HOT-296: Chief Scientist Report

Chief Scientist: Fernando Santiago-Mandujano

R/V *Kilo Moana*

5-9 October, 2017

Cruise ID: **KM 17-15**
Departed: 5 October at 0830 (HST)
Returned: 9 October at 0730
Vessel: **R/V *Kilo Moana***
Master of the Vessel: Captain Gray Drewry
OTG Marine Technicians: Jeff Koch, Steven Tottori

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 October 5th 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 October 6th to 8th.
3) Station 52, the site of WHOTS-14 Mooring (anchor position 22° 40.0154' N, 157° 57.0915' W) was to be occupied on October 8th 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 October 8th for approximately 2 hours.

Upon arrival to Station Kahe a 1300 lb. weight-test cast to 1000 m, and one CTD cast to 1000 m were to be conducted on the afternoon of October 5th. 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 free-drifting sediment trap array was to be deployed, followed by the deployment of a Wirewalker. These two arrays were to stay in the water for about 52 hours. This was to be followed by a 1000 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 October 7th.

Another free-drifting array (Gas Array) was to be deployed for 24 hours for incubation experiments on October 7th. The Gas Array was to be recovered on October 8th.

A plankton net was to be towed between 1000-1400, and 2200-0200 for 30 minute intervals on October 6th and 7th 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), usually deployed during HOT cruises, was being serviced and was not available during this cruise.

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 October 8th.

A trace metal free sample was to be collected by the ATE sampler on October 7th at Station ALOHA.

After the 36 hour burst period of CTD work at Station ALOHA was accomplished, the ship was to transit to recover the floating Gas Array, the Wirewalker, and the Sediment Trap Array on the morning of October 8th.

After recovering the arrays, the ship was to transit to Station 52 to conduct a one-hour 200 m CTD yo-yo cast.

If time allowed, one profiler float from the University of Washington/MBARI (K. Johnson, D. Swift, S. Riser) was to be recovered from the vicinity of Station ALOHA.

An Apex profiler (D. Swift, S. Riser, UW) was to be deployed on October 8th after all operations at Station ALOHA had been completed.

Once operations at Station ALOHA were complete, the ship was to transit to Station 6, referred to as Station Kaena where a near-bottom CTD cast (~2500 m) was to be conducted to collect salinity and chlorophyll samples for calibration.

After Station Kaena 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, and the meteorological package.

2. SCIENCE PERSONNEL

Participant	**Title**	**Affiliation/HOT Group**
Karin Bjorkman	Scientist	UH
Dan Sadler	Research Associate	UH
Brenner Wai	Research Associate	UH
Donn Viviani	Post-Doc	UH
Morgan Linney	Graduate Student	UH
Blake Watkins	Marine Engineer	UH
Tim Burrell	Research Associate	UH
Ryan Tabata	Research Associate	UH
Paul Den Uyl	Research Associate	UH
Eric Shimabukuro	Research Associate	UH
Gerarda Terlouw	Post Graduate Trainee	UH
Pao Chi Hwang	Volunteer	
Jefrey Snyder	Marine Technician	UH
Fernando Santiago-Mandujano	Research Associate	UH
Andrew King	Research Associate	UH
Svetlana Naratov	Graduate Student	UH

Paige Mino	Volunteer	
Garrett Hebert	Undergrad Student	UH
Solange Duhamel	Scientist	Lamont-Doherty
Maria Del Carmen Munoz Marin	Scientist	Univ. of Cordoba
Fuyan Li	Scientist	UH
Benedetto Barone	Scientist	UH
Steven Tottori	Marine Technician	OTG
Jeff Koch	Marine Technician	OTG

3. GENERAL SUMMARY

Operations at Station ALOHA were conducted with some modifications due to rough weather during the first two days of the cruise. Deployment of the Wirewalker and primary productivity array were postponed one day, and the Gas array deployment was cancelled.

One 1000 m CTD cast was completed at Station Kahe. Two near bottom CTD casts and twelve 1000 m CTD casts were conducted at Station ALOHA. One 200 m yo-yo CTD cast was completed near the WHOTS mooring (Station 52) with five cycles completed. One near bottom cast was completed at Station Kaena.

The ship's trawl winch and 0.681 wire were used for CTD deployments using the A-frame. Due to the rough weather, the CTD lowering speed had to be reduced to a minimum of 12 m/min at times to prevent negative tensions and slack in the wire, increasing the total duration of some of the 1000 m casts to nearly 2 hours.

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

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

The optical package was deployed in the morning of October 8th.

The ATE failed and was not deployed.

An Apex profiler float was successfully deployed on October 8th before leaving Station ALOHA.

Due to a blockage in the draining of the underway water system in the Met lab, the thermosalinograph, fluorometer, transmissometer and flow cytometer could not be operated during the cruise.

The broad band/narrow band Ocean Surveyor ADCP and the Workhorse ADCP were working correctly during the cruise.

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

Winds were easterlies about 25-30 kt the first two days of the cruise with 8 ft waves, decreasing to less than 2 kt during the second part of the cruise, with very smooth seas.

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 Drewry 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)

October 5, 2017

0800 - All aboard. Depart from Pier 35
0840 - Safety briefing by the captain. Science meeting
0930 - Fire and Abandon ship drills
1045 - Arrived at Kahe Station
1055 - Weight cast to 500 m.
1126 - End of weight cast
1209 - Start S1C1 CTD cast to 1000 m
1320 - End of cast
1325 - Transit to ALOHA Station
1806 - Shutdown clean seawater system in Met lab due to drain blockage
2220 - Arrived to ALOHA Station

October 6, 2017

0039 - Deployed sediment traps: 22 45.015'N, 158 1.120'W
0337 - Raining on station
0433 - Start S2C1 CTD deep cast
0643 – CTD at 9 m off the bottom (22 45.010'N, 158 0.030'W)
0903 - End of cast
1056 - Start S2C2 CTD cast to 1000 m
1236 - End of cast
1245 - Transit to pump ship's tanks
1358 - Start S2C3 CTD cast to 1000 m
1546 - End of cast
1655 - Start S2C4 CTD cast to 1000 m
1851 - End of cast
2017 - Start S2C5 CTD cast to 1000 m
2144 - End of cast
2208 - Start net tow
2240 - End net tow
2245 - Start net tow
2309 - End net tow
2323 - Start S2C6 CTD cast to 1000 m

October 7, 2017

0037 - End cast
0145 - Deployed Wirewalker 22 42.998'N, 158 2.687'W
0225 - Start S2C7 CTD cast to 1000 m
0346 - End of cast
0522 - PP array deployment 22 45.076'N, 158 3.474'W

0557 - Start S2C8 CTD cast to 1000 m
0711 - End of cast
0715 - Transit to pump ship's tanks
0830 - Start S2C9 CTD cast to 1000 m
0943 - End of cast
1030 - ATE cancelled due to equipment failure
1105 - Start S2C10 CTD cast to 1000 m
1205 - End cast
1221 - Start net tow
1245 – End net tow
1250 – Start net tow
1320 – End net tow
1323 - Start net tow
1345 – End net tow
1350 - Start S2C11 CTD cast to 1000 m.
1519 - End of cast
1530 - Transit to pump ship's tanks
1700 - Start S2C12 CTD cast to 1000 m
1819 - End of cast.
1913 - Start PP array recovery, 22 47.001'N, 158 7.593' W
1935 - End of recovery
2006 - Start S2C13 CTD cast to 1000 m
2132 - End of cast
2200 - Start net tow
2230 - End of net tow
2333 - Start S2C14 CTD cast to near-bottom

October 8, 2017

0140 - CTD at 10 m off the bottom 22 45.003'N, 158 00.095'W
0338 - End of cast
0354 - Start Optics cast
0540 - End Optics cast
0600 - Transit to recover Wirewalker
0652 - Start Wirewalker recovery, 22 47.363' N, 158 9.936' W
0722 - End of recovery
0725 - Transit to recover Sediment traps
0800 - Start sediment traps recovery 22 53.405'N 158 15.473'W
0845 - End of recovery
0900 - Transit to Sta 52
1210 - Start S52C1 CTD yo-yo cast to 200 m. Five cycles completed
1331 - End of cast
1350 - Apex float deployed, 22 40.077' N, 157 58.561' W
1400 - Transit to Kaena Station
1844 - Arrive at Station Kaena, S6C1 –near bottom CTD
2105 - End of cast
2115 - Transit to Honolulu

October 9, 2017

0730 - 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
Dave Caron	SCOPE: DNA collection	USC
Ed DeLong	SCOPE: DNA and Viral DNA collection	UH
Dan Repeta	SCOPE: DOM collection	WHOI
Angelique White	SCOPE: Diazotroph Microscopy	OSU
Chris Follett	SCOPE: Measuring Nitrogen Fixation from Diel Fluctuations in Stoichiometry	MIT
Solange Duhamel Maria Del Carmen Munoz Marin	Diel variability in Prochlorococcus photoheterotrophic metabolism	Lamont-Doherty, University of

		Cordoba (Spain)
Fuyan Li Edward DeLong	The variations of archaeal tetraether lipids along the depth profile and their biosynthesis pathway at the HOT station	UH
Benedetto Barone David Karl	Test deployment of Wirewalker during HOT cruise	UH
Dana Swift Steve Riser	Deployment of ARGO float with new prototype conductivity sensor	UW