 02:38-03:24 Redeploy S2C7, Open Cast
 04:53-05:56 S2C8, Open Cast, MC DNA/PO Secondary Standard
 06:10 Transit to pump tanks
 08:05-09:13 S2C9, PSi Cast
 10:46-11:49 S2C10, Open Cast, D. Lindell/P. Dillen
 14:02-14:55 S2C11, ATP Cast
 16:58-17:51 S2C12, Open Cast
 18:00 Transit to pump tanks
 19:59 Begin S2C13, HPLC Cast
 20:56 Rain on station
 21:02 End S2C13

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22:59-23:51 S2C14, Open Cast (1000m only, near-bottom portion cancelled due to conditions)

April 4, 2024

00:08-03:07 VPR Tow #2

03:15 Transit to pump tanks, then to WHOTS Mooring

06:00 WHOTS maneuvering/handling tests

08:12-09:07 S50C1, WHOTS Mooring Yo-Yo Cast (5 profiles between 25 and 200m)

09:59-13:12 VPR Tow #3

13:24-14:20 VPR Tow #4

14:26 Transit to Station Kaena

20:42-21:38 S6C1, Kaena Cast (1000m only, near-bottom portion cancelled due to conditions)

April 5, 2024

08:34 Arrive at Pier 35

HOT program sub-components:

Investigator	Project	Institution
Angelique 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
Angelique White	UVP	UH
Debbie Lindell	Seasonal Virus Sampling	Technion
Andrew Hirzel	Video Plankton Recorder	UH
Brandon Brenes	Water collection for FCM analysis	UH
Paige Dillen	A-DOM Samples	UH