

# HOT-230: Chief Scientist Report

Chief Scientist: Susan Curless

*R/V Kilo Moana*

February 27- March 3, 2011

Cruise ID: **KM 11-08**

Departed: February 27, 2011 at 0900 (HST)

Returned: March 3, 2011 at 0735

Vessel: **R/V Kilo Moana**

Master of the Vessel: Captain Gray Drewry

OTG Marine Technicians: Dan Fitzgerald 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 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 50, the site of WHOTS-7 Mooring, approximate position 22° 46.0052'N 157° 53.9897'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 500 m, one CTD cast to 1000 m, and a Hyperpro cast were to be conducted on the afternoon of February 27<sup>th</sup>. 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 one shallow CTD cast to 200 m, 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 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 March 1st.

Another free-drifting array (Gas Array) was to be deployed for 24 hours for incubation experiments on March 1st. The Gas Array was to be recovered on March 2nd.

A plankton net was to be towed between 1000-1400, and 2200-0200 for 30 minute intervals on February 28th and March 1st at Station ALOHA.

The Hyperpro was to be deployed for a half-hour period near noon time on February 27th, March 1st and March 2nd.

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 March 1st and 2nd and in the early morning of March 2nd.

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 March 2nd.

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, a Hyperpro cast, and two shallow 200 m CTD casts.

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, underway fluorometer, meteorological package and a pCO<sub>2</sub> system.

## 2. SCIENCE PERSONNEL

<b>Participant</b>	<b>Title</b>	<b>Affiliation/HOT Group</b>
Adriana Harlan	Research Associate	UH/BEACH
Dan Sadler	Research Associate	UH/BEACH
Brett Updyke	Research Associate	UH/BEACH
Susan Curless	Chief Scientist –Res. Assoc.	UH/BEACH
Lance Fujieki	Computer Specialist	UH/BEACH
Donn Viviani	Graduate Student	UH/BEACH
Blake Watkins	Marine Engineer	UH/BEACH
Shimi Rii	Graduate Student	UH/BEACH
Sara Thomas	Technician	UH/CMORE
Lydia Baker	Graduate Student	UH/CMORE
Cameron Fumar	Research Associate	UH/PO
Dave Haskisaka	Research Associate	UH/PO
Jefrey Snyder	Marine Technician	UH/PO
Craig Nosse	Research Associate	UH/PO
Brad Stubbs	Volunteer	PO
Dave Wisegarver	Technician	NOAA/PMEL
Dan Fitzgerald	Marine Technician	OTG
Ben Colello	Marine Technician	OTG

## 3. GENERAL SUMMARY

Operations during the cruise were conducted as planned with only minor schedule delays. One 1000 m CTD cast was completed at Station Kahe. Two near bottom CTD cast, thirteen 1000 m and three 200 m CTD casts were conducted at Station AOHA. One 200 m yo-yo CTD cast was completed near the WHOTS mooring (Station 50) but only five of the six planned cycles were completed (see Section 4.0 for details).

The floating sediment trap array, primary production array, and gas array were all deployed and recovered successfully. All three arrays drifted to the southwest of the center of Station 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 net tow was completed on February 28th.

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 ADCP, fluorometer, pCO<sub>2</sub> and meteorological system ran without interruption during the cruise. The thermosalinograph also ran continuously throughout the cruise with a brief (about 2 hours) interruption when the thermosalinograph pump was being tested on February 27th.

Winds were from the northeast throughout the cruise at 10-15 knots. Seas were about 4-6 feet.

We arrived at Snug Harbor for off-loading on March 3rd, at 0735 (HST).

#### 4. INCIDENTS AFFECTING SCIENCE OPERATIONS

Three incidents occurred during the cruise affecting science operations:

##### A and B) Ship's Propulsion Failure and Trawl Winch Power Failure

The ship lost the port propulsion motor at 1118 (HST) on March 1st during the downcast of a 1000 m CTD cast. The cast was not interrupted and position was maintained with the starboard screw and bow thruster while engineering was trouble shooting the problem.

At 1123 (HST) the trawl winch lost power with the CTD package at 765 dbar during the upcast.

Engineering was called and power to the winch was restored at 1139 (HST) and the CTD upcast was continued. Once the CTD was on board (1210 HST), the Chief Scientist was called to the Bridge (1220 HST) with the OTG Technician on watch (Dan Fitzgerald) to allow a further delay of the deployment of the Hyperpro (originally scheduled for 1200 HST and delayed due to trawl winch power failure). This delay was to provide time for engineering to re-boot motor control computers. The re-boot did not fix the problem and at 1247 (HST) science operations continued with the deployment of the Hyperpro while engineering continued troubleshooting.

The Hyperpro, AC9/FRRf, and S2C13 CTD cast were all successfully conducted slightly behind their scheduled times using the starboard shaft and bow thruster to maintain station. At 1514 (HST) the port motor was brought back on-line with a blown fuse being the reported cause of engine failure. At 1526 (HST) S2C13 was on deck and science operations continued as scheduled.

##### C) Trawl Winch Level Wind Malfunction

During the beginning of the S50C1 200 m yo-yo CTD cast (0820 HST), an issue with the trawl winch level wind was reported. The cast was stopped with the CTD package at 10 dbar and engineering was called. At 0840 (HST) the level wind was operational and the CTD cast was resumed but needed to go to 467 m on the first cycle to clear the wire problem. Due to the extra time taken to go to 467 m to clear the wire problem, only 5 cycles of the planned 6 were completed at Station 50.

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

The UH Marine Center, Captain and ship's crew and OTG technicians 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 and help us maintain our schedule.

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

##### **February 27th, 2011**

0856- Depart Snug Harbor

0945- Science Party Meeting - During the Science Party Meeting the Captain and science party discussed deployment and recovery strategies for the Hyperpro. A new protocol of having the instrument sit at the surface for a few moments while the ship bumps ahead to establish an aft tending wire angle before the instrument is allowed to 'free fall' in the water column was established as the new deployment technique.

1028- Fire and Abandon Ship drills

1050- Secure from all drills

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1200- Weight cast to 500 m  
1230- Weight cast complete  
1240- Hyperpro deployed  
1250- Hyperpro at bottom of cast, 121 m.  
1258- Hyperpro on deck  
1312- S1C1 Kahe 1000 m CTD  
1430- End of S1C1  
1440- Transit to Station ALOHA  
2155- Arrive at Station ALOHA, four miles due South of the center  
2200- Sediment Trap weight in the water  
2223- Sediment Traps deployed 22° 41.072'N 157° 59.746'W

## **February 28th, 2011**

0013- S2C1 200 m CTD cast  
0130- S2C2 1000 m CTD cast  
0240- End of cast  
0345- Begin Primary Production Array Deployment  
0400- PP Array Deployed 22° 43.006'N 158° 2.176'W  
0410- Transit to center of Station ALOHA  
0440- Begin S2C3 PO Deep Cast 22° 46.006'N 158° 00.012'W  
0623- At 5 m off the bottom, 4810 m 22° 44.942'N 158° 00.037'W  
0830- End of cast  
0835- Transit to pump ship's tanks  
1000- Net tow  
1030- End net tow  
1106- S2C4 1000 m CTD cast  
1240- End of cast  
1300- Net tow  
1330- End net tow  
1335- Hand net tow (LB)  
1350- End hand net tow (LB)  
1415- S2C5 1000 m CTD cast  
1528- End of cast  
1540- Transit to pump ship's tanks  
1648- S2C6 1000 m CTD cast  
1801- End of cast  
1838- Primary Production Array Recovered 22° 39.790'N 158° 02.283'W  
1945- S2C7 1000 m CTD cast  
2114- End of cast  
2202- Net Tow  
2230- End of Net Tow  
2305- S2C8 1000 m CTD cast

## **March 1st, 2011**

0022- End of cast  
0052- Net Tow  
0120- End Net Tow  
0148- S2C9 1000 m CTD cast

0152- Tag line got caught on rosette frame during deployment. Package was recovered, line untangled, and re-deployed.  
0202- Winch speeds were decreased to 20m/min due to ship's roll.  
0250- End of cast  
0255- Transit to pump ship's tanks.  
0430- Begin Gas Array Deployment  
0446- Gas Array Released 22° 43.668'N 158° 01.400'W  
0455- S2C10 1000 m CTD cast  
0557- End of cast  
0750- S2C11 1000 m CTD cast  
0900- End of cast  
1000- Net Tow  
1030- End of Net Tow  
1100- S2C12 1000 m CTD cast  
1123- Power failure of traction winch on up cast with package at 765 dbar. Engineering called.  
1139- Winch power restored, up cast continued.  
1210- End of cast.  
1220- Chief Sci called to bridge to speak with Captain and lead OTG tech. Port motor is not responsive, all agreed to delay Hyperpro deployment till re-booting of port motor computer could be attempted at MCS.  
1240- Re-boot did not bring port motor on-line.  
1247- Hyperpro Deployed- stbd screw and bow thruster used to maintain heading.  
1300- Hyperpro cast complete, 141 m was reached.  
1315- AC9/FRRf cast  
1355- End AC9/FRRf cast  
1410- S2C13 1000 m CTD cast  
1515- Port engine brought back on-line  
1529- End CTD cast, both engines off-line...ship drifting  
1533- Engines on-line, transit to pump ship's tanks  
1656- S2C14 1000 m CTD cast  
1705- Sensor issues noted during 10 m soak  
1712- Package brought back on board to investigate  
1717- Upon recovery, the rinsing water bottle was found to still be attached to the rosette. It was removed and the package was re-deployed.  
1819- End of cast  
1946- S2C15 1000 m CTD cast  
2107- End of cast  
2200- Net Tow  
2230- End of net tow  
2250- S2C16 near bottom CTD cast  
2301- Problems with the winch surface tension read out in the dog house...resolved

## **March 2nd, 2011**

0033- At 4808 m, 7 m off the bottom 22° 45.025'N 158° 0.012'W Bottom signal was received from Knudsen 12kHz.  
0228- End of cast  
0300- AC9/FRRf  
0345- End of AC9/FRRf  
0355- Transit to pump ship's tanks

0500- Sediment Trap Recovery 22° 36.19'N 158° 03.20'W  
0530- End recovery, transit to Gas Array  
0613- Gas Array Recovery 22° 42.35'N 158° 07.65'W  
0640- End of recovery, transit to Station 50  
0805- S50C1  
0825- Problems with level wind on winch, CTD at 10dbar.  
0840- Restart cast from surface, went down to 467 m on first cycle to clear wire problem.  
1000- End S50C1, 5 cycles complete  
1020- AC9/FRRf  
1100- End AC9/FRRf  
1115- Hyperpro  
1135- Hyperpro out  
1150- S2C17 200 m CTD cast  
1228- End of cast  
1335- S2C18 200 m CTD cast  
1405- End of cast  
1410- Transit Station Kaena  
2000- Arrive at Station Kaena  
2010- S6C1 near bottom CTD cast  
2205- End of Cast  
2213- Transit to Snug Harbor

### **March 3rd, 2011**

0735- Arrive Snug Harbor, starboard side to pier for blue van offload.  
0746- Shifting ship  
0808- All secure port side to pier for full offload.

**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
Paul Kemp (via Lydia Baker)	Diatom-bacterial interactions	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
Matt Church (via Donn Viviani, Daniela Böttjer, and Dan Sadler)	Ocean Perturbation Experiment	UH