HOT 328: Chief Scientist Report
Chief Scientist: Fernando Santiago-Mandujano
R/V *Kilo Moana*
March 22 - 26, 2021

Cruise ID: KM 21-03
Vessel: R/V *Kilo Moana*, University of Hawaii
Master of the Vessel: Captain David Martin
Chief Scientist: Fernando Santiago-Mandujano, University of Hawaii
Marine Technicians: Trevor Young, Lance Frymire

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.

- Sailed with a minimum science party, one scientist per stateroom, with the exception of two people (working on opposite 12-hour watches) sharing one room
- All cruise participants self-isolated according to the HOT Risk Mitigation Plan before the cruise (March 6th –21st).
- All cruise participants were tested for COVID-19 twice before the cruise (March 6th and 19th).

During the cruise all participants:

- wore face masks
- maintained a distance of 6 ft. when possible
- properly disinfected of all workspaces often
- remained in their staterooms as much as possible during non-work hours

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_328_KM_Cruise_Plan.pdf

Science operations were planned for 4 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 52, the site of WHOTS-16 Mooring (anchor position 22° 40.01'N 157° 56.96'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
Eleanor Bates	Graduate Student	UH	USA
Karin Bjorkman	Scientist	UH	Sweden
Brandon Brenes	Research Assistant	UH	USA
Tim Burrell	Research Associate	UH/SCOPE	NZL
Dan Fitzgerald	Research Associate	UH	USA
Lance Frymire	Marine Technician	OTG	USA
Yuriy Mosiyenko	Engineer	Hawboldt	Ukraine
Fernando Pacheco	Research Associate	UH	Brazil
Tully Rohrer	Research Associate	UH/SCOPE	USA
Dan Sadler	Research Associate	UH	USA
Fernando Santiago-Mandujano	Research Associate	UH	USA
Eric Shimabukuro	Graduate Student	UH	USA
Ryan Tabata	Research Associate	UH/SCOPE	USA
Peter Visser	Engineer	Hawboldt	Canada
Blake Watkins	Marine Engineer	UH	USA
Trevor Young	Marine Technician	OTG	USA

4.0. GENERAL SUMMARY

Before the cruise, two engineers from Hawboldt (P. Visser, Y. Mosiyenko) came from Canada to work on the CTD crane/winch system to finish the implementation of the crane/rosette docking system, and to solve some issues with the system.

Equipment loading was conducted on March 21st, and the cruise started on March 22nd at 09:00 (HST). At Station Kahe, in addition to the 1000 m CTD cast, one 300 m cast was conducted to test the Hawboldt system. After conducting all other scheduled operations at Station Kahe the ship proceeded to Station ALOHA.

Upon arrival at Station ALOHA, the floating sediment traps, and WireWalker were deployed west of the station's center. A CTD cast was conducted to collect water for the primary productivity array, and subsequently the primary productivity array was deployed. The gas array experiment was deployed on March 24th as scheduled, and recovered on March 25th. All floating arrays were recovered successfully.

At Station ALOHA, one near-bottom CTD cast, and eleven 1000 m CTD casts were completed. One 3-cycle yoyo CTD cast to 350 m was completed near the WHOTS mooring (Station 52).

CTD operations were interrupted after S2C9 on March 24th at about 0915 after the CTD wire parted near the termination while recovering the rosette. The rosette fell when the base of the package was about 1.5 -2 m above the deck, damaging the frame, various bottles and some of the instruments, nobody got hurt. Apparently problems in the Hawboldt system communications caused the winch to overreact during recovery, pulling the cable while the rosette was in the docking head breaking the cable. A full report from the Hawboldt engineers is pending. The extent of the CTD/Rosette damage is being assessed.

The OTG rosette and bottles, our backup CTD and sensors, and the 0.681 winch and wire were used to continue CTD operations. Three CTD casts during the 36 hour burst period were missed while the backup CTD/Rosette package was being assembled. The second deep cast was cancelled, and the sampling was modified to acquire the required samples. The Station Kaena cast was cancelled to allow time for the Hawboldt engineers to conduct tests with the system using the 1000 lb weight after implementing safety features to the system. A deep cast (> 4000 m) was conducted near Station Kaena using the weight. Additional tests were conducted on the pier using the OTG rosette and the bottles full of water after unloading all the cruise equipment.

Six net tows for the core HOT zooplankton collection were completed successfully; three during the day and three during the night.

Three casts were conducted with the Trace Metals CTD using the W2 winch.

Hyperpro operations were conducted once at Station Kahe and twice at Station ALOHA, on March 23rd and 25th respectively.

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

The VPR (Video Plankton Recorder from Tracy Villareal) was deployed twice, on March 24th at night and during the day.

The weather was favorable during the cruise, with 8-12 kt winds and flat seas. The arrays did not drift significantly, all of them stayed within the ALOHA circle.

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

The R/V *Kilo Moana* continues to maintain very good ship support for our work. The LARS system worked well before the 3/24 incident. The implementation of the docking head allowed for "hands-free" deployments and recoveries.

Captain David Martin and the ship's crew showed flexibility, concern, and dedication to our scientific mission.

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.

6.0. DAILY REPORT OF ACTIVITIES (HST)

March 21, 2021

0900 - Began equipment loading
1100 – Safety briefing by the Captain

March 22, 2021

0836 - Depart from Pier 35
0901-0928 - Fire and Abandon ship drills
1125 - Arrived at Kahe Station
1140-1236 - Weight cast to 900 m with 1000 lb weight.
1242-1311 - Hyperpro cast
1337-1406 - S1C1 CTD cast to 300 m to test the Hawboldt system
1420-1533 - S1C2 CTD cast to 1000 m
1555-1608 - Trace metal cast. The trace metal winch W2 which was used
1615 - Transit to ALOHA Station.

March 23, 2021

0031- Arrived at Station ALOHA.
0037-0048 - Wirewalker deployed: 22 48.0341'N, 158 2.9544'W
0115-0139 - Sediment traps deployed: 22 48.9622'N, 158 2.9425'W
0203-0322 - S2C1 1000 m CTD cast
0502 - Heavy rain
0520-0542 - Deployed Primary Productivity array, 22 44.9184'N, 158 1.8466'W. Deployment delayed due to problems with the Seamac winch
0621 - Begin S2C2 Near bottom cast
0659 - Stopped several times to solve level winding problem
0854 - At 12 m off the bottom, 22 45.1039'N, 158 0.4504'W
1044 - End of cast
1131-1156 - Trace metal cast 2
1225-1253 - Net tow
1312-1344 - Hyperpro cast
1401-1515 - S2C3 1000 m CTD cast
1525 - Transit to pump ship's tanks
1703-1820 - S2C4 1000 m CTD cast
1854-1911 - PP array recovered, 22 42.7192'N, 158 3.2565'W
2005-2124 - S2C5 CTD cast to 1000 m
2157-2229 - Plankton Net tow
2232-2259 - Plankton Net tow
2307 - Start S2C6 CTD cast to 1000 m.

March 24, 2021

0004 - End of cast
Heavy rain

0050 - Start VPR deployment: 22 41.7413'N, 158 1.908'W
0141 - End VPR tow-yo: 22 40.6942'N, 158 1.3984'W
0156-0258 - S2C7 CTD cast to 1000 m
0416-0444 - Gas array deployment: 22 46.6188'N, 158 4.454'W
0458-0621 - S2C8 CTD cast to 1000 m
0634 - Transit to pump ship's tanks
0801-0917 - S2C9 CTD cast to 1000 m. CTD winch wire snapped during recovery. CTD landed on deck from 1.5-2 m height
1334-1400 - Trace metal cast #3
1410 - Start VPR tow-yo cast: 22 47.9997'N, 158 2.7255'W
1708 - End of VPR tow-yo: 22 44.6584'N, 158 5.9216'W
1840 - Transit to pump ship's tanks
2007-2124 - S2C10 CTD cast to 1000 m
2203-2235 - Plankton net tow
2255- - Start S2C11 CTD cast to 1000 m

March 25, 2021

0023 - End of cast
0153-0343 - S2C12 CTD cast to 1000 m
0400-0544 - Optics cast
0546 - Transit to recover gas array
0625-0645 - Recovered gas array 22 42.4864'N, 158 5.7697'W
0650 - Transit to recover sediment traps
0708-0726 - Recovered sediment traps: 22 41.2534'N, 158 6.4069'W
0728 - Transit to recover Wirewalker
0740-0759 - Recovered Wirewalker: 22 40.8421'N, 158 8.3679'W
0801 - Transit to WHOTS buoy
1015-1045 - Plankton net tow
1051-1121 - Plankton net tow
1154-1225 - Hyperpro cast
1305-1425 - S52C1, yo-yo cast near the WHOTS buoy
1430 - Ended operations at Station ALOHA. Start Hawboldt system testing in transit to Station Kaena

March 26, 2021

0940 - Arrive Pier 35, first line. Partial equipment unloading
1300-1430 - Hawboldt tests conducted on the pier using the OTG rosette and bottles full of water

HOT program sub-components:

Investigator	**Project**	**Institution**
Angelicque 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
Andrew Dickson	CO_2 dynamics and intercalibration	SIO
Paul Quay	$DI^{13}C$	UW
Dan Repeta	SCOPE: DOM collection	WHOI
Angelicque White	SCOPE: C-STAR, UVP, IRS Traps, AA3	UH
John Zehr	Samples for unicellular cyanobacterium	UCSC
Sonya Dyhrman	Physiological ecology of diatom diazotroph associations using metatranscriptome samples.	LDEO
Nicholas Hawco Eleanor Bates	Quantifying Iron Turnover in the Upper Ocean via Time-series Measurements at Station ALOHA	UH
Andres Salazar Sara Ferron	Water Collection for Mass Spectrometer Standard	UH
Tracy Villareal	Transparent exopolymer and phytoplankton vertical migration as sources for preformed nitrate anomalies in the subtropical N. Pacific Ocean	U of Texas at Austin