HOT 324: Chief Scientist Report
Chief Scientist: Fernando Santiago-Mandujano
R/V *Kilo Moana*
November 17 - 21, 2020

Cruise ID: KM 20-13
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, Jeffrey Koch

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.
- All cruise participants self-isolated according to the HOT Risk Mitigation Plan before the cruise (October 27th – November 16th).
- All cruise participants were tested for COVID-19 twice before the cruise (October 27th and November 10th).

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_324_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
Brandon Brenes	Research Assistant	UH	USA
Tim Burrell	Research Associate	UH/SCOPE	NZL
Dan Fitzgerald	Research Associate	UH	USA
Carolina Funkey	Research Associate	UH	USA
Nicholas Hawko	Scientist	UH	USA
Lucie Knor	Research Assistant	UH	GER
Jeffrey Koch	Marine Technician	OTG	USA
Fernando Pacheco	Research Associate	UH	BRA
Dan Sadler	Research Associate	UH	USA
Fernando Santiago-Mandujano -Chief Scientist	Research Associate	UH	USA
Eric Shimabukuro	Graduate Student	UH	USA
Ryan Tabata	Research Associate	UH/SCOPE	USA
Blake Watkins	Marine Engineer	UH	USA
Trevor Young	Marine Technician	OTG	USA

4.0. GENERAL SUMMARY

Equipment loading was conducted on November 16th, and the cruise started on November 17th at 09:00 (HST). After conducting operations at Station Kahe the ship proceeded to Station ALOHA.

Upon arrival at Station ALOHA, a CTD cast was conducted to collect water for the primary productivity array. The primary productivity array, floating sediment traps, IRSC sediment traps, and WireWalker were deployed just south of the station center, as there was a strong 0.5 knot northward current in the upper 80 m. Given the strong winds forecasted on the day scheduled for the arrays recoveries (November 21st), we decided to recover them earlier on November 20th. All arrays drifted NNEward nearly 33 nm from Station ALOHA, they were in the water for at least 48 hours. The IRSC traps malfunctioned and did not collect any samples. The gas array experiment scheduled to be deployed on November 20th was rescheduled for November 19th and recovered on November 20th.

At Station ALOHA, two near bottom CTD casts, and fourteen 1000 m CTD casts were completed. The 36-hour CTD burst period was interrupted for the recovery of the drifting arrays on November 20th, two of the CTD casts scheduled during this period were not conducted. One 5-cycle yoyo CTD cast to 200 m was completed near the WHOTS mooring (Station 52). The near-bottom CTD cast scheduled at Station Kaena (Station 6) for November 21st was not conducted because the CTD wire got caught in one of the ship's fittings during cast preparations and it was badly bent when the winch pulled the cable.

An anomalous feature was observed in all the CTD casts at Station ALOHA, consisting of a salinity increase (~0.1 g/kg) and an oxygen decrease (~0.3 ml/l) in the salinity minimum between 400 and 500 dbar.

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

Four casts were conducted with the Trace Metals CTD. The winch used for the first cast (the "HOT winch") failed and could not bring the package onboard. The recovery and continued operations with this CTD were transferred to the SeaMac winch. One cast scheduled for November 21st was cancelled due to the rough weather.

Hyperpro operations were conducted once at Station Kahe and once at Station ALOHA, during the primary production experiment. The cast scheduled for November 21st near the WHOTS mooring was cancelled due to rough weather conditions. Each operation consisted of 2 deep casts to 185 m, and a 5 cycle Yo-Yo cast to 20 m.

The 300 kHz ADCP, underway fluorometer, transmissometer, thermosalinograph and the ship's meteorological suite ran without interruption during the cruise. The 38 kHz ADCP is still not working, T. Young did some repairs to the system before the cruise, but it still did not function properly.

A Seaglider (SG148) was successfully recovered in the morning of November 18th at Station ALOHA, and an APEX Argo float was deployed before leaving Station ALOHA on November 21st.

The weather was moderate at the beginning of the cruise with 15-20 knot easterly winds, turning rough starting on November 21st due to the winds increasing to 25-30 knot. A NNEward current of about 0.5 knots was present in the upper 80 m during the cruise.

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 throughout the cruise giving very consistent CTD cast times that allowed us to stick to our schedule. We look forward to full implementation of the docking head which will allow 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)

November 16, 2020

0900 - Began equipment loading

November 17, 2020

0843 - All aboard. Turning around the ship to load the Trace Metal van on the starboard side.
0915 - Depart from Pier 35
0945 - Safety briefing. Fire and Abandon ship drills
1155 - Arrived at Kahe Station
1158-1239 - Weight cast to 900 m with 1200 lb weight.
1251-1325 - Hyperpro cast
1417-1511 - S1C1 CTD cast to 1000 m.
1545-1624 - Trace metal cast. The trace metal winch could not lift the CTD out of the water. Had to use the Seamac winch to recover the CTD
1638 - Transit to Station ALOHA.
2354 - Arrived at Station ALOHA.

November 18, 2020

0157-0253 - S2C1 1000 m CTD cast
0436 - Deployed Primary Productivity array, 22 43.0824'N, 158 2.8411'W
0510-0529 - IRSC Sediment traps deployed: 22 42.6489'N, 158 2.2018'W
0558 - Sediment traps deployed: 22 42.2059'N, 158 1.3641'W
0646 - Wirewalker deployed: 22 41.7102'N, 158 0.5008'W
0913 - Seaglider recovered: 22 45.9313'N, 157 56.6830'W
1005 - Transit to pump ship's tanks
1219-1253 - Hyperpro cast
1316-1343 - Net tow
1411-1502 - S2C2, 1000 m CTD cast
1515 - Transit to recover Primary Productivity array
1800-1817 - Recovered PP array, 22 49.5584'N, 157 59.8618'W
1900-1920 - Trace metal cast #2
1930 - Transit to pump ship's tanks
2203-2232 - Net tow
2238-2307 - Net tow
2317 - Start Optics cast

November 19, 2020

0057 - End Optics cast
0133-0231 - S2C3 1000 m CTD cast
0345-0402 - Gas Array deployed, 22 48.0246'N, 157 57.6086'W
0523 - Start S2C4, near-bottom CTD cast.
0658 - 4 m off the bottom, 22 45.127'N, 158 0.040'W
0908 - End of cast

0925-0953 - Trace metal cast #3
1103-1233 - S2C5 1000 m CTD cast
1248-1321 - Net tow
1415-1508 - S2C6 1000 m CTD cast
1658-1808 - S2C7 1000 m CTD cast
1957-2136 - S2C8, 1000 m CTD cast. Level winding problems, winch stopped at 870 dbar downcast for 20 min to fix the problem
2201-2230 - Net tow
2305 - S2C9, 1000 m CTD cast

November 20, 2020

0013 - End of CTD cast
0154-0240 - S2C10, 1000 m CTD cast
0250 - Transit to recover gas array
0425-0442 - Recovered gas array, 22 59.6376'N, 157 49.3588'W
0525-0536 - Recovered Wirewalker, 22 58.6374'N, 157 51.4526'W
0612-0630 - Recovered Sediment Traps, 23 1.4311'N, 157 50.2249'W
0742-0804 - Recovered IRSC Sediment Traps, 23 10.1033'N, 157 45.5429'W
0809-1040 - Transit back to Station ALOHA
1049-1141 - S2C11, 1000 m CTD cast
1232-1321 - S2C12, 1000 m CTD cast
1414-1506 - S2C13, 1000 m CTD cast
1537-1555 - Trace metals cast #4
1657-1753 - S2C14, 1000 m CTD cast
1956-2105 - S2C15, 1000 m CTD cast
2110 - Transit to pump ship's tanks
2256 - Start S2C16, near-bottom CTD cast

November 21, 2020

0050 - CTD 8 m off the bottom. 22 45.019'N, 158 0.006'W
0210 - End of CTD cast
0338-0428 - S52C1, 200 m CTD yo-yo cast, 5 cycles
0428 - Transit to pump ship's tanks
1024 - APEX Argo float deployment: 22 43.2544'N, 157 56.5375'W
1026 - Transit to Station Kaena
1730 – Arrived at Station Kaena. Cancelled S6C1. The CTD wire got damaged when the wire got caught in one of the ship’s plumbing fittings while the winch was pulling it preparing for deployment.
1800 – Transit to Honolulu Pier 35

November 22, 2020

0742 - Arrive Pier 35, first line. Partial Ship unloading

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
Anill Rick Rupan Andrew Meyer	Apex Argo float deployment	UW