

# HOT-233: Chief Scientist Report

Chief Scientist: Susan Curless

**R/V Kilo Moana**

July 18-22, 2011

Cruise ID: **KM 11-20**

Departed: July 18, 2011 at 0800 (HST)

Returned: July 22, 2011 at 0736 (HST)

Vessel: **R/V Kilo Moana**

Master of the Vessel: Captain Richard Meyer

OTG Marine Technicians: Dan Fitzgerald, Ben Colello, Dave Hashisaka (OTG Intern)

## 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 2<sup>nd</sup>, 3<sup>rd</sup>, and 4<sup>th</sup> days of the cruise.
- 3) Station 52, the site of WHOTS-8 Mooring, approximate position 22°40.1572'N, 157°57.0225'W, was to 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 1000 m, one CTD cast to 1000 m, a Hyperpro cast and a hand lowered Niskin cast were to be conducted on the afternoon of July 18th. 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 four shallow CTD casts to 200 m to collect water for various experiments and for preparation of the Primary Productivity Array. These 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 21st.

Another free-drifting array (Gas Array) was to be deployed for 24 hours for incubation experiments on July 20th. The Gas Array was to be recovered on July 21st.

A plankton net was to be towed between 1000-1400, and 2200-0200 for 30 minute intervals on July 19th and 20th at Station ALOHA.

The Hyperpro was to be deployed for a half-hour period near noon time on July 18th, 20th and 21st.

HOT-233 Chief Scientist Report

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 July 20th and 21st and in the early morning of July 21st.

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 21st.

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 one shallow 200 m CTD 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,  $p\text{CO}_2$  system, underway fluorometer and the meteorological package.

## 2. SCIENCE PERSONNEL

<b>Participant</b>	<b>Title</b>	<b>Affiliation/HOT Group</b>
Daniela Böttjer	Postdoctoral Researcher	UH/CMORE
Susan Curless	Research Associate	UH/BEACH
Lance Fujieki	Computer Specialist	UH/BEACH
Scott Grant	Research Associate	UH/CMORE
Aric Mine	Graduate Student	University of Chicago/BEACH
Shimi Rii	Graduate Student	UH/BEACH
Dan Sadler	Research Associate	UH/BEACH
Brett Updyke	Research Associate	UH/BEACH
Daniela del Valle	Postdoctoral Researcher	UH/CMORE
Donn Viviani	Graduate Student	UH/BEACH
Brenner Wai	Graduate Student	UH/CMORE
Blake Watkins	Marine Engineer	UH/BEACH
Sam Wilson	Postdoctoral Researcher	UH/CMORE
Cameron Fumar	Research Associate	UH/PO
Jefrey Snyder	Marine Technician	UH/PO
Craig Nosse	Research Associate	UH/PO
Alison Andrews	Undergraduate Intern	UH/PO
Reagan Grant	Volunteer	PO
Jim Foley	Marine Educator	UH/CMORE
Nick DeBoer	Teacher	Punahou School
Charlotte Godfrey-Romo	Teacher	Hilo High School
Shelia Folan	Teacher	Florin High School
Dan Fitzgerald	Marine Technician	OTG
Ben Colello	Marine Technician	OTG
Dave Hashisaka	Marine Technician Intern	OTG

### 3. GENERAL SUMMARY

Operations during the cruise were delayed due to various problems with the Caley winch and crane system.

At Station Kahe a ~500 lb off-set was noticed between the tension read out of the test weight in air and its known weight. Operations were delayed for re-calibration of the Caley tension read out. The ship board dynamometer was not working correctly so the test weight was used as a single point calibration of the system.

At Station ALOHA operations were further delayed when an error light on the winch occurred with the CTD package at 1890 dbar on the up cast of a near bottom CTD cast. Investigation revealed problems with the level wind and loss of tension read out. Work was done to resolve the level wind issues and the tension read out was set to zero to be able to recover the package. All science stops between 1890 dbar and the surface were cancelled. Further troubleshooting resulted in replacing a damaged ground fault wire between the load cell and cell amp. The tension read out was again re-calibrated using the test weight before operations were able to continue.

Other minor delays to science operations experienced during the cruise were due to loss of rendering control and a clear oil cooling fault alarm on the Caley during CTD operations. Another slight delay was experienced after the accidental deployment of the small boat reserve fuel tanks off the O1 deck. Other problems with the Caley that were experienced throughout the cruise were: belly pack not working correctly, crane slewing on its own during parking procedures, and the docking head moving on its own during CTD casts.

To make up time in the schedule from the delays at Station Kahe, two of the four planned 200 m CTD casts on the morning of July 19th at Station ALOHA were conducted to only 100 m. To make up time for the delays experienced during the deep cast one of the 1000 m casts in the 36 hour burst CTD period was cancelled and its water requirements were redistributed in the remaining CTD casts.

One 1000 m CTD cast was completed at Station Kahe. Two near bottom CTD casts, eleven 1000 m, three 200 m and two 100 m CTD casts were conducted at Station ALOHA. One 200 m yo-yo CTD cast was completed near the WHOTS mooring (Station 52) but due to time constraints, only four of the six planned cycles were completed. One near bottom cast was conducted 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 northwest of the center of Station ALOHA.

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

One of the night time tows experienced a cod end failure and was not fully processed. An archive of the tow was preserved, but no size fractionation of the sample material was done due to loss of complete sample volume.

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 around noon and once in the early morning. The LISST had to be set for a timed start for data collection (via computer) because the magnet switch was not working correctly.

The ATE was successfully deployed and a trace metal free sample was collected.

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

The thermosalinograph,  $p\text{CO}_2$  system and underway fluorometer lost data when the flow through uncontaminated seawater system stopped working. Approximately an hour and half of data was lost while the seawater system was plumbed to operate using the back-up pump.

The plumbing that supplies water to the remote temperature sensor of the thermosalinograph was found to be broken at the start of the cruise and could not be repaired. Therefore for the duration of the cruise the sea surface temperature readout on the underway system was not working.

As on previous cruises, twists developed in the CTD wire just above the rosette. The CTD had to be detached from the wire several times throughout the cruise to eliminate the twists each time they occurred to prevent damage to the wire.

Winds were from the east throughout the cruise holding at 18-20 knots, with 6 ft seas and cloudy skies throughout the trip.

We arrived at Snug Harbor for off-loading on July 22, at 0736 (HST).

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

The R/V *Kilo Moana* continues to maintain excellent ship support for our work. Captain Rick and the ship's crew showed enthusiasm, concern, and dedication to our scientific mission.

Technical support during this cruise was good. OTG personnel were not available for the pre-cruise planning meeting, but were available at any time to assist in our work during the cruise.

A special thank you goes to Dan Fitzgerald who replaced the damaged ground fault wire on the Caley. Without his expertise and ability to diagnose and repair the problem, our cruise may very well have ended with the discovery of this problem.

#### 5. DAILY REPORT OF ACTIVITIES (HST)

July 18, 2011

0800- Depart Snug Harbor

0840- Science Party Safety Briefing with Captain.

0910- Abandon Ship and Fire Drill

1050- Arrive at Station Kahe

1100- Weight Cast

1130- End weight cast

1150- Hyperpro

1200- Attempts to calibrate tension meter with dynamometer failed, single point calibration with weight cast weight used to calibrate tension readout of Caley

1213- Hyperpro complete

1220- Calibration of Caley tension readout continues

1232- Niskin cast

1250- End of Niskin cast

1300- S1C1 1000 m CTD cast -no pinger, switch not working

1445- End of cast

1450- Transit to Station ALOHA

2210- Arrive Station ALOHA, 4 miles due south of the center

2220- Sediment deployment begins

2244- Sediment trap array released  $22^\circ 41.02'N$   $157^\circ 59.81'W$

2323- S2C1 200 m CTD cast

July 19, 2011

0003- End of cast

0035- S2C2 200 m CTD cast

HOT-233 Chief Scientist Report

0127- End of cast  
0206- S2C3 100 m CTD cast  
0231- End of cast  
0254- S2C4 100 m CTD cast  
0320- End of cast  
0410- PP Array Deployed 22° 42.995'N 158° 0.041'W  
0454- S2C5 PO Deep Cast  
0650- At bottom 22° 35.013'N 157° 59.999'W 6m off the bottom  
0805- All stop at 1890 on up cast, error light on winch control, loss of tension read out and issues with level wind on winch drum. Level wind issue resolved, tension set to 0 to retrieve package, remaining depth stops terminated and cast recovered with no motion compensation and no tension read out. Trouble with docking head also experienced during cast, moving of head on its own when not engaged.  
0920- End of cast- trouble shooting continued (0920-1350) on tension readout, damaged ground fault wire between load cell and cell amp found and replaced by OTG and tension read out re-calibrated with weight.  
1020- Net tow  
1050- End net tow  
1055- Transit to pump tanks  
1245- Net Tow  
1256- ATE  
1330- ATE complete  
1335- Hand net tow  
1420- S2C6 1000 m CTD cast  
1615- End of cast  
1720- S2C7 1000 m CTD cast  
1846- End of cast  
1852- Caley crane slewed on its own during parking  
1958- PP Array Recovered 22° 46.229'N 158° 6.206'W  
2031- S2C8 - deployment delayed due to clear oil pump cooling fault on Caley  
2201- End of cast  
2210- Transit to pump ship's tanks  
2250- S2C9 1000 m CTD cast - deployment delayed due to a lanyard snapping at start of deployment  
2324- S2C9 start of cast  
2333- All stop at 38 db of down cast "rendering control" lost

July 20, 2011

0056- End of cast  
0102- Net tow  
0136- End of net tow, cod end broken  
0237- S2C10 1000 m CTD cast  
0353- End of cast  
0515- Gas Array Deployed 22° 43.537'N 158° 0.726'W  
0542- S2C11 1000 m CTD cast  
0650- End of cast  
0700- Underway SW system noticed to be not functioning and incubators were not being re-filled.  
0821- S2C12 1000 m CTD cast  
0830- Underway SW system back on-line; engineering changed pumps  
0930- End of cast  
1000- Net Tow  
1035- End of net tow  
1046- S2C13 1000 m CTD cast  
1206- End of cast  
1210- Hyperpro  
1230- End hyperpro  
1235- AC9/FRRf  
1309- Re-deployment of AC9/FRRf due to it not starting properly on first deployment. Computer used to create a time start instead of magnetic switch.  
1345- End of AC9/FRRf  
1352- S2C14 1000 m CTD cast  
1400- Cast brought back on board and delayed due to the accidental deployment of 4 gasoline tanks off the O1 deck.  
1528- End of cast  
1533- Transit to pump Ship's tanks

HOT-233 Chief Scientist Report

1646- S2C15 1000 m CTD  
1756- End of cast  
1951- S2C16 1000 m CTD  
2107- End of cast  
2201- Net Tow  
2248- Net Tow  
2340- S2C17 near bottom CTD cast

July 21, 2011

0107- Winch speed slowed to ~33 due to spikes in tension read out  
0133- 8 m off the bottom, 22° 44.9978'N 158° 0.004'W  
0350- End of cast, niskin #8 did not trip  
0355- Transit to pump ship's tanks  
0500- AC9/FRRf  
0538- End of AC9  
0545- Transit to Gas Array  
0623- Recovery of Gas Array 22° 48.05'N 158° 10.35'W  
0645- End of recovery, transit to Sediment Traps  
0740- Sediment Trap Recovery 22° 51.91'N 158° 17.30'W  
0800- End of recovery, transit to Station 52  
1000- S52C1 200 m yo-yo cast  
1113- End of cast, 4 cycles complete  
1120- Hyperpro  
1138- End of Hyperpro  
1155- AC9/FRRf  
1234- End of AC9  
1345- S2C18  
1420- End of cast  
1505- Transit Station Kaena  
1945- Arrive Station Kaena  
1954- S6C1 near bottom CTD  
2204- End of Cast  
2216- Transit to Snug Harbor

July 22, 2011

0736- Arrive Snug Harbor 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	SIO
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 Shimi Rii)	Investigation of temporal changes in picoeukaryote diversity at Station ALOHA	UH
Matt Church (via Donn Viviani)	Bacterial production and EOC at Station ALOHA	UH
Henrieta Dulaiova and Ken Buesseler	Japanese radionuclide release sampling	UH
Matt Church (via Daniela Böttjer and Sam Wilson)	Nitrogen Fixation methodology comparison	UH
Dave Karl (via Daniela del Valle)	Sample collection for methylphosphonate production experiments	UH
Matt Church (via Donn Viviani, Daniela Böttjer, and Dan Sadler)	Ocean Perturbation Experiment (x2)	UH
Dave Karl (via Jim Foley)	Science Teachers Aboard Research Ships (STARS)	UH
David Ho (via Sam Wilson)	Oxygen 17 in deep North Pacific water	UH