HOT-223: Chief Scientist Report

Chief Scientist: Susan Curless

R/V *Kilo Moana*

July 7-11, 2010

Cruise ID: **KM-1012**
Departed: July 7, 2010 at 0800 (HST)
Returned: July 11, 2010 at 0808 (HST)
Vessel: **R/V *Kilo Moana***
Operator: University of Hawaii
Master of the Vessel: Captain Ross Barnes
Chief Scientist: Susan Curless
OTG Technicians: Justin Smith and Ben Colello

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 the first day of the cruise for about 2.5 hours.
2) Station 2, referred to as Station ALOHA (A Long Term Oligotrophic Habitat Assessment) 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 the 2nd, 3rd, and 4th days of the cruise.
3) Station 52, is the site of the WHOTS-6 Mooring, located at 22° 39.989'N, 157° 56.961'W will be occupied on the 4th day of the cruise 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 will be occupied on the 4th day of the cruise for approximately 3 hours.

Upon arrival to Station Kahe a 1000 lb. weight-test cast to 1000 m, one CTD cast to 1000 m, and a Hyperpro cast were to be conducted at this location on the afternoon of July 7th. 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 at 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 one shallow CTD cast to 200 m, one 1000 m cast (to collect water for the Primary Production Array), and a second 200 m CTD cast. These three casts were to be followed by the deployment of the free-drifting Primary Productivity Array to incubate insitu 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 July 9th.

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

A plankton net was to be towed between 1000-1400, and 2200-0200 for 30 min intervals on July 8th and 9th at Station ALOHA.

The ATE was to be deployed at 1300 on July 8th to collect a trace metal free water sample.

The Hyperpro was to be deployed for half-hour periods near noon time on July 7th, 9th, and 10th.

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 of July 10th and around noon time on July 9th and 10th.

After the 36 hour burst period of CTD work at Station ALOHA was accomplished, the ship was to transit to recover the floating Sediment Trap array and the Gas Array on the morning of July 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 52 were complete, the ship was to re-position within Station ALOHA to conduct an ACS/AC9/FRRf/LISST cast, a Hyperpro cast, and 200 m CTD cast.

At opportune times in the schedule, the ship was to position itself approximately 1 km away from the HPM (HOT Profiler Mooring) to communicate with the mooring through a hydrophone.

Once those operations 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, meteorological package and the pCO2 system.

2. SCIENCE PERSONNEL

Participant	Title	Affiliation/HOT Group
Daniela Böttjer	Post-doc	UH/CMORE
Susan Curless	Chief Scientist – Res. Assoc.	UH/BEACH
Daniela del Valle	Post-doc	UH/BEACH
Lance Fujieki	Computer Specialist	UH/BEACH
Adriana Harlan	Research Associate	UH/BEACH
Dan Sadler	Research Associate	UH/BEACH
Brett Updyke	Research Associate	UH/BEACH
Donn Viviani	Graduate Student	UH/BEACH
Brenner Wai	Technician	UH/CMORE
Blake Watkins	Marine Engineer	UH/BEACH
Jim Foley	Marine Educator	UH/CMORE
Lydia Baker	Graduate Student	UH/CMORE
Kiara Kealoha	Intern	CMORE
Cameron Fumar	Research Associate	UH/PO
Bo Keopaseut	Research Associate	UH/PO
Paul Lethaby	Research Associate	UH/PO
Jefrey Snyder	Marine Technician	UH/PO
Craig Nosse	Research Associate	UH/PO
Didier Dumas	Graduate Student	UH/PO
Chris Schvarcz	Graduate Student	UH
Qian (Lydia) Li	Graduate Student	UH
Bruce Howe	Scientist	UH
Jennie Mowatt	Technician	UH
Kiminori Shitashima	Scientist	CRIEPI/Japan
Justin Smith	Marine Technician	OTG
Ben Colello	Marine Technician	OTG

3. GENERAL SUMMARY

Operations during the cruise were conducted as planned with only minor schedule delays experienced. These delays were a result of all cruise operations being conducted through the A-Frame and the need to break down from CTD operations and set-up for back deck operations (array deployment/recovery ops, net tows, optics instrument casts) caused delays to the schedule.

Two objectives for HOT 223 were not met.
-The ATE trace metal sampler was not working correctly or communicating with the computer and was therefore not deployed and no sample was collected.
-The weather did not provide safe conditions for launching the small boat. Without the ability to safely retrieve the Gliders should they fail in their test checkout dive, the Sea Glider's were not deployed.

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

The floating sediment trap array, primary production array, and gas array were all deployed and recovered successfully. All three arrays drifted to the northeast of the center of ALOHA.

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

Two hand net tows were conducted on July 8th and 9th for Chris Schvarcz and Lydia Baker.

The Hyperpro was deployed three times around noon.

The optical package ACS/AC9/FRRf/LISST was deployed three times during the cruise, twice around noon and once in the early morning.

Attempts to communicate with the HPM proved problematic at the 1 km distance from the mooring. In further attempts the ship was re-positioned closer to the mooring anchor coordinates in hopes of increasing the chances for successful communication. Despite problems with the deck unit for the hydrophone, partial file downloads from the HPM were achieved at the closer distance.

The ADCP, thermosalinograph, fluorometer, pCO2 system and the ship's meteorological system ran without interruption throughout the cruise.

Winds were from the east throughout the cruise at 15-25 kts. The seas were also from the east, building from 2-3 ft to 4-6 ft throughout the cruise, and an easterly swell of 4-6 ft was present at Station ALOHA.

We arrived at Snug Harbor for off-loading on July 11th, at 0808 (HST).

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 Ross and the ship's crew showed enthusiasm, concern, and dedication to our scientific mission.

Technical support during this cruise was good. OTG personnel were available at any time to assist in our work.

5. DAILY REPORT OF ACTIVITIES (HST)

July 7, 2010
0800- Depart Snug Harbor
0912- Fire and abandon ship drills
0943- Secure from all drills
0950- Science party meeting and briefing with Captain.
1024- A-Frame launching procedures and rules meeting with AB's and CM.
1100- 1000 lb. 1000 m weight Cast
1200- End weight cast
1215- Hyperpro
1255- S1C1 1000m CTD cast- pinger was not turned on and was noticed once package was already in the water. Package recovered, pinger turned on, and packaged re-deployed.
1304- S1C1 cast re-deployed
1438- Transit to ALOHA
2218- Arrive at Station ALOHA
2335- Sediment Trap Deployed, 3 miles east of the center, 22° 45.067'N 157° 56.957'W

July 8, 2010
0017- S2C1 200m CTD cast
0124- S2C2 1000m CTD cast
0301- End of cast
0320- Transit to 2 miles east of the center
0408- S2C3 200m CTD
0455- End of cast
0530- Deployment of the Primary Production Array 22° 44.8'N 157° 57.7'W, 2 miles east of the center.
0607- S2C4 PO Deep Cast
0806- 5m off the bottom 22° 45.0'N 158° 00.1'W
1010- End of cast
1015- Transit to pump ship's tanks
1200- S2C5 PO shallow 1000 m CTD cast
1358- Net tow (BW)
1440- Hand net tow (CS)
1451- Second hand net tow (CS/LB)
1504- Hand nets on board
1534- S2C5 1000m CTD cast
1613- Hydrophone deployed (B.Howe) 22° 45.2'N 158°00.9'W
1754- S2C7 1000m CTD cast
2045- PP array recovered 22° 54.075'N 157° 52.301'W
2138- S2C8 1000m CTD cast
2325- Net tow (BW)
2355- Net tow (BW)

July 9, 2010
0030- S2C9 1000m CTD cast
0233- S2C10 1000m CTD cast
0430- Gas Array Deployed 22° 44.873'N 157° 56.749'W
0459- S2C11 1000m CTD cast
0808- Hydrophone in water (B.Howe) 22° 45.013'N 157° 54.585'W
0823- Hydrophone on board
0855- End of cast
0900- Transit to pump ship's tanks.
1000- Hand net tows, two total in water (CS)
1005- Hydrophone in water 22° 44.95'N 158° 1.146'W
1021- Hydrophone on board
1023- Hand net tows on board
1027- Net tow (BW)
1058- Net on board
1104- S2C13 1000m CTD cast
1210- End of cast
1227- Net tow (BW)
1254- Net on board
1305- Hyperpro
1334- AC9/FRRf
1411- End AC9
1421- S2C14 1000m CTD cast

1558- End of cast
1614- Hydrophone in water (B.Howe) 22° 45’N 158° 00.9’W
1621- Hydrophone on board
1654- S2C15 1000m CTD cast
1804- End of cast
1956- S2C16 1000m CTD cast
2200- Net tow (BW)
2300- S2C17 PO 2nd Deep

July 10, 2010
0100- 5m off the bottom 22° 45.040'N 157° 59.998'W
0255- End of Cast
0315- AC9/FRRf
0354- End of AC9/FRRf
0646- Sediment Trap Recovery 23° 10.66'N 157° 45.41'W
0713- Transit to Gas Array
0830- Recovery of Gas Array 22° 59.54'N 157° 47.04'W
0915- Transit to Station 52
1130- S52C1 200 m yo-yo cast
1310- End of cast
1314- Hyperpro
1345- AC9/FRRf
1425- End of AC9/FRRf
1438- S2C18 200 m CTD cast
1506- End of cast
1515- Transit HPM (HOT Profiler Mooring)
1612- Arrive at HPM 22° 45.026’N 158° 1.543’W, floats off starboard side, Hydrophone in water.
1630- Hydrophone on board
1632- Transit to Station Kaena
2145- Arrive Station Kaena
2200- S6C1 near bottom CTD cast 21° 50.776’N 158° 21.80’W

July 11, 2010
0012- End of cast
0030- Transit to Snug Harbor
0808- Arrive Snug Harbor for full off-load

HOT program sub-components:

Investigator	Project	Institution
Matt Church	Core Biogeochemistry	UH
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	$DI^{13}C$	UW
Penny Chisholm	Prochlorococcus population dynamics	MIT
Matt Church	Diversity and activities of nitrogen-fixing microorganisms	UH
Various CMORE PI's	Microbial RNA/DNA collection	UH/CMORE
Additional programs:		
Dave Karl (via Sam Wilson)	Reduced gases in the upper ocean: The cycling of methane, sulfide and nitrous oxide.	UH
Grieg Steward (via Chris Schvarcz)	Virus collection and concentration from Station ALOHA waters.	UH/CMORE
Dave Karl (via Daniela del Valle)	Radio labeled methylphosphonate method developing analysis.	UH
Lydia Baker	Diatom-bacterial interactions	UH
Bruce Howe and Matthew Alford	HOT Profiler Mooring communication and data transmission testing	UH/APL
Qian Li	Thraustochytrid abundance distribution and diversity at Station ALOHA	UH
Kiminori Shitashima and Bruce Howe	In-situ pCO2/pH sensor testing	CRIEPI/UH
Dave Karl (via Steve Poulos)	Sea Glider deployment at Station ALOHA	UH
Angel White	ALOHA surface seawater collection	OSU
Matt Church (via Donn Viviani, Daniela Böttjer, and Dan Sadler)	Carbon dioxide ocean perturbation experiment.	UH