HOT-257: Chief Scientist Report

Chief Scientist: Fernando Santiago-Mandujano

R/V *Kilo Moana*

25-29 November, 2013

Cruise ID: **KM 13-21**
Departed: 25 November at 0855 (HST)
Returned: 29 November at 0730 (HST)
Vessel: **R/V *Kilo Moana***
Master of the Vessel: Captain Gray Drewry
OTG Marine Technicians: Trevor Young, 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 25th 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 26th, 27th, and 28th.
3) Station 52, the site of WHOTS-10 Mooring (anchor position 22° 40.12'N 157° 57.01'W) was to be occupied on November 28th 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 28th for approximately 2 hours.

Upon arrival to Station Kahe a 1000 lb. weight-test cast to 500 m, one CTD cast to 1000 m, and a Hyperpro cast were to be conducted on the afternoon of November 25th. 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. The sediment trap array was 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 27th.

Another free-drifting array (Gas Array) was to be deployed for 24 hours for incubation experiments on November 27th. The Gas Array was to be recovered on November 28th.

A plankton net was to be towed between 1000-1400, and 2200-0200 for 30 minute intervals on November 26th and November 27th at Station ALOHA.

The Hyperpro was to be deployed for approximately 45 minutes at 1400 on November 25th, 26th, and 28th to collect three profiles during each deployment.

A package including a Wet Labs AC9, a Chelsea Fast Repetition Rate Fluorometer (FRRf), a SeaBird Seacat, 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 and around noon on November 28th.

A trace metal free sample was to be collected by the ATE sampler on November 27th 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 and the Sediment Trap Array on the morning of November 28th.

After recovering the arrays, the ship was to transit to Station ALOHA to conduct ACS/AC9/FRRf/LISST casts, after which the ship was to transit to Station 52 to conduct a one-hour 200 m CTD yo-yo cast, and a subsequent Hyperpro cast at Station ALOHA.

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 Snug Harbor.

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

2. SCIENCE PERSONNEL

Participant	**Title**	**Affiliation/HOT Group**
Susan Curless	Research Associate	UH/BEACH
Dan Sadler	Research Associate	UH/BEACH
Brett Updyke	Research Associate	UH/BEACH
Adriana Harlan	Research Associate	UH/BEACH
Lance Fujieki	Research Associate	UH/BEACH
Blake Watkins	Marine Engineer	UH/BEACH
Christopher Schvarcz	Graduate Student	UH/CMORE
Sara Ferrón-Smith	Postdoctoral Scholar	UH/C-MORE
Stuart Donachie	Scientist	UH/Microbiology
Jefrey Snyder	Marine Technician	UH/PO
Fernando Santiago-Mandujano	Research Associate	UH/PO
Cameron Fumar	Research Associate	UH/PO
Daniel McCoy	Research Associate	UH/PO
Øyvind Lundesgaard	Graduate Student	UH/PO
Carly Goodman	Undergrad Student	UH/PO
Justin Smith	Marine Technician	OTG
Trevor Young	Marine Technician	OTG

3. GENERAL SUMMARY

Operations at Station ALOHA were conducted as planned.

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 three cycles completed. One near bottom cast was completed at Station Kaena.

The trawl winch with the 0.681 wire and the A-frame were used for CTD operations.

The Sediment Traps, Primary Production Array, and Gas Array were all deployed and recovered successfully. A southward current of nearly ½ kt was present throughout the cruise and the arrays drifted in that direction. The sediment traps drifted 19 nm, the gas array drifted 16.5 nm, and the primary production array drifted 6.6 nm.

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

Hyperpro casts (3 cycles each) were conducted on November 25th, 26th, and 28th.

The optical package ACS/AC9/FRRf/LISST was deployed four times on November 28th, two back to back deployments in the early morning, and two at around noon.

The ATE was successfully deployed on November 27th.

The underway thermosalinograph system and fluorometer ran without interruption 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. The port anemometer seemed to have problems as it displayed high wind speeds as compared to the starboard and the Ultrasonic anemometers. The Ultrasonic anemometer showed wind direction glitches, and the RM Young precipitation also showed glitches sporadically during the cruise. The temperature from the humidity sensor showed a noisy signal as compared to the RM Young temperature sensor data.

Winds were about 15 kt from the southeast.

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 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 25, 2013

0855 - All aboard. Depart from Snug harbor
0930 - Safety briefing by the Captain. Science meeting
1000 - Fire and Abandon ship drills
1150 - Arrived at Kahe Station
1200 - Weight cast to 500 m
1235 - End of weight cast
1248 - Start S1C1 CTD cast to 1000 m
1415 - End of cast
1426 - Start hyperpro cast

1454 - End of hyperpro cast
1500 - Transit to ALOHA Station
2240 - Arrived to ALOHA Station
2245 - Start sediment traps deployment
2307 - Deployed sediment traps: 22 45.013'N, 158 1.978'W

November 26, 2013

0148 - Start S2C1 CTD cast to 1000 m
0305 - End of cast
0415 - Start Primary production array deployment
0430 - Deployed PP array: 22 44.941'N, 158 0.896'W
0446 - Start S2C2 CTD deep cast
0642 - 4 m off the bottom (22 45.002'N, 158 0.020'W)
0900 - End of cast
0905 - Transit to pump ship's tanks
1000 - Start net tow
1034 - End net tow
1100 - Start S2C3 CTD cast to 1000 m
1240 - End of cast
1330 - Start Hyperpro cast
1400 - End Hyperpro
1415 - Start S2C4 CTD cast to 1000 m
1522 - End of cast
1621 - Start S2C5 CTD cast to 1000 m
1733 - End of cast
1810 - Recovered PP array 22 41.468' N, 157 59.344'W
1822 - Transit to pump ship's tanks
1954 - Start S2C6 CTD cast to 1000 m
2126 - End of cast
2200 - Start net tow
2235 - End net tow
2238 - Start net tow
2259 - End net tow
2309 - Start S2C7 CTD cast to 1000 m

November 27, 2013

0021 - End cast
0157 - Start S2C8 CTD cast to 1000 m
0308 - End of cast
0400 - Gas array deployment 22 42.983'N, 158 3.011'W
0440 - Start S2C9 CTD cast to 1000 m
0555 - End of cast
0749 - Start S2C10 CTD cast to 1000 m
0912 - End of cast
0915 - Transit to pump ship's tanks
1000 - Start net tow
1035 - End net tow
1040 - Start ATE sampling
1110 - End ATE sampling
1114 - Start S2C11 CTD cast to 1000 m
1225 - End cast
1236 - Start net tow
1310 - End net tow
1347 - Start S2C12 CTD cast to 1000 m.

1410 - End of cast
1650 - Start S2C13 CTD cast to 1000 m
1803 - End of cast
1804 - Transit to pump ship's tanks
1946 - Start S2C14 CTD cast to 1000 m
2106 - End of cast
2200 - Start net tow
2230 - End of net tow
2253 - Start S2C15 CTD cast to near-bottom

November 28, 2013

0055 - CTD at 4 m off the bottom 22 45.018'N, 157 59.975'W
0255 - End of cast
0303 - Start AC9
0515 - End of AC9
0520 - Transit to recover gas array
0630 - Start gas array recovery 22 33.65'N 158 5.15'W
0645 - End of recovery
0650 - Transit to recover sediment traps
0715 - Start sediment traps recovery 22 33.96'N 158 1.76'W
0740 - End of recovery
0745 - Transit back to ALOHA Station
0950 - Start AC9
1210 - End AC9
1250 - Start S52C1 CTD yo-yo cast to 200 m near the WHOTS-10 mooring, 22 40.492'N, 157 59.185'W
1341- End of cast, 3 cycles completed
1345 - Transit inside the ALOHA circle
1411 - Hyperpro cast
1444 - End cast
1447 - Transit to Station Kaena
1927 - Arrive at Station Kaena, S6C1 –near bottom CTD
2141 - End of cast
2147 - Transit to Snug Harbor

November 29, 2013

0730 - Arrive Snug Harbor, full offload.

6. HOT program sub-components:

Investigator	Project	Institution
Matt Church	Core Biogeochemistry	UH
Dave Karl		
Bob Bidigare		
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
Matt Church & Ricardo Letelier	Diversity and activities of nitrogen-fixing microorganisms	UH

Sam Wilson	Reduced gases in the upper ocean: The cycling of methane, sulfide and nitrous oxide	UH
Christopher Schvarcz	Viral Dynamics in the Oligotrophic Open Ocean, Station ALOHA	C-MORE
Justine Shortell, Stuart Donachie	Cultivation of single bacterial cells from the deep sea (Undergraduate Research Opportunities Program)	UH/Microbiology
Sara Ferron-Smith, Sam Wilson	Sample collection for inter-comparison of N2O and CH4	C-MORE
John Casey	Collection of surface seawater for cell culture media	C-MORE
Rebecca Briggs	S-LAB Method Verification	UH
Erica Goetze	Temporal stability of copepod populations at Station ALOHA	UH