HOT-308: Chief Scientist Report

Chief Scientist: Fernando Santiago-Mandujano

R/V *Kilo Moana*

10-12 December, 2018

Cruise ID: **KM 18-23**
Departed: 10 December at 0850 (HST)
Returned: 12 December at 0735
Vessel: **R/V *Kilo Moana***
Master of the Vessel: Captain Joey Daigle Jr.
OTG Marine Technicians: Julianna Diehl, Rob Palomares

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 December 10th 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 December 11h to 13th.
3) Station 50, the site of WHOTS-15 Mooring (anchor position 22° 46.045'N 157° 53.888'W) was to be occupied on December 13th 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 December 13th 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 December 10th. 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 December 12th.

Another free-drifting array (Gas Array) was to be deployed for 24 hours for incubation experiments on December 12th. The Gas Array was to be recovered on December 13th.

A plankton net was to be towed between 1000-1400, and 2200-0200 for 30 minute intervals on December 11th and 12th 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 December 10th and 13th.

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 December 13th.

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 December 13th.

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
Dan Fitzgerald	Research Associate	UH
Carolina Funkey	Research Associate	UH
Kyla Herrmann	Education Specialist	UH
Ross Langston	Professor	WCC
Svetlana Natarov	Research Assistant	UH
Rebecca O'Kusky	Volunteer	
Tully Rohrer	Research Associate	UH
Dan Sadler	Research Associate	UH
Fernando Santiago-Mandujano – Chief Scientist	Research Associate	UH
Eric Shimabukuro	Research Associate	UH/SCOPE
Michelle Smith	Lecturer	WCC
Jefrey Snyder	Marine Technician	UH
Ryan Tabata	Research Associate	UH
Blake Watkins	Marine Engineer	UH
Julianna Diehl	Marine Technician	OTG
Rob Palomares	Marine Technician	OTG

3. GENERAL SUMMARY

Operations at Station ALOHA had to be cancelled on the second day of the cruise due to safety concerns regarding an A-frame rusted flag block counter weight used for the trawl winch wire. The rust was at the elbow welds (see pictures below), it was making cracking noises, and rust was falling down due to the enhanced ship motion caused by the rough weather. The flag block is located at the top of the A-frame, under which most of the cruise operations were to be conducted (deployment/recovery of CTD, arrays, net tows, etc.). In addition, none of the arrays, Wirewalker, nor the net-tows were deployed due to the strong winds (25-30 kt), and high seas (> 10 ft).

Pictures of the A-frame flag block counter weight on the R/V Kilo Moana on December 12th, 2018.

One 1000 m CTD cast and one Hyperpro cast were completed at Station Kahe. The CTD cast was conducted using the Dynacon winch and 0.322 wire, but wire-out and tension display were only available at the winch operator station, and wire tension recording was not available despite continued troubleshooting by the OTG technicians. After consulting with the Captain, it was decided to continue CTD operations using the trawl winch and 0.681 wire. One near-bottom CTD cast was conducted at ALOHA Station.

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

The Workhorse ADCP system was working correctly during the cruise, although it stopped running for nearly 4 hours on December 11th and it had to be restarted. The OS 38 ADCP was not available because its deck box failed during the previous ship's cruise.

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

Winds were easterlies at 25 to 30 kt, and seas were more than 10 feet.

A current of about 0.5 kt towards the SW was present in the upper 100 m.

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)

December 10, 2018

0850 - All aboard. Depart from Pier 35
0925 - Safety briefing, Science meeting
0940 - Fire and Abandon ship drills
1135 - Arrived at Kahe Station
1155 - Weight cast to 500 m with 1200 lb weight.
1230 - End of weight cast
1240 - Start hyperpro cast
1316 - End hyperpro cast
1320 - Troubleshooting CTD tension/wire-out display problems
1355 - Start S1C1 CTD cast to 1000 m.
1515 - End of cast
1525 - Transit to ALOHA Station.
2350 - Arrived to ALOHA Station.

December 11, 2018

0240 - Due to strong winds (25-30 kt) and high seas (>10 ft) no arrays were deployed
0734 - Start S2C1 CTD deep cast
1029 - Bottom of the cast, 12 m off the bottom, 22 45.004'N, 158 0.0082'W
1049 - Noticed that shipboard ADCP stopped working at 0704. Restarted
1239 - End of cast
1500 - After assessing the conditions of the A-frame flag block, it was decided to cancel operations on the back deck due to safety concerns. The captain, chief engineer, chief scientist and authorities at the Marine Center were consulted. Dave Karl was informed of the situation.

December 12, 2018

0735 - Arrive Honolulu Harbor, Pier 35.

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
Qian Li Grieg Steward	Seawater collection for culturing (phytoplankton and virus) purpose.	UH
Michelle Smith Ross Langston	Oceanographic Tools Video Project for Science of the Sea OCN-201 class.	WCC