

HOT-231 Chief Scientist's Report

Chief Scientist: Craig Nosse

R/V Kilo Moana

April 10 – 14, 2011

Cruise ID: **KM 11-13**

Departed: April 10, 2011 at 0900 (HST)

Returned: April 14, 2011 at 0730

Vessel: **R/V Kilo Moana**

Master of the Vessel: Captain Gray Drewry

OTG Marine Technicians: Trevor Goodman, Trevor Young and Dan Fitzgerald

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 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 the 2nd, 3rd, and 4th days of the cruise.
- 3) Station 50, the site of WHOTS-7 Mooring, approximate position 22° 46.0052'N 157° 53.9897'W was to 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 was to be occupied on the 4th day of the cruise for about 2 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 on the afternoon of April 10th. 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 53 hours. This was to be followed by one shallow CTD cast to 200 m and one 1000 m cast (to collect water for the Primary Production Array). These two casts were to be followed by the deployment of the free-drifting Primary Production Array to incubate insitu for about 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 April 12th.

Another free-drifting array (Gas Array) was to be deployed for 24 hours for incubation experiments on April 12th. The Gas Array was to be recovered on April 13th.

A plankton net was to be towed between 1000-1400 and 2200-0200 for 30 minute intervals on April 11th-12th at Station ALOHA.

The Hyperpro was to be deployed for a half-hour period near noon time on April 10th, 12th and 13th.

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 around noon time on April 12th and 13th and in the early morning of April 13th.

An Automated Trace Element Sampler (ATE) was to be deployed on April 11th to a depth of 10 m.

After recovering the arrays, the ship was to transit to Station 50 to collect 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, a Hyperpro cast, a shallow 200 m CTD cast and a VANES cast.

Trace-metal clean samples were to be collected using VANE samplers from the Massachusetts Institute of Technology (MIT). These samplers were to be attached to the ship's CTD wire via clamps and deployed to 1000 m. After the operation was complete, the ship was to transit to Station Kaena.

Station 6, referred to as Station Kaena, was to be occupied with one near-bottom CTD cast (~2500 m) with water samples collected for salinity and chlorophyll analysis and calibration.

After Station Kaena operations were completed 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 a pCO₂ system.

2. SCIENCE PERSONNEL

Participant	Title	Affiliation/HOT Group
Susan Curless	Research Associate	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
Blake Watkins	Marine Engineer	UH/BEACH
Donn Viviani	Graduate Student	UH/BEACH
Cameron Fumar	Research Associate	UH/PO
Jefrey Snyder	Marine Technician	UH/PO
Craig Nosse	Research Associate	UH/PO
David Hashisaka	Research Associate	UH/PO
Alison Andrews	Undergraduate Intern	UH/PO
Sherine Boomla	Volunteer	UH/PO
Sara Thomas	Technician	UH/CMORE
Scott Grant	Graduate Student	UH/CMORE
Jessica Fitzsimmons	Graduate Student	MIT
Trevor Goodman	Marine Technician	OTG
Trevor Young	Marine Technician	OTG
Dan Fitzgerald	Marine Technician	OTG

3. GENERAL SUMMARY

Operations during the cruise were primarily set back due to a failed underwater connector (see Section 4A) for the CTD that caused a three hour delay. That delay combined with the heavy sea state, which required slower winch speeds, impeded progress towards completing 100% of all planned activities. Some time was recovered during the cruise (by combining work on some CTD casts) but not enough to be able to complete the 2nd deep CTD cast at Station ALOHA nor the near-bottom CTD cast planned at Station Kaena.

Completed CTD work included: one 1000 m CTD cast at Station Kahe and one near-bottom, one 200 m and fourteen 1000 m CTD casts at Station ALOHA. The 200 m yo-yo CTD cast was also completed near the WHOTS mooring (Station 50) but only three of the six planned cycles were completed to recover some time in the cruise schedule.

The floating sediment trap array, primary production array, and gas array were all deployed and recovered successfully. Drift tracks for the arrays were generally to the northwest. Recovery of the primary production array was delayed for approximately 20 minutes due to problems with the ship's bow thruster.

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

The Hyperpro was deployed and recovered successfully three times near noon.

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

Due to schedule constraints, the science party elected to not deploy the ATE.

The VANE samplers were deployed with all eight samplers successfully collecting water.

The ADCP, fluorometer, pCO₂ and meteorological system ran without interruption during the cruise.

Winds were from the east throughout the cruise at around 20 knots. Seas were in the 8-10 foot range for most of the cruise. Sea state was rough enough to require enabling of “heave compensation” for the Caley CTD winch system in order to maintain wire tension with reasonable average wire speed during CTD casts.

After many of the CTD casts, twists developed in the CTD wire just above the rosette. The CTD had to be detached from the wire to eliminate the twists each time they occurred. About 10-15 minutes were required to perform the untwisting. The cause of the twists is currently under investigation and the UH Marine Center has received helpful information from the University of Delaware which is familiar with a similar CTD winch system.

We arrived at Snug Harbor for off-loading on April 14th, at 0730 (HST).

4. INCIDENTS AFFECTING SCIENCE OPERATIONS

Two incidents occurred during the cruise affecting science operations:

A) Underwater connector failure

The CTD showed communications errors as the instrument was being prepared for the first deep cast at Station ALOHA on April 11th at about 0535 (HST). After a thorough diagnostic check, it was determined that an underwater connector from the CTD wire termination had failed. Jeffrey Snyder noted that he had seen other underwater connectors of this type, from the same manufacturer, fail in a previous experience.

The failed connector was replaced and tested. The entire diagnosis and repair process took about three hours. Given that the deep cast was already one hour behind schedule (mostly due to weather conditions requiring slower winch speeds and delaying operations in general), the cruise became four hours behind schedule once CTD operations could be resumed.

B) Bow thruster failure

The ship's bow thruster failed as preparations were being made to recover the Primary Production Array on April 12th at about 2015 (HST). The bow thruster would not start and the recovery had to be completed without its use. The failed bow thruster caused about a 20 minute delay. Bad circuit boards for the bow thruster were found the next morning and were replaced.

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

The UH Marine Center, Captain and ship's crew worked to accommodate our scientific work. Of particular note, their efforts to allow us to load on April 9th, within their already scheduled work, was very much appreciated.

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

6. DAILY REPORT OF ACTIVITIES (HST)

April 10th, 2011

0900 Depart Snug Harbor
0940 Safety meeting
1010 Fire and emergency drill
1200 Weight test cast
1310 Hyperpro
1336 S1C1 - 1000 m CTD cast
1526 Transit to Station ALOHA
2229 Arrive Station ALOHA
2311 Sediment trap deployed at 22 41.015 N, 157 59.973 W
2358 S2C1 - 200 m CTD cast

April 11th, 2011

0200 S2C2 - 1000 m CTD cast
0530 Primary productivity array deployed at 22 40.017 N, 158 0.021 W
0535 CTD experiencing communication problem. Troubleshooting and testing reveals failed underwater connector. Reterminate.
0836 Begin S2C3 - 4800 m CTD cast
1340 Net tow
1515 S2C4 - 1000 m CTD cast
1720 Transit to pump tanks
1827 S2C5 - 1000 m CTD cast
2050 Recovered Primary Productivity Array at 22 46.82 N, 158 5.69 W
2137 S2C6 - 1000 m CTD cast
2336 Net tow

April 12th, 2011

0011 Net tow
0045 Transit to pump tanks
0121 S2C7 - 1000 m CTD cast
0352 S2C8 - 1000 m CTD cast
0655 Deployed Gas Array at 22 45.00 N, 158 0.00 W
0709 S2C9 - 1000 m CTD cast
0930 S2C10 - 1000 m CTD cast
1115 Transit to pump tanks
1145 Net tow
1220 Hyperpro
1250 AC9
1335 S2C11 - 1000 m CTD
1455 S2C12 - 1000 m CTD
1633 Transit to pump tanks
1801 S2C13 - 1000 m CTD
2056 S2C14 - 1000 m CTD
2232 Net tow

2302 Transit to pump tanks
2359 S2C15 - 1000 m CTD

April 13th, 2011

0205 AC9
0300 S2C16 - 1000 m CTD
0700 Recover sediment traps at 23 1.369 N, 158 6.613 W
0840 Recover gas array at 22 53.966 N, 158 13.328 W
1040 S50C1 - 200 m yo-yo CTD
1218 Hyperpro
1240 AC9
1411 VANES cast
1710 Transit to Snug Harbor

April 14th, 2011

0730 Arrive Snug Harbor, starboard side to pier to unload OTG Rad Van and incubators
0850 Shifting ship
0930 All secure port side to pier for full offload

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	SIO
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
Ed Laws (via Scott Grant)	P ³³ uptake experiment	UH
Matt Church (via Donn Viviani)	Bacterial production and EOC at Station ALOHA	UH
Matt Church (via Donn Viviani, Daniela Bottjer, and Dan Sadler)	Ocean Perturbation Experiment	UH
Ed Boyle (via Jessica Fitzsimmons)	Intercalibration and methods development for colloidal iron analyses	MIT
Henrieta Dulaiova and Ken Buesseler	Japanese radionuclide release sampling	UH