HOT-250: Chief Scientist Report

Chief Scientist: Fernando Santiago-Mandujano

R/V *Kilo Moana*

5-9 March, 2013

Cruise ID: **KM 13-05**
Departed: 5 March at 0850 (HST)
Returned: 9 March at 0730 (HST)
Vessel: **R/V *Kilo Moana***
Master of the Vessel: Captain Gray Drewry
OTG Marine Technicians: Trevor Goodman, Trevor Young, Jennie Mowatt

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 March 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 March 6th, 7th, and 8h.
3) Station 50, the site of WHOTS-9 Mooring (anchor position 22° 46.071'N 157° 53.956'W) was to be occupied on March 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 March 8th for approximately 3 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 March 5th. The single CTD cast was to be conducted to collect continuous profiles 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 200 m CTD cast to collect water for incubation experiments, and 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 March 7th.

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

A plankton net was to be towed between 1000-1400, and 2200-0200 for 30 minute intervals on March 6th and March 7th at Station ALOHA.

The Hyperpro was to be deployed for approximately 45 minutes near noon time on March 5th, 6th, and 8th 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 March 8th.

A trace metal free sample was to be collected by the ATE sampler on March 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 and the Sediment Trap Array on the morning of March 8th.

After recovering the arrays, the ship was to transit to Station ALOHA to conduct ACS/AC9/FRRf/LISST casts, and Hyperpro casts, after which the ship was to transit to Station 50 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 Snug Harbor.

The following instruments were to collect data throughout the cruise: shipboard ADCP, thermosalinograph, pCO_2 system, 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
Shimi Rii	Graduate Student	UH/BEACH
Blake Watkins	Marine Engineer	UH/BEACH
Daniela Böttjer	Postdoctoral Researcher	UH/CMORE
Benedetto Barone	Postdoctoral Researcher	UH/CMORE
Christopher Schvarcz	Graduate Student	UH/CMORE
Brenner Wai	Graduate Student	UH/CMORE
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
Michael Grissom	Graduate Student	UH/PO
Jennifer George	Volunteer	UH/PO
David Murphy	Scientist	Sea-Bird
Carol Janzen	Scientist	Sea-Bird
Eric Grabowski	Research Associate	UH/CMORE
Oscar Sosa	Graduate Student	MIT/CMORE
Trevor Goodman	Marine Technician	OTG
Trevor Young	Marine Technician	OTG
Jennie Mowatt	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, thirteen 1000 m CTD casts, and one 200-m cast were conducted at Station ALOHA. One 200 m yo-yo CTD cast was completed near the WHOTS mooring (Station 50) with five 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 strong ½ kt southwestward current was present throughout the cruise and all arrays drifted in that direction. The sediment traps drifted 23 nm, the gas array drifted 16 nm, and the primary production array drifted 8 nm.

Six net tows for the core HOT zooplankton collection were completed successfully; three during the day, and three during the night. E. Grabowski conducted an additional net tow during the day on March 7th.

Hyperpro casts (3 cycles each) were conducted on March 5th, 6th, and 8th.

The optical package ACS/AC9/FRRf/LISST was deployed four times on March 8th, two back to back deployments in the early morning, and two at around noon.

The ATE could not be deployed due to problems communicating with it.

The underway thermosalinograph and *p*CO2 system, and the ship's meteorological suite ran without interruption during the cruise. The underway fluorometer was removed for calibration before the cruise and was not available to collect data. The broad band/narrow band Ocean Surveyor ADCP and the Workhorse ADCP were working correctly during the cruise.

Winds were from the east early in the cruise at about 14 kt, and slowly decreased in intensity to about 5 kt and turned to southerly by the end of the cruise.

4. R/V *Kilo Moana* OFFICERS AND CREW, TECHNICAL SUPPORT

The R/V *Kilo Moana* continues to maintain 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)

March 5, 2013
0850- All aboard. Depart Snug Harbor
1000- Safety briefing with the Captain and Chief Scientist
1045- Fire and abandon ship drills
1130- Arrive at Station Kahe, weight cast to 500 m
1244- Hyperpro cast (3 cycles)
1325- End of Hyperpro
1340- S1C1, 1000 m CTD cast.

1501- End of cast.
1520- Transit to Station ALOHA
2305- Arrive at Station ALOHA
2312- Deployed Sediment Traps (22° 44.915’N, 158° 2.237’W)

March 6, 2013
0021- S2C1 200 m CTD cast.
0103- End of cast.
0156- S2C2 1000 m CTD cast.
0315- End of cast.
0448- Deployed PP Array 22° 44.935’N, 158° 1.076’W
0509- S2C3 PO Deep Cast.
0708- At 3 m off the bottom (22° 44.992’N, 158° 0.020’W)
0911- End of cast.
0915- Transit to pump ship's tanks
1015- Net Tow starts
1045- End net tow
1116- S2C4 1000 m CTD PO Shallow
1244- End of cast.
1250- Hyperpro cast (3 cycles)
1330- End Hyperpro
1348- S2C5 1000 m CTD.
1502- End of cast.
1505- Transit to pump ship’s tanks
1648- S2C6 1000 m CTD.
1800- End of cast.
1915- Recover PP array 22° 39.364'N 158° 6.877'W
1934- Array on board
2004- S2C7 1000 m CTD
2121- End of cast.
2156- Net Tow starts
2225- End net tow
2230- Net Tow starts
2300- End net tow
2313- S2C8 1000 m CTD.

March 7, 2013
0017- End of cast.
0020- Transit to pump ship’s tanks
0154- S2C9 1000 m CTD.
0310- End of cast.
0420- Gas Array Deployment 22° 45'N 158° 1.14'W
0455- S2C10 1000 m CTD
0600- End of cast.
0756- S2C11 1000 m CTD
0908- End of cast.
0910- Transit to pump ship’s tanks
1010- Net tow start
1040- End Net tow
1040- ATE inoperable, not deployed
1055- S2C12 1000 m CTD
1205- End of cast.
1220- Net Tow start
1253- End Net Tow
1256- Net tow start (E. Grabowski)
1346- End Net Tow

1358- S2C13 1000 m CTD
1512- End of cast.
1540- Transit to pump ship's tanks
1648- S2C14 1000 m CTD
1800- End of cast.
1849- Transit to pump ship's tanks
1953- S2C15 1000 m CTD
2104- End of Cast.
2200- Net Tow
2226- End of net tow
2251- S2C16 PO 2nd deep cast

March 8, 2013
0044- At 5 m off the bottom 22° 45.017'N 158° 0.037'W
0226- End of Cast.
0305- AC9/FRRf
0400- End first cast
0405- AC9/FRRf
0444- End of second cast
0650- Gas Array recovery 22° 36.531'N 158° 16.972'W
0700- Transit to recover sediment traps
0812- Sediment Trap Recovery 22° 31.295'N 158° 22.196'W
0815- Transit to WHOTS mooring
1104- AC9/FRRf
1155- AC9/FRRf on deck, start second deployment
1242- End cast
1255- Hyperpro cast (3 cycles)
1340- End cast
1345- S50C1 200 m yo-yo cast
1521- End of cast, 5 cycles completed
1530- Transit to Station Kaena
2109- Arrive at Station Kaena, S6C1 –near bottom CTD
2316- End of cast
2320- Transit to Snug Harbor

March 9, 2013
0700- Arrive H buoy
0730- Arrive Snug Harbor, full offload.

6. HOT program sub-components:

Investigator	Project	Institution
Matt Church	Core Biogeochemistry	UH
Dave Karl		
Bob Bidigare		
Roger Lukas	Hydrography	UH
Mike Landry	Zooplankton dynamics	SIO
Ricardo Letelier	Optical measurements	OSU
Ancillary programs:		
Charles Keeling	CO_2 dynamics and intercalibration	SIO
Paul Quay	$DI^{13}C$	SIO
Matt Church	Diversity and activities of nitrogen-fixing microorganisms	UH

Additional programs:

Dave Karl (via Sam Wilson)	Reduced gases in the upper ocean: The cycling of methane, sulfide and nitrous oxide	UH/Moore
Adina Paytan	O^{18} natural abundance	UCSC
Matt Church (via Shimi Rii)	Investigation of temporal changes in picoeukaryote diversity at Station ALOHA	UH
Grieg Steward (via Christopher Schvarcz)	Viral Dynamics in the Oligotrophic Open Ocean, Station ALOHA	UH
Erica Goetze	Temporal stability of copepod populations at Station ALOHA	UH
Matt Church (via Daniela Bottjer)	Nitrogen Fixation and Nutrient Addition Experiment	UH
Dave Karl (via John Casey)	Water collection for media preparation	UH/CMORE
David Murphy, Carol Janzen	Testing of Oxygen Sensors and Conductivity Cells	Sea-Bird Electronics
Ed Delong (via Oscar Sosa)	Cultivation of Heterotrophic Microbes by Dilution	MIT/CMORE
Matt Church (via Eric Grabowski)	Carbon and Nitrogen Standards collection Video documenting cruise activities	UH/CMORE