HOT-297: Chief Scientist Report

Chief Scientist: Fernando Santiago-Mandujano

R/V *Kilo Moana*

7-11 November, 2017

Cruise ID: **KM 17-17**
Departed: 7 November at 0900 (HST)
Returned: 11 November at 0820
Vessel: **R/V *Kilo Moana***
Master of the Vessel: Captain Gray Drewry
OTG Marine Technicians: Jeff Koch, Justin Smith

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 7th 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 8th to 10th.
3) Station 52, the site of WHOTS-14 Mooring (anchor position 22° 40.0154' N, 157° 57.0915' W) was to be occupied on November 10th 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 10th 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 November 7th. 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 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 November 9th.

Another free-drifting array (Gas Array) was to be deployed for 24 hours for incubation experiments on November 9th. The Gas Array was to be recovered on November 10th.

A plankton net was to be towed between 1000-1400, and 2200-0200 for 30 minute intervals on November 8th and 9th 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 November 10th.

A trace metal free sample was to be collected by the ATE sampler on November 9th at Station ALOHA.

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 10th.

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

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**
Tara Clemente	Research Associate	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
Gagandeep Lally	Undergrad Student	UH
Jefrey Snyder	Marine Technician	UH
Fernando Santiago-Mandujano	Research Associate	UH
Andrew King	Research Associate	UH
Svetlana Natarov	Graduate Student	UH
Kelsey Nichols	Undergrad Student	UH
Caitlyn Loch	Undergrad Student	UH
Ashley Holck	Undergrad Student	UH
Oscar Sosa	Post-Doc	UH
Daniel Repeta	Scientist	WHOI
Justin Smith	Marine Technician	OTG

Jeff Koch	Marine Technician	OTG

3. GENERAL SUMMARY

Operations at Station ALOHA were conducted as scheduled without any problems.

Some of the CTD casts showed secondary fluorescence maxima between 180 and 400 dbar during down and upcasts.

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 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. Maximum CTD lowering speed was 50 m/min.

The Sediment Traps, Wirewalker, Primary Production and Gas Arrays 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 as scheduled.

The ATE was deployed as scheduled and a sample was taken.

The thermosalinograph, fluorometer, transmissometer and flow cytometer were collecting data 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 8-15 kt the first two days of the cruise with smooth seas. The winds increased to 20 kt by the end of the cruise.

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)

November 7, 2017

0905 - All aboard. Depart from Pier 35
0930 - Safety briefing, Science meeting
1020 - Fire and Abandon ship drills
1123 - Arrived at Kahe Station
1154 - Weight cast to 1000 m with 1200 lb weight.
1224 - End of weight cast
1304 - Start S1C1 CTD cast to 1000 m.
1412 - End of cast
1420 - Transit to ALOHA Station.
2210 - Arrived at ALOHA Station.
2237 - Deployed Wirewalker, 22° 44.229'N, 158° 0.804'W
2338 - Deployed sediment traps array, 22° 43.534'N, 158° 1.443'W

November 8, 2017

0155 - Start S2C1 CTD cast to 1000 m
0226 - End of cast
0422 - Deployed Primary Productivity array, 22° 43.537'N, 158° 0.377'W.
0500 - Start S2C2 CTD deep cast
0649 - Bottom of the cast, 22° 45.009'N, 158° 0.024'W
0855 - End of cast
1024 - Start S2C3 CTD cast to 1000 m
1210 - End of cast
1225 - Start net tow
1255 - End net tow
1300 - Transit to pump ship's tanks
1404 - Start S2C4 CTD cast to 1000 m
1510 - End of cast
1630 - Start S2C5 CTD cast to 1000 m
1742 - End of cast
1814 - Recovered PP array, 22° 45.275'N, 158° 0.25'W.
1959 - Start S2C6 CTD cast to 1000 m
2118 - End of cast
2205 - Start net tow
2229 - End net tow
2232 - Start net tow
2259 - End net tow
2320 - Start S2C7 CTD cast to 1000 m

November 9, 2017

0025 - End cast
0158 - Start S2C8 CTD cast to 1000 m
Secondary fluorescence maximum between 390 and 450 dbar downcast, and at 400 and 185 dbar upcast. A bottle was closed at 185 dbar for sampling.
0308 - End of cast
0415 - Gas array deployment, 22° 47.769'N, 157° 58.101'W
0505 - Start S2C9 CTD cast to 1000 m
0607 - End of cast
0759 - Start S2C10 CTD cast to 1000 m
0903 - End of cast

0910 - Transit to pump tanks
1005 - Deployed ATE, 22° 49.003'N, 157° 56.693'W
1038 - ATE recovered
1100 - Start S2C11 CTD cast to 1000 m
Secondary fluorescence maximum at 300 dbar upcast. Bottle sample taken.
1223 - End cast
1226 - Start net tow
1255 - End net tow
1257 - Start net tow
1324 - End net tow
1405 - Start S2C12 CTD cast to 1000 m.
Secondary fluorescence maxima at 210 and 270 dbar upcast.
1510 - End of cast
1652 - Start S2C13 CTD cast to 1000 m
1805 - End of cast
1955 - Start S2C14 CTD cast to 1000 m
2104 - End of cast
2200 - Start net tow
2228 - End net tow
2306 - Start S2C15 CTD cast to near-bottom

November 10, 2017

0053 - CTD at 8 m off the bottom 22° 45.117'N, 158° 0.103'W
0241 - End of cast
0301 - Start Optics cast
0439 - End of Optics cast
0440 - Transit to recover Gas array
0620 - Recovered Gas array, 22° 51.79'N, 158° 0.001'W
0621 - Transit to recover Wirewalker
0730 - Recovered Wirewalker, 22° 47.0'N, 158° 3.5'W
0735 - Transit to recover sediment traps
0840 - Recovered sediment traps, 22° 45.466'N, 158° 3.539'W
0842 - Transit to Station 52
1045 - ADCP survey, 0.25 nm from WHOTS-14 buoy
1130 - Start S52C1 CTD yo-yo cast to 200 m, near the WHOTS-14 mooring, 5 cycles completed
1255 - End of cast
1315 - Transit to Kaena Station
1735 – Arrived at Kaena Station.
1746 - Start S6C1 CTD cast to near-bottom
2001 – End of cast
2020 – Transit to Honolulu Harbor

November 11, 2017

0820 - 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
Oscar Sosa	Large volume collection of particulate organic matter	UH
Danielle Hull Kathleen Ruttenberg	Water collection for SOEST Laboratory for Analytical Biogeochemistry – Quality Control	UH
Morgan Linney David Karl	Characterizing free DNA at Station ALOHA	UH