HOT-224: Chief Scientist Report

Chief Scientist: Susan Curless

R/V *Kilo Moana*

August 6-10, 2010

Cruise ID: **KM-1015**
Departed: August 6, 2010 at 0900 (HST)
Returned: August 10, 2010 at 0750 (HST)
Vessel: **R/V *Kilo Moana***
Operator: University of Hawaii
Master of the Vessel: Captain Ross Barnes
Chief Scientist: Susan Curless
OTG Technicians: Kuhio Vellalos 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 50, is the site of the WHOTS-7 Mooring, located at 22° 46.0'N 157° 54.0'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 500 m, one CTD cast to 1000 m, and a Hyperpro cast were to be conducted at this location on the afternoon of August 6th. 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 August 8th.

Another free-drifting array (Gas Array) was to be deployed for 24 hours for incubation experiments on August 8th. The Gas Array was to be recovered on August 9th.

A plankton net was to be towed between 1000-1400, and 2200-0200 for 30 min intervals on August 7th and 8th at Station ALOHA.

The ATE was to be deployed at 1300 on August 7th to collect a trace metal free water sample.

The Hyperpro was to be deployed for half-hour periods near noon time on August 6th, 8th, and 9th.

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 August 9th and around noon time on August 8th and 9th.

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 August 9th.

After recovering the arrays, the ship was to transit to Station 50 to conduct a one-hour 200 m CTD yo-yo cast. Once operations at Station 50 were complete, the ship was to re-position within Station ALOHA to conduct an ACS/AC9/FRRf/LISST cast, and a Hyperpro cast.

Once those operations were complete, the ship was to position itself approximately 0.5 km away from the HPM (HOT Profiler Mooring) to communicate with the mooring through a hydrophone.

Throughout the scheduled time at Station ALOHA, three two hour time slots were set aside for the deployment of Sea Glider #146. Deployment would only occur if weather conditions allowed for small boat operations to be conducted safely. Whether this operation was allowed to occur was at the Captain's discretion.

Once Station ALOHA 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
Scott Grant	Research Associate	UH/CMORE
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
Sandra Martinez-Garcia	Scientist	UVigo/BEACH
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
Daniel Tiedge	Undergraduate Student	UH/PO
Nicholas Seymour	Student Assistant	UH/PO
Kuhio Vellalos	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. During the planned 500 m weight cast at Station Kahe random thumping in the wire drum per drum rotation were experienced during the weight down cast. The Chief Engineer explained that excess slack had been introduced into the drum from the previous cruise's shallower casts with a lighter package. To get excess slack out of the trawl winch drum before attaching the CTD package to the wire, the weight cast was conducted to 1000 m.

One 1000 m CTD cast was completed at Station Kahe. Two near bottom CTD casts, thirteen 1000 m and two 200 m CTD casts were conducted at Station ALOHA. One 200 m yo-yo CTD cast was completed near the WHOTS mooring (Station 50). 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 NNW 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.

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.

The ADCP, thermosalinograph, fluorometer, pCO2 system ran without interruption throughout the cruise, however it was noticed that there were temperature discrepancies between the CTD, the thermosalinograph, and the pCO2 system. The thermosalinograph temperature was higher than the CTD temperature and the pCO2 system temperature was much lower than both the CTD and thermosalinograph temperatures. The data streams from these instruments will have to be closely analyzed to isolate these anomalies from the regular data stream. This problem was reported to OTG.

Winds were from the east throughout the cruise at 10-20 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 2-3 ft was present at Station ALOHA.

We arrived at Snug Harbor for off-loading on August 10th, at 0750 (HST).

Three objectives for HOT 224 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 Sea Glider should it have failed during the checkout dive, the Sea Glider was not deployed.
-Communication problems persist with the HPM despite the new transducer. After two attempts, a successful download of information from the mooring did not occur.

Ship's equipment that was not operational during the cruise:
-Knudsen 12kHz passive sub-bottom profiler
-Meteorological package had data logging issues throughout the cruise.
-The blue SeaMac winch was operational during the cruise, however the on/off control switch on the SeaMac winch does not work and power can only be cut to the winch at the plug outlet in the staging bay.

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)

August 6th, 2010
0900- Depart Snug Harbor
0940- Fire and abandon ship drill
1026- Science party meeting with Captain
1146- Weight cast to 500 m
1200- Thumping noise noticed with trawl winch with random thumps per drum revolution. Engineering was called to investigate the problem. Chief Engineer Roy explained that the thumping was slack in the wire tightening...his guess was that the shallower casts on the previous cruise with a lighter packaged introduced small amount of slack into the drum and that our heavier weight and packaged would work the slack out as we continued our operations. We decided to take the weight down to 1000 m to make sure this was the case and to attempt to get as much slack out as we could before attaching the package.
1246- Weight cast on board
1304- Hyperpro cast

1315- Hyperpro on board
1346- S1C1 1000 m CTD cast -console computer issues and ship's need to re-position on station delayed deployment.
1516- End of cast
1530- Transit to Station ALOHA
2310- Arrive at Station ALOHA, 1 mile NE of the center
2339- Sediment Traps deployed 22° 45.939'N 157° 58.876'W

August 7, 2010
0009- S2C1 200 m CTD cast
0041- End of cast
0116- S2C2 1000 m CTD cast for Primary Production
0227- End of cast
0344- S2C3 200 m CTD cast
0413- Deployment of the PP Array 0.5 miles NE of the center 22° 45.422'N 157° 59.667'W
0533- Deployment complete
0537- S2C4 near bottom PO deep CTD cast, 6 m off the bottom 22° 44.885'N 157° 59.649'W
0918- End of cast
1030- Net tow
1105- End of net tow
1126- S2C5 1000 m CTD cast PO shallow
1148- End of cast
1309- Net tow
1340- End of net tow
1415- S2C6 1000 m CTD cast
1654- S2C7 1000 m CTD cast
1908- Recovered Primary Production Array 22° 50.781'N 158° 2.214'W
2000- S2C8 1000 m CTD cast
2200- Net Tow
2257- S2C9 1000 m CTD cast

August 8, 2010
0106- Net Tow
0156- S2C10 1000 m CTD cast
0352- Gas Array Deployed 22° 45.371'N 157° 59.402'W
0522- S2C11 1000 m CTD cast
0620- End of cast
0753- S2C12 1000 m CTD cast
0855- End of Cast
1000- Net Tow
1035- Net tow completed
1051- S2C13 1000 m CTD cast
1156- End of cast
1204- Hyperpro
1220- Hyperpro on board
1235- AC9/FRRf
1313- End of AC9/FRRf cast
1316- Transit to pump ship's tanks
1415- S2C14 1000 m CTD cast

1538- End of S2C14
1659- S2C15 1000 m CTD cast
1811- End of cast
1953- S2C16 1000 m CTD cast
2105- End of cast
2115- Transit to pump tanks
2200- Net Tow
2228- Net on board
2302- S2C17 PO 2nd Deep CTD cast

August 9, 2010
0044- 6 m off the bottom 22° 44 976'N 157° 59.496'W
0229- End of cast
0308- AC9/FRRf cast
0352- AC9/FRRf recovered
0355- Transit to Sediment traps
0543- Sediment Traps Recovered 22° 58.54'N 158° 5.58'W
0601- End of Recovery
0603- Transit to Gas Array
0655- Recovery of the Gas Array 22° 53.8'N 158° 6.15'W
0706- End of Recovery
0710- Transit to Station 50
0905- S50C1 200 m yo-yo CTD cast
1015- End of cast
1025- Transit to HPM
1208- Hydrophone deployed 22° 45.258'N 158° 1.768'W
1210- Listening to HPM -not allowing download
1228- Recovered hydrophone
1247- Hyperpro
1304- AC9/FRRf
1345- AC9/FRRf recovered
1413- Deploy Hydrophone
1417- Talking to Hydrophone 22° 45.550'N 158° 2.101'W
1428- Recovery of Hydrophone
1438- Transit to Station Kaena
1930- Arrive Station Kaena
1957- S6C1 near bottome CTD cast
2223- End of cast
2225- Transit Snug Harbor

August 10, 2010
0750- Arrive at Snug Harbor starboard side to the pier for equipment off loading
0920- All fast port side to pier 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/Moore
Dave Karl (via Daniela del Valle)	Radio labeled DMSP assimilation rates and method developing analysis.	UH/Moore
Dave Karl (via Sandra Martinez-Garcia)	In-vivo INT reduction method incubation time experiments.	UH/UVigo
Bruce Howe and Matthew Alford	HOT Profiler Mooring communication and data transmission.	WHOI/APL
Dave Karl (via Steve Poulos)	Sea Glider deployment at Station ALOHA	UH
Alli Fong	ALOHA surface seawater collection for aggregates.	UH/CMORE
Matt Church (via Donn Viviani, Daniela Böttjer, and Dan Sadler)	Carbon dioxide ocean perturbation experiment.	UH