HOT-307: Chief Scientist Report

Chief Scientist: Fernando Santiago-Mandujano

R/V *Kilo Moana*

15-19 November, 2018

Cruise ID: **KM 18-21**
Departed: 15 November at 0855 (HST)
Returned: 19 November at 0730
Vessel: **R/V *Kilo Moana***
Master of the Vessel: Captain Joey Daigle Jr.
OTG Marine Technicians: Trevor Young, Julianna Diehl

1. SCIENTIFIC OBJECTIVES

The objective of the cruise was to maintain a collection of hydrographic and biogeochemical data at the Hawaii Ocean Time-series (HOT) stations. Four stations were to be occupied during the cruise, in the following order:

1) Station 1, referred to as Station Kahe, is located at 21° 20.6'N, 158° 16.4'W and was to be occupied on November 15th for about 2 hours.
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. This is the main HOT station and was to be occupied during November 16th to 18th.
3) Station 50, the site of WHOTS-15 Mooring (anchor position 22° 46.045'N 157° 53.888'W) was to be occupied on November 18th for about one hour.
4) Station 6, referred to as Station Kaena, is located off Kaena Point at 21° 50.8'N, 158° 21.8'W and was to be occupied on November 18th for about 2 hours.

Upon arrival to Station Kahe a 1300 lb. weight-test cast to 500 m, a Hyperpro cast, and a CTD cast to 1000 m were to be conducted on the afternoon of November 15th. The single CTD cast was to be conducted to collect a continuous profile of various physical and chemical parameters. Water samples were to be collected at discrete depths for biogeochemical measurements. After these operations were satisfactorily completed, the ship was to proceed to Station ALOHA.

Upon arrival to Station ALOHA, the Wirewalker was to be deployed, followed by the deployment of the free-drifting sediment trap array. These two arrays were to stay in the water for about 52 hours. This was to be followed by a 200 m CTD cast for preparation of the Primary Productivity Array. This cast was to be followed by the deployment of the free-drifting Primary Productivity Array to incubate *in situ* for 12 hours. A full-depth (~4740 m) CTD cast was to be conducted after the deployment of the Primary Production Array, followed by 1000 m CTD casts at strict 3 hour intervals for at least 36 hours for continuous and discrete data collection, ending with another full-depth CTD cast at 2300 on November 17th.

Another free-drifting array (Gas Array) was to be deployed for 24 hours for incubation experiments on November 17th. The Gas Array was to be recovered on November 18th.

A plankton net was to be towed between 1000-1400, and 2200-0200 for 30 minute intervals on November 16th and 17th at Station ALOHA.

The Hyperpro (a profiling unit with one up-looking and one down-looking hyperspectral radiometer, a WET Labs ECO-BB2F triplet, temperature and conductivity sensors), was to be deployed at noon time on November 15th and 18th.

An optical package including a package consisting of a SeaBird Seacat with temperature, conductivity, fluorometer, and pressure sensors, and a LISST particle size and distribution analyzer was to be used to profile the upper 200 m at Station ALOHA in the early morning on November 18th.

After the 36 hour burst period of CTD work and the optical cast at Station ALOHA were accomplished, the ship was to transit to recover the floating Gas Array, the Wirewalker, and the Sediment Trap Array on the morning of November 18th.

After recovering the arrays, the ship was to transit to Station 50 (WHOTS-15 mooring) to conduct a one-hour 200 m CTD yo-yo cast.

Once the above operations were complete, the ship was to transit to Station Kaena to conduct a near-bottom CTD cast.

After all operations were complete, the ship was to transit back to Honolulu Harbor, Pier 35.

The following instruments were to collect data throughout the cruise: shipboard ADCP, thermosalinograph, underway fluorometer, transmissometer, flow cytometer, pCO_2 system, and the meteorological package.

2. SCIENCE PERSONNEL

Participant	Title	Affiliation/HOT Group
Kendra Babcock	Research Associate	UH
Karin Bjorkman	Scientist	UH
Macarena Burgos	Scientist	UCádiz
Tim Burrell	Research Associate	UH/SCOPE
Tara Clemente	Research Associate	UH/SCOPE
Mathilde Dugenne	Post-Doc	UH/SCOPE
Dan Fitzgerald	Research Associate	UH
Carolina Funkey	Research Associate	UH
Benjamin Granzow	Graduate Student	WHOI
Ashley Holck	Undergraduate Student	UH
Ye Jin Joo	Undergraduate Student	UH
Svetlana Natarov	Research Assistant	UH
Tully Rohrer	Research Associate	UH
Dan Sadler	Research Associate	UH
Fernando Santiago-Mandujano – Chief Scientist	Research Associate	UH
Eric Shimabukuro	Research Associate	UH/SCOPE
Jefrey Snyder	Marine Technician	UH
Brian Swilley	Undergraduate Student	UH
Blake Watkins	Marine Engineer	UH
Julianna Diehl	Marine Technician	OTG
Trevor Young	Marine Technician	OTG

3. GENERAL SUMMARY

Operations at Station ALOHA were conducted without any major problems.

One 1000 m CTD cast was completed at Station Kahe. Two near bottom CTD casts and thirteen 1000 m CTD casts were conducted at Station ALOHA. One 200 m yo-yo CTD cast was completed near the WHOTS mooring (Station 50) with five cycles completed, and one near-bottom cast was conducted at Staion Kaena (Station 6).

The ship's Dynacon CTD winch with .322 wire were used for CTD deployments using the A-frame. Maximum CTD lowering speed was 50 m/min. Low CTD speeds (~15 to 30 m/s) were needed during various casts due to the rough weather conditions, to prevent large tension fluctuations on the CTD wire.

The Sediment Traps, Wirewalker, Primary Production and Gas Arrays were all deployed and recovered successfully.

Six net tows were completed successfully; three during the day, and three during the night.

The optical package was deployed as scheduled.

The hyperpro casts were conducted as scheduled.

The thermosalinograph, fluorometer, transmissometer, pCO_2, and flow cytometer were collecting data during the cruise.

The ADCP systems were working correctly during the cruise.

The ship's meteorological suite ran without interruption during the cruise.

Winds were easterlies about 15 to 25 kt, and seas were about 6-7 feet. A strong westward current (~ 1 kt) in the upper 100 m was persistent during the cruise. The sediment traps and other arrays drifted nearly 20 nm westward from ALOHA Station.

4. 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 Daigle and the ship's crew showed flexibility, enthusiasm, concern, and dedication to our scientific mission.

Technical support during this cruise was very good. OTG personnel were available to assist in our work during the cruise.

5. DAILY REPORT OF ACTIVITIES (HST)

November 15, 2018

0855 - All aboard. Depart from Pier 35
0930 - Safety briefing, Science meeting
0950 - Fire and Abandon ship drills
1149 - Arrived at Kahe Station
1153 - Weight cast to 500 m with 1200 lb weight.
1225 - End of weight cast

1239 - Start hyperpro cast
1308 - End hyperpro cast
1331 - Start S1C1 CTD cast to 1000 m.
1435 - End of cast
1442 - Transit to ALOHA Station.
2230 - Arrived to ALOHA Station.
2253 - Deployed Wirewalker, 22 44.9942'N, 158 1.1444'W
2356 - Deployed sediment traps array, 22 46.0919'N, 158 2.0169'W

November 16, 2018

0202 - Start S2C1 CTD cast to 1000 m
0314 - End of S2C1 CTD cast
0448 - Deployed Primary Productivity array, 22 47.145'N, 158 1.9858'W.
0605 - Start S2C2 CTD deep cast
0804 - Bottom of the cast, 10 m off the bottom
1036 - End of cast
1107 - Start net tow
1134 - End net tow
1217 - Start S2C3 CTD cast to 1000 m
1347 - End of cast
1400 - Start hyperpro cast
1430 - End hyperpro
1502 - Start S2C4 CTD cast to 1000 m
1611 - End of cast
1615 - Transit to pump ship's tanks
1742 - Start S2C5 CTD cast to 1000 m
1903 - End of cast
2000 - Recovering primary productivity array. 22 45.63'N, 158 7.793'W. Some of the surface buoys got caught briefly under the ship during recovery, but dislodged after the ship did some maneuvering.
2035 - Recovery completed.
2116 - Start S2C6 CTD cast to 1000 m.
2252 - End of cast
2310 - Start net tow
2340 - End net tow
2345 - Start net tow

November 17, 2018

0013 - End net tow
0036 - Start S2C7 CTD cast to 1000 m
0157 - End cast
0304 - Start S2C8 CTD cast to 1000 m
0421 - End of cast
0525 - Start Gas array deployment
0546 - Gas array deployed, 22 47.0346'N, 158 1.0355'W
0614 - Start S2C9 CTD cast to 1000 m
0741 - End of cast
0748 - Transit to pump ship tanks
0903 - Start S2C10 CTD cast to 1000 m
1023 - End of cast
1131 - Start S2C11 CTD cast to 1000 m

1238 - End cast
1254 - Start net tow
1321 - End net tow
1326 - Start net tow
1355 - End net tow
1416 - Start S2C12 CTD cast to 1000 m.
1529 - End of cast
1656 - Start S2C13 CTD cast to 1000 m
1814 - End cast
1825 - Transit to pump ship's tanks
1951 - Start S2C14 CTD cast to 1000 m
2115 - End of cast
2200 - Start net tow
2230 - End net tow
2301 - Start S2C15 CTD cast to near-bottom

November 18, 2018

0107 - CTD at 4804 dbar, 22 45.0159'N, 158 00.0247'W
0307 - End of cast
0328 - Start Optics cast
0503 - End of Optics cast
0510 - Transit to recover Gas array
0624 - Recovering Gas array, 22 44.6819'N, 158 9.2816'W
0640 - End recovery
0645 - Transit to recover sediment traps
0810 - Recovering sediment traps, 22 48.39'N, 158 23.29'W
0830 - End recovery
0835 - Transit to recover Wirewalker
0855 - Recovering Wirewalker, 22 46.73'N, 158 23.48'W
0905 - End recovery
0910 - Transit to Station 50
1153 - Arrived at Station 50. Start S50C1 CTD yo-yo cast to 200 m, near the WHOTS-15 mooring,
1302 - End of yo-yo cast, 5 cycles completed
1325 - Start hyperpro cast
1400 - End hyperpro cast
1454 - Start bathymetric survey to confirm the depth at the anchor location of some of the previous WHOTS moorings (WHOTS-9, -12 and -14).
1651 - End of survey
1655 - Transit to Station Kaena

November 19, 2018

0735 - Arrive Honolulu Harbor, Pier 35, full offload.

6. HOT program sub-components:

Investigator	Project	Institution
Dave Karl	Core Biogeochemistry	UH
John Dore	Biogeochemistry QA/QC	MSU

Roger Lukas	Hydrography	UH
Mike Landry	Zooplankton dynamics	SIO
Ricardo Letelier	Optical measurements	OSU

Ancillary programs:

Andrew Dickson	CO_2 dynamics and inter-calibration	SIO
Paul Quay	$DI^{13}C$	SIO
Matthew McCarthy Tom Guilderson	Sediment trap samples to look at amino acid-based paleo proxies to examine propagation of exported production into coral polyps and skeletons.	UCSC
Matt Church	Diversity and activities of nitrogen-fixing microorganisms	UM/FLBS
Sam Wilson	Reduced gases in the upper ocean: The cycling of methane, sulfide and nitrous oxide.	UH
Sara Ferrón-Smith	Determination of gross primary production from the euphotic zone in situ, using the drifting primary production array	UH
Ed DeLong	SCOPE: DNA and Viral DNA collection	UH
Daniel Repeta	SCOPE: DOM collection	WHOI
Angelique White	SCOPE: Diazotroph Microscopy	OSU
Benjamin Granzow Daniel Repeta	Fast Fluorescent Chemical Assay for C-P Lyase Analysis	WHOI