HOT 345: Chief Scientist Report

Chief Scientist: Karin Björkman
R/V *Kilo Moana*
October 7th-11th, 2023

Cruise ID: KM 22-16
Vessel: R/V *Kilo Moana*, University of Hawaii
Master of the Vessel: David C. Martin
Chief Scientist: Karin Björkman, 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_345_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 to be occupied on October 7 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 October 8–11.
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 October 10th.
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 October 10th for about 2 hours.

3.0. SCIENCE PERSONNEL

Participant	Title	Affiliation	Citizenship
Katherine Ackerman	Graduate student	UH	USA
Hunter Adams	MATE intern	TAMU	USA

Karin Björkman	Chief Scientist	UH	SWE
Jia Cashon	Undergrad Student	UH	USA
Dan Fitzgerald	Research Associate	UH	USA
Carolina Funkey	Research Associate	UH	USA
Nicole Mathews	Undergrad Student	UH	USA
Matthew Miller	Undergrad Student	UH	USA
Sarah Nance	Undergrad Student	UH	USA
Fernando Carvalho Pacheco	Research Associate	UH	BRA
Dan Sadler	Research Associate	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
Ella Wake	Undergrad Student	UH	NZL
Blake Watkins	Marine Engineer	UH	USA
Jenn Willson	MATE intern	UW	USA
Ben Duncan	OTG	UH	USA
Trevor Young	OTG	UH	USA

4.0. GENERAL SUMMARY

Loading of gear occurred on Friday October 6th, with departure on Saturday October 7th at 0933 (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 two Hyperpro casts (5 yoyo-20m; 180m; ~140m, intercomparison of two different instrument). Following these operations, we conducted one CTD cast to a depth of 1000 meters and one trace metal (TM) cast before transiting to Station ALOHA.

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 1000 m CTD cast for primary productivity (PP). The PP array deployment proceeded without any complications. This was followed by a near-bottom CTD cast. During the recovery of this cast a hydraulic hose broke on the Hawboldt crane system. Operations were transferred to the 0.681 wire to continue CTD work through the A-frame. The transfer took ~ 6 hours to complete before the next cast could begin at ~1500. During the ~0900-1500 time frame a TM-cast, Hyperpro cast and one net tow were conducted. Due to time constraints the next operation was the recovery of the PP array. Prior to this recovery, to allowed free motion of the A-frame, pay out some of the 0.681 wire was required. During this procedure slack in the wire occurred, creating loose wraps on the winch drum to the extent that this wire could no longer be used for the remainder of the cruise. After the successful recovery of the PP-array, replacement of the hydraulic hose to repair the Hawboldt crane commenced and was completed in ~ 2.5 hours. A reworked schedule started with two net tows followed by a CTD cast at 2330, using the repaired Hawboldt system. The Gas Array (GA) was deployed approximately two nautical mile west of the center at Station ALOHA and recovered ~ a day later, followed by the sediment trap recovery. Deployments and recoveries went without problems.

During our time at Station ALOHA, we completed two near-bottom CTD casts and 10 1000 m CTD casts. Due to the ship's equipment failures we had to cancel three CTD casts and were unable to complete the 36-hour CTD burst sampling. However, all core HOT and ancillary projects CTD samples were collected. In addition, six net tows for the core HOT zooplankton collection were completed, three during

the day and three at night. Three total casts were conducted with the Trace Metal CTD and three VPR tows were conducted at Station ALOHA.

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).

Aerosol sampling was conducted at Station ALOHA by two atmospheric scientists from the Department of Atmospheric Sciences at the University of Hawaii at Mānoa utilized a fishing rod and 3D printed instrumentation known as mini-GNIs (https://github.com/nugentlab/miniGNI, https://doi.org/10.1175/JTECH-D-20-0197.1) to sample giant sea salt aerosol size distributions approximately 15 meters above the ocean surface. These samples were taken every 6 hours, with an additional intensive sampling day where samples were collected every 3 hours.

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 8-18 knots from the E-ENE, and swell was 2-6 ft. 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 provided excellent support for our work during the cruise. Captain David Martin did an excellent job during array recoveries.

6.0. DAILY REPORT OF ACTIVITIES (HST)

Friday October 6, 2023
0900-1700: Loading

Saturday 7, 2023
0927 Depart Pier 35
1000-1100 Safety briefing and drills
1219 Arrive Station Kahe
1228-1248 weight cast
1252-1314 HyperPro cast 1 (5 yo-yo, 1 deep profile)
1320-1334 HyperPro cast 2
1343-1400 S1C1
1425-1538 TM-cast 1
1545 Transit to Station ALOHA

Sunday October 8, 2023
0003-0032 Sediment trap deployment
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0152-0255	S2C1 PP-cast
0404-0429	PP-array deployment
0505-0849	S2C2 PO-Deep: Hydraulic line on Hawboldt crane breaks during recovery of cast. Operations switching to using 0.681 wire through the A-frame. DF performs both electrical and mechanical terminations. SeaMac winch moved to accommodate CTD-package to be rolled into the staging bay.
1045-1110	Trace metal cast TM-2
1307-1340	Hyperpro cast
1347-1415	Net tow
1500-1648	S2C3 PO-shallow (not performed at center of circle)
1655	Transit to pump tanks
1800	During an operation to pay out extra wire on the 0.681 winch, slack wire occurred on the drum causing it to unspool, creating a wuzzle rendering this winch unusable.
1842-1856	PP-array recovery
~1900	Repairs of Hawboldt hydraulic hose starts.
~2130	Successfully completed.
2145	DF switched system back to Hawboldt system.
2209-2305	Net tows
2329	Begin S2C4 BEACH

Monday October 9, 2023

2329-0057	S2C4 BEACH cast
0203-0307	S2C5 Gas-array
0412-0436	Gas-array deployment
0505-0616	S2C6 PSi cast
0620	Transit to pump tanks
0835-0952	S2C7 PC/PN cast (delayed from 0700 schedule -due to pump run)
1055-1210	S2C8 PPO4 cast
1220-1322	Net tows (2)
1349-1452	S2C9 ATP cast
1502-1640	VPR cast-1
1653-1745	S2C10 open cast
1808-1835	TM-cast-3
1836	Transit to pump tanks
2003-2117	S2C11 HPLC cast
2200-2226	Net tow
2230	Transit to center of ALOHA circle
2302	S2C12 Begin PO-Deep-2 cast

Tuesday October 10, 2023

2302-0218	S2C12 PO-deep 2 cast
0232-0337	VPR cast-2
0345	Transit to Gas-array
0448-0515	Gas-array recovery (22˚ 36.9061’ N, 158˚ 04.9338’ W)
0517	Transit to sediment trap array
0546-0615	Sediment trap recovery (22˚ 33.2034’ N, 158˚ 07.9486’ W)
0616	Transit to WHOTS

0853-0952 Yo-yo cast at WHOTS
1004-1050 VPR cast-3
1159-1243 Hyperpro casts
1245 Transit to Station Kaena
1903-2107 S6C1 Kaena

Wednesday October 11, 2023
0800-0900 Arrive at Pier 35, starboard to, offload TM-van
1000 Tied up port to. 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 Logan Tegler	Quantifying Iron Turnover in the Upper Ocean via Time-series Measurements at Station ALOHA	UH
Debbie Lindell	Seasonal Virus Sampling	Technion
Kathrine Ackerman	sea salt aerosol size distributions and diel patterns	UH