

# HOT-225: Chief Scientist Report

Chief Scientist: Paul Lethaby

*R/V Kilo Moana*

September 2-6, 2010

Cruise ID: **KM-1017**

Departed: September 2, 2010 at 0900 (HST)

Returned: September 6, 2010 at 0750 (HST)

Vessel: **R/V Kilo Moana**

Operator: University of Hawaii

Master of the Vessel: Captain Ross Barnes

Chief Scientist: Paul Lethaby

OTG Technicians: Kuhio Vellalos and Trevor Goodman

## 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 2<sup>nd</sup>, 3<sup>rd</sup>, and 4<sup>th</sup> 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 4<sup>th</sup> 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 4<sup>th</sup> 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, a Hyperpro cast, and a 20 m hand-held Niskin cast were to be conducted at this location on the afternoon of September 2nd. 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 September 4th.

Another free-drifting array (Gas Array) was to be deployed for 24 hours for incubation experiments on September 4th. The Gas Array was to be recovered on September 5th.

A plankton net was to be towed between 1000-1400, and 2200-0200 for 30 min intervals on September 3rd and 4th at Station ALOHA.

A hand-held surface net tow was to be conducted at 1300 on September 3rd.

An Automatic Trace Element sampler (ATE) was to be deployed at 1330 on September 3rd to collect a trace metal free water sample.

The Hyperpro was to be deployed for half-hour periods near noon time on September 3rd, 4th, and 5th.

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 September 5th and around noon time on September 4th and 5th.

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 September 5th.

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 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 pCO<sub>2</sub> 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
Donn Viviani	Graduate Student	UH/BEACH
Brenner Wai	Technician	UH/BEACH
Daniela Böttjer	Post-doc	UH/CMORE
Scott Grant	Research Associate	UH/CMORE
Blake Watkins	Marine Engineer	UH/BEACH
Cameron Fumar	Research Associate	UH/PO
Paul Lethaby	Chief Scientist – Res. Assoc.	UH/PO
Jefrey Snyder	Marine Technician	UH/PO
Craig Nosse	Research Associate	UH/PO
Rebecca Baltés	Graduate Student	UH/PO
Derick Kato	Volunteer	UH/PO
Jim Foley	Marine Educator	UH/CMORE
Davilla Riddle	Teacher	Kalama Intermediate
Dana Spink	Teacher	Toledo Elementary
Mark Shanahan	Teacher	Kalani High
Brandon Carter	Technician	UCSC
Dave Wisegarver	Technician	NOAA/PMEL
Dong-Ha Min	Scientist	UT
Kuhio Vellalos	Marine Technician	OTG
Trevor Goodman	Marine Technician	OTG

## 3. GENERAL SUMMARY

Operations during the cruise were conducted mostly as planned. Delays to the schedule were caused by the electrical failure of one of the conductors in the 0.680 trawl wire which was being used for CTD casts. The electrical failure occurred during the deep cast S2C4 at 1400 dbar on the upcast.

Intermittent modulo errors had been experienced during the first cast at Station Kahe indicating likely problems with the electrical signal along the wire. It was suspected that the termination was the cause and during the transit to ALOHA J. Snyder re-did the electrical part of the termination. No problems were observed during the first cast at Station ALOHA which was to 200 m. However, three modulo errors occurred during the second cast to 1000 m. A third cast to 200 m again showed no problems. During the deep cast five modulo errors were experienced on the downcast and two more on the upcast before all communication was lost to the deck box at 1400 dbar. Power to the CTD was switched off and the rosette was recovered. Additionally there were errors reported with communications to the water carousel which resulted in the three deepest bottles not being fired. Subsequent to this, the remaining bottles were closed using the manual button on the deck box before communication was lost. As a result only 19 out of 24 sample bottles were closed.

Inspection of the old termination revealed that the water jacket containing the three conductors had not been properly waterproofed. Insulation testing showed a large difference in resistance between the conductor in use and the two unused conductors. Fifty meters of wire was cut and a complete re-termination using one of the spare conductors was made. No problems were observed with the wire for the remainder of the cruise.

As a result of the trouble shooting and re-termination following the deep cast, the first cast of the 36 hour burst sampling period originally scheduled for 1100 on September 3rd (Shallow PO cast S2C5) was postponed until 1400; [Casts 6 – 8 were all started 3 hours later than scheduled]. The PUR cast (S2C9) scheduled for 2300 on September 3rd was moved to 2300 the following day and the second deep cast was rescheduled for 0130 on September 5th so as not to affect the order and timing of the remaining casts. The nighttime optical cast originally scheduled for 0300 on September 5th was moved forward to 0300 on September 4th.

The first cycle of the yo-yo cast near to the WHOTS mooring was to 750 dbar to remove a gap in the level wind on the winch drum. The remaining cycles were to 200 dbar as scheduled.

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 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. The primary productivity array was recovered later than expected in full nighttime conditions due to extended transit and maneuvering. All three arrays drifted to the WNW 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.

One hand held 20 m Niskin cast was conducted at Station Kahe.

One hand held surface net tow was conducted at Station ALOHA.

The Hyperpro was deployed three times around noon.

The optical package AC9/FRRf/LISSST was deployed three times during the cruise, twice around noon and once in the early morning. The package did not contain the ACS as it was out for repair/calibration.

The ADCP, thermosalinograph, fluorometer, pCO<sub>2</sub> and meteorological system ran without interruption throughout the cruise. The meteorological system continued to have the same issues brought to the attention of OTG after HOT-223. Air temperatures (RM Young RTD and Rotronics humidity temperature) were not accurate. The electronic spiking that was affecting several of the sensors at the same time is still present. The sensors affected were the Biospherical PAR sensor, the Epply PIR sensor, the Rotronics humidity probe, and the RM Young rain gauge. The starboard anemometer has been replaced with the anemometer originally used prior to KM1010 at the request of the bridge.

Winds were from the east throughout the cruise at 15-20 kts. The seas were also from the east, remaining 3-5 ft throughout the cruise.

We arrived at Snug Harbor for off-loading on September 6th, at 0750 (HST).

**One objective for HOT 225 was not met:**

-The ATE trace metal sampler was not working correctly or communicating with the computer and was not deployed and no sample was collected.

**Ship's equipment that was not operational during the cruise:**

-Knudsen 12kHz passive sub-bottom profiler

**Injury to personnel:**

-L. Fujieki lowered the sediment trap weight onto his right foot injuring his big toe as he was putting the weight away after recovery. He sustained a minor cut and some bruising.

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

The R/V *Kilo Moana* continues to maintain good ship support for our work. The Captain 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)**

**02 September 2010**

0900 Departed from Snug harbor  
1000 Abandon ship and fire drills  
1045 Safety briefing and science meeting  
1145 Arrive at Station KAHE  
1150 500 m weight cast  
1250 Hyperpro cast  
1338 Station 1 cast 1 (1000 m) - 13 modulo errors  
1528 Niskin cast (20 m)  
1535 Rescue boat launch/recovery drill  
1550 Transit to station ALOHA  
Re-terminate CTD cable in effort to trouble shoot modulo errors.  
2319 Arrive at station ALOHA  
2347 Sediment trap array deployed (22° 45.00'N 158° 04.23'W)

**03 September 2010**

0014 Station 2 cast 1 (200 m)  
0131 Station 2 cast 2 (1000 m)  
0355 Station 2 cast 3 (200 m)  
0500 Primary production array deployed (22° 44.88'N 158° 03.24'W)  
0537 Station 2 cast 4 (deep cast)  
Communication with CTD lost on upcast at 1400 dbar.  
CTD cable re-terminated after 50 m was cut.

0920 Transit to pump tanks  
1011 Net tow  
1238 Net tow  
1316 Hand deployed surface net tow  
1425 Station 2 cast 5 (1000 m)  
1555 Transit to pump ships tanks  
1731 Station 2 cast 6 (1000 m)  
2042 Primary production array recovered (22° 46.00'N 158° 07.29'W)  
2105 Station 2 cast 7 (1000 m)  
2230 Net tow  
2309 Station 2 cast 8 (1000 m)

#### **04 September 2010**

0109 Net tow  
0251 Station cast 9 (1000 m)  
0414 AC-9/FRRf optics cast  
0538 Deploy gas array (22° 47.40'N 158° 00.74'W)  
0551 Station 2 cast 10 (1000 m)  
0857 Station 2 cast 11 (1000 m)  
1002 Net tow  
1054 Station 2 cast 12 (1000 m)  
1220 Hyperpro cast  
1246 AC-9/FRRf optics cast  
1348 Station 2 cast 13 (1000 m)  
1510 Transit to pump tanks  
1653 Station 2 cast 14 (1000 m)  
1951 Station 2 cast 15 (1000 m)  
2110 Transit to pump tanks  
2205 Net tow  
2248 Station 2 cast 16 (1000 m)

#### **05 September 2010**

0125 Station 2 cast 17 (deep cast)  
0515 Transit to recover sediment trap  
0715 Recovered Sediment trap array (22° 46.90'N 158° 17.90'W)  
0833 Recovered Gas array (22° 49.01'N 158° 10.58'W)  
1052 Station 50 Cast 1 (1-hr 200 m yo-yo cast)  
The first cycle was conducted to 750 dbar to remove a gap in the wire on the winch drum.  
1241 Hyperpro cast  
1309 AC-9/FRRf optics cast  
2000 Station 6 cast 1 (2400 m)  
2225 Transit to Snug Harbor

#### **06 September 2010**

0750 Arrive at Snug Harbor starboard side to the pier for equipment off loading  
0857 All fast port side to pier for full off load

## HOT program sub-components:

<b>Investigator</b>	<b>Project</b>	<b>Institution</b>
Matt Church	Core Biogeochemistry	UH
Roger Lukas	Hydrography	UH
Mike Landry	Zooplankton dynamics	SIO
Ricardo Letelier	Optical measurements	OSU
<b>Ancillary programs:</b>		
Charles Keeling	CO <sub>2</sub> dynamics and intercalibration	SIO
Paul Quay	DI <sup>13</sup> 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
<b>Additional programs:</b>		
Dave Karl (via Sam Wilson)	Reduced gases in the upper ocean: The cycling of methane, sulfide and nitrous oxide.	UH/Moore
Matt Church (via Donn Viviani, Daniela Böttjer, and Dan Sadler)	Carbon dioxide ocean perturbation experiment.	UH
Brandon Carter/John Zehr	Identify, isolate and determine the type of association between UCYN-A and its potential host.	UCSC
Dave Karl (via Jim Foley)	Science Teachers Aboard Research Ships (STARS)	UH/CMORE
John Bullister	Changing ventilation timescales and anthropogenic CO <sub>2</sub> in the subtropical North Pacific based on repeated multiple transient tracer observations	NOAA/PMEL
Albert Coleman (via Aric Mine )	Sample collection for oxygen 18 stable isotope and low level phosphorus analysis.	University of Chicago