HOT 332: Chief Scientist Report
Chief Scientist: Fernando Santiago-Mandujano
R/V *Kilo Moana*
July 15 – 19, 2021

Cruise ID: KM 21-11
Vessel: R/V *Kilo Moana*, University of Hawaii
Master of the Vessel: Captain Joey Daigle
Chief Scientist: Fernando Santiago-Mandujano, University of Hawaii
Marine Technicians: Julianna Diehl, 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.

- All science party was vaccinated.
- All cruise participants self-isolated according to the HOT Risk Mitigation Plan before the cruise (July 6 – July 14).
- All cruise participants were tested twice for COVID on July 6 and July 12

During the cruise all participants:

- wore face masks
- maintained a distance of 6 ft. when possible
- properly disinfected all workspaces often

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_332_Operational_Cruise_plan.pdf

Science operations were planned for 7 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
James Ash	Graduate Student	UH	USA
Eleanor Bates	Graduate Student	UH	USA
Brandon Brenes	Research Assistant	UH	USA
Julianna Diehl	Marine Technician	OTG	USA
Dan Fitzgerald	Research Associate	UH	USA
Lance Frymire	Marine Technician	OTG	USA
Lucie Knor	Graduate Student	UH	DEU
Fernando Pacheco	Research Associate	UH	BRA
Tully Rohrer	Research Associate	UH/SCOPE	USA
Dan Sadler	Research Associate	UH	USA
Andres Salazar Estrada	Graduate Student	UH	CHL
Fernando Santiago-Mandujano	Research Associate	UH	USA
Ryan Tabata	Research Associate	UH/SCOPE	USA
Blake Watkins	Marine Engineer	UH	USA
Amanda Whitworth	Research Associate	SOEST-Lab	USA

4.0. GENERAL SUMMARY

Equipment loading was conducted on July 14th, and the cruise departed on July 15th at 08:56 (HST). During loading, the .681 trawl winch and cable were prepared for CTD work as there was no clearance to use the Hawboldt system given the HOT-331 cruise incident in which the CTD/rosette package sank to the bottom when the cable broke. On departure day, the Hawboldt was clear to be used, but we decided to use the .681 winch and A-frame for CTD deployment at Station Kahe and switch to the Hawboldt for operations at Station ALOHA. The CTD that just came back from Sea-Bird service/inspection after crashing on deck during the HOT-328 cruise was used with the OTG rosette and bottles. The CTD showed communication problems and modulo errors during deployment at Station Kahe and after unsuccessful troubleshooting we decided cancel the cast, to finish all other operations, and to proceed to Station ALOHA while continuing troubleshooting the CTD during transit.

Upon arrival at Station ALOHA, the WireWalker and the sediment traps were deployed south of center station, as the currents were expected to carry them towards the NW. The Hawboldt LARS system passed the prescribed operational checks and a weight cast was conducted. The CTD had communication problems and modulo errors again during deployment, and after unsuccessful troubleshooting we decided to switch to use the OTG fish, deck box and computer for data collection. Due to time constraints we decided to postpone the primary productivity array to the next day replacing the gas array deployment.

At Station ALOHA, two near bottom CTD casts and twelve 1000 m CTD casts were completed. One 5-cycle yoyo CTD cast to 200 m was completed near the WHOTS mooring (Station 52) and one near bottom CTD cast was completed at Station Kaena (Station 6).

The gas array experiment planned for July 17th was cancelled. It was replaced by the primary productivity array which could not be deployed on July 16th due to time constrains caused by problems with the CTD.

A CTD cast was conducted to collect water for the primary productivity array in the morning of July 17th, and the array was deployed 3 nm west of station center. The primary productivity array drifted towards the NW and was recovered after sunset on July 17th.

Six net tows for the core HOT zooplankton collection were completed: three during the day and three at night. A net trap was deployed on July 16th, and recovered on July 17th. The optics cast was conducted as scheduled on July 18th.

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

Three trace-metal casts were completed.

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 correctly due a failed cable, but data were collected using three transducers and may still be useful.

Winds during the cruise were 17-23 knots from the NE and bumped up to 25-27 knots on July 18th. The currents at Station ALOHA were small and variable, all the arrays drifted short distances towards the NW.

Special thanks to Dan Fitzgerald for working overtime troubleshooting our CTD and eventually switching HOT operations over to the OTG CTD.

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.

Captain Joey Daigle and the ship's crew showed flexibility, concern, and dedication to our scientific mission. Ship handling was very good during all operations.

Thanks also to OTG and the ship's crew for transferring operations from the .691 wire to the Hawboldt during transit to Station ALOHA.

Technical support during this cruise was very good. OTG personnel had their CTD ready for us to replace our non-functioning CTD, and were available to assist in our work during the cruise. They were flexible and accommodating.

6.0. DAILY REPORT OF ACTIVITIES (HST)

Thursday, July 15, 2021

0820 - All aboard, turning ship around to load trace metal van
0856 - Depart from Pier 35
0930 - Safety briefing
0945-1015 - Abandon ship and fire drills
1137 - Arrived to Station Kahe
1143-1208 - Weight cast with 0.681 winch/wire
1215-1255 - Hyperpro cast
1346 - Tried to start S1C1 CTD cast, but communication errors when the CTD went in the water. Recovered CTD, inspected connection, re-did the connection
1416 - Tried to start CTD cast, but the communication errors persisted. Decided to cancel the CTD cast, continue with all other operations at this station and troubleshoot the CTD during transit to Station ALOHA.
1447-1500 - Trace metal cast 1
1505 - Depart to Station ALOHA
Transferring the OTG CTD to the wet lab on the sled. Dan F. re-terminating 0.322 wire to continue CTD operations with the Hawboldt winch/wire
2252 - Arrived to Station ALOHA
2322 - Deployed Wirewalker, 22 41.1234'N, 158 1.1243'W

Friday, July 16, 2021

0010 - Deployed sediment traps array: 22 42.1552'N, 158 0.8414'W
0104-0126 - Weight cast to 500 m, after running tests on Hawboldt system
0223 - Attempted to start CTD cast, but had communication errors. CTD back on board. Switching to use OTG's CTD for the next casts
0516 - Start S2C1, near-bottom cast
0648 - CTD at 12 m off the bottom, 22 45.032'N, 158 0.037'W
0843 - End of cast
1008-1043 - Trace metal cast 2
1117-1225 - S2C2 CTD cast to 1000 m
1245-1312 - Net tow
1417-1515 - S2C3 CTD cast to 1000 m
1646 - Deployed net traps: 22 45.0261'N, 158 3.2556'W
1650 - Transit to pump ship's tanks
1754-1904 - S2C4 CTD cast to 1000 m
1910 - Transit to finish pumping ship's tanks
2003-2116 - S2C5 CTD cast to 1000 m
2201-2230 - Net tow
2232-2301 - Net tow
2310 - Start S2C6 CTD cast to 1000 m

Saturday, July 17, 2021

0009 - End of S2C6

0200-0259 - S2C7 CTD cast to 1000 m
0414 - Start PP array deployment
0428 - Deployed PP array: 22 45.0474'N, 158 3.1970'W
0505-0553 - S2C8 CTD cast to 1000 m
0603 - Transit to pump ship's tanks, incinerate trash
0822-0914 - S2C9 CTD cast to 1000 m
1111-1204 - S2C10 CTD cast to 1000 m
1221-1250 - Net tow
1253-1323 - Net tow
1329-1402 - Hyperpro cast
1415-1507 - S2C11 CTD cast to 1000 m
1510 - Transit to recover net traps
1615 – Released net traps
1630-1640 - Recovered net traps: 22 49.2307’N, 158 2.1304’W
1645-1737 - S2C12 CTD cast to 1000 m
1806 - Attempted to deploy trace metal CTD, but problems with the bottle firing system, bottles closed once touched the water. Problem fixed and re-deployed.
1827-1855 - Trace metal CTD cast
1915-1930 - Recovered PP array
1932 - Transit to pump ship's tanks
2045-2147 - S2C13 CTD cast to 1000 m
2210-2231 - Net tow
2316 - Start S2C14 near-bottom CTD cast

Sunday, July 18, 2021

0053 - 9 m off the bottom, 22 45.0268'N, 158 0.0073'W
0232 - End of cast
0308-0444 - Optics cast
0450 - Transit to recover sediment traps
0556-0614 - Recovered sediment traps: 22 49.4836'N, 158 1.0776'W
0635-0648 - Recovered Wirewalker: 22 47.6889'N, 158 2.5745'W
0655 - Transit to WHOTS buoy
1014-1108 - S52C1 CTD yo-yo cast to 200 m, 5 cycles
1150-1219 - Hyperpro cast
1221 - Transit to Station Kaena
1730 – Arrived to Station Kaena
1804-2008 – S6C1 near bottom CTD cast
2020 – Depart to Honolulu

Monday, July 19, 2021

0743 – First line. Arrived to Pier 35. End of cruise.

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, IFCB	UH
Nicholas Hawco Eleanor Bates	Quantifying Iron Turnover in the Upper Ocean via Time-series Measurements at Station ALOHA	UH
Sonya Dyhrman	Physiological ecology of diatom diazotroph associations using metatranscriptome samples.	LDEO
Debbie Lindell	Seasonal Virus Sampling	Technion
Kathleen Ruttenberg Danielle Hull Amanda Whitworth	Low nutrient water collection for the SOEST Laboratory for Analytical Biogeochemistry	S-Lab
Angelique White Mathilde Dugenne	Imaging Depth profile at Station ALOHA	UH
Rachel Foster	Identifying function and fitness proteins required for	Stockholm

N and C transfer in an open ocean symbiotic cyanobacterium by expression in heterologous systems	University