

# **HOT-235: Chief Scientist's Report**

Chief Scientist: Craig Nosse

***R/V Kilo Moana***

September 24 – 28, 2011

Cruise ID: **KM 11-27**

Initial Departure: September 24, 2011 at 0800 (HST)

Final Return: September 28, 2011 at 0730

Master of the Vessel: Captain Gray Drewry

OTG Marine Technicians: Trevor Goodman and Ben Collelo

## **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 (anchor 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 was to be occupied on the 4<sup>th</sup> 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 September 24<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 for various experiments and one 1000 m CTD cast 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 *in situ* for 12 hours. A full-depth (~4740 m) CTD cast was to be conducted after the deployment of the primary productivity 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 26<sup>th</sup>.

Another free-drifting array (gas array) was to be deployed for 24 hours for incubation experiments on September 26<sup>th</sup>. The gas array was to be recovered on September 27<sup>th</sup>.

A plankton net was to be towed for 30 minute intervals at nine separate occasions on September 25<sup>th</sup> and 26<sup>th</sup> at Station ALOHA.

The Hyperpro was to be deployed at Station ALOHA for a half-hour period near noon time on September 26<sup>th</sup> and 27<sup>th</sup>.

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 September 26<sup>th</sup> and 27<sup>th</sup> and in the early morning of September 27<sup>th</sup>.

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 27<sup>th</sup>.

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 and a Hyperpro 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*CO<sub>2</sub> system, underway fluorometer and the meteorological package.

## 2. SCIENCE PERSONNEL

<b>Participant</b>	<b>Title</b>	<b>Affiliation/HOT Group</b>
Susan Curless	Research Associate	UH/BEACH
Lance Fujieki	Computer Specialist	UH/BEACH
Adriana Harlan	Research Associate	UH/BEACH
Shimi Rii	Graduate Student	UH/BEACH
Dan Sadler	Research Associate	UH/BEACH
Brett Updyke	Research Associate	UH/BEACH
Donn Viviani	Graduate Student	UH/BEACH
Blake Watkins	Marine Engineer	UH/BEACH
Daniela Böttjer	Post-doc	UH/CMORE
Ben Rubin	Intern	UH/CMORE
Sam Wilson	Postdoctoral Researcher	UH/CMORE
Cameron Fumar	Research Associate	UH/PO
Jefrey Snyder	Marine Technician	UH/PO
Craig Nosse	Research Associate	UH/PO
David Hashisaka	Research Associate	UH/PO
Kristin Halbert	Graduate Student	UH ZOOLOGY
John Fitzpatrick*	Graduate Student	UH ZOOLOGY
Trevor Goodman	Marine Technician	OTG
Ben Collelo	Marine Technician	OTG

\* Elected not to continue participation on cruise after in-port winch repair was made on September 25<sup>th</sup>.

## 3. GENERAL SUMMARY

The docking head for the R/V *Kilo Moana* Caley CTD crane malfunctioned at Station Kahe on the first day of the cruise (September 24<sup>th</sup> at about 1500 (HST)). The docking head could only move in one of two required directions. The ship's engineers worked to troubleshoot the problem and discovered a

failed power amplifier at about 1745. There was no spare amplifier on board. A “workaround” was attempted with an amplifier that is primarily used for testing other shipboard equipment. Unfortunately, although initially promising, the “workaround” amplifier failed at about 1830 when a weight-test cast was being attempted. At about 1900 it was decided to return to port as the vast majority of HOT science work requires a functioning CTD winch/crane system.

The science party disembarked the ship at about 2300 on September 24<sup>th</sup>. Before disembarking, the Chief Scientist informed the science party that an update would be provided via email at 1500 on the following day, September 25<sup>th</sup>. Everyone was required to check this update. For individuals without Internet access, the Chief Scientist required a telephone check-in at 1500 on September 25<sup>th</sup>.

The ship’s engineers and OTG came up with a different “workaround” for the docking head during the late morning of September 25<sup>th</sup>. The HOT Principal Investigators (PIs) and Chief Scientist reported to the ship at 1200 to observe a pierside demonstration of the “workaround”. The new approach utilized a power supply which could manually control the docking head as opposed to the regular power amplifier and solenoid system. The power supply would be operated from the R/V *Kilo Moana* wet lab by the OTG technician on duty. After the demonstration (at about 1330), the HOT PIs decided that the cruise could proceed with a 500 m weight-test cast outside of Honolulu Harbor. If the test was successful, the ship would then transit to Station ALOHA to complete as much HOT science work as possible in the remaining time. It was agreed by Captain Drewry and the HOT PIs that the heave compensation feature for the Caley winch would not be enabled during the cruise as the feature was problematic during the weight-test cast at Station Kahe on September 24<sup>th</sup>.

The Chief Scientist sent an email at about 1340 requesting the science party to return to the ship at 1900 for a departure at 2000. A “telephone tree” was also initiated and calls went out to the science party requesting them to return to the ship. At about 1600, the Chief Scientist informed Captain Drewry that the science party would be able to return to the ship by 1900 and we could set sail at 2000.

Unfortunately, the departure at 2000 was delayed about 20 minutes due to ship traffic in Honolulu Harbor as we were unable to get channel clearance. Once underway, Captain Drewry informed the Chief Scientist that there would be two (2) 500 m weight-test casts outside of Honolulu Harbor. The 1<sup>st</sup> weight-test cast would allow Vic Polidoro (OTG technician temporarily on board the ship) to diagnose problems seen when heave compensation for the Caley winch was used. Captain Drewry stated that this 1<sup>st</sup> cast would help ensure that problems seen with heave compensation enabled would not translate to further problems when heave compensation was disabled. The 2<sup>nd</sup> weight-test cast would then have heave compensation disabled completely to test the winch and crane system as it was to be used at Station ALOHA.

The 1<sup>st</sup> weight-test cast started at about 2120. The Caley CTD winch produced the same problematic behavior as the previous day; wildly oscillating tension spikes that if allowed to continue, would induce jolting movement of the winch wire drum. At about 2150, the Chief Scientist asked the Captain how long the diagnosis of the problematic behavior would continue. The Captain told the Chief Scientist that he should ask Vic himself. Upon the Chief Scientist’s inquiry, Vic proposed the problem was perhaps related to the location of the Motion Reference Unit (MRU) for the Caley system. Vic determined that a high priority item for the future was to move the MRU to a different location where it could get a more accurate signal. The Captain told Vic that he wanted to immediately exchange the current MRU with another MRU on board. Vic explained that such a change would require at least a couple of hours and the ship would have to remain outside Honolulu Harbor until the early morning hours. The Captain restated his request, but then asked the Chief Scientist if such time could be afforded. The Chief Scientist said this time could not be afforded if the cruise was to continue.

The 2<sup>nd</sup> weight-test cast started at about 2220. No problems were observed, minus a persistent problem seen in the past few months when the wire is spooling near the winch cheeks.

The ship set sail towards the entrance into Keehi lagoon to meet a small boat piloted by Kuhio Vellalos of OTG. Vic Polidoro transferred to the small boat at 2315 and the ship began transit to Station ALOHA to conduct an abbreviated cruise plan.

**Operations cancelled and personnel change due to shortened cruise length:**

- Sediment trap array
- Gas array
- Phycoerythrin CTD cast
- PUR CTD cast
- Second near bottom CTD cast at Station ALOHA
- Automated Trace Element sampler
- Station Kahe – 1000 m CTD cast
- Station Kaena – Near Bottom CTD cast
- 200 m yo-yo CTD cast at WHOTS-8 Mooring Station
- Various ancillary scientist participant water requests (see last page for list of program components and cruise participant science that was compromised)
- John Fitzgerald (UH Zoology) elected not to continue participation on the cruise after in-port winch repair was made on September 25<sup>th</sup>

**Operations completed on the revised cruise plan for HOT-235:**

- One near bottom CTD cast and nine 1000 m CTD casts were conducted at Station ALOHA.
- The free floating primary productivity array was deployed and recovered successfully. The array drifted to the southwest relative to 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. A cruise participant from UH Zoology took samples from these net tows and did one additional net tow independently of the six core tows.
- The Hyperpro was deployed and recovered successfully twice 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.
- One surface hand net tow was completed.
- The ADCP, fluorometer, and meteorological system ran without interruption during the cruise. The  $p\text{CO}_2$  system was not fully operational during the cruise due to a software malfunction.

Winds were from the east at 5-15 knots during the cruise, with less than 3 foot seas.

As on previous cruises, twists developed in the CTD wire just above the rosette. The CTD had to be detached from the wire on occasion to eliminate the twists to prevent damage to the wire.

Also, as on previous cruises, the Caley wire had to be closely monitored when the wire was at the ends of the drum cheeks to make sure there no bad wraps. This sometimes necessitated stopping the winch and relaying bad wire wraps.

On multiple occasions the Caley system reported “Level wind motor has tripped” and the system has to be reset.

The Caley CTD belly pack was damaged during storage between casts. Repairs were successful after about a 15 minute delay to a 1000 m cast.

We arrived at Snug Harbor to offload at about 0730 (HST) on September 28<sup>th</sup>.

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

This was a challenging cruise that required a lot of effort to try and accomplish as much work as possible. The ship's engineers worked very hard to provide a CTD crane/winch system that would work safely and effectively, without all the resources needed to do so (spare parts). OTG also assisted in this effort. The Captain, Officers and Crew established and endured two long periods of freshwater restrictions without complaint so that we could have maximum use of science time without having to leave Station ALOHA to pump the wastewater tanks.

In order to provide the "workaround" for the Caley docking head, the Able Bodied seamen (ABs) were tasked with manipulating the belly pack for the Caley system during the launch and recovery of the CTD. They were not familiar with this particular use of the belly pack nor were they familiar with the manipulations required to launch and recover the CTD. By taking minor delays to execute a non-documented form of on the job training, combined with calm weather and an overall professionalism to the job, the ABs were able to perform this newly presented task successfully.

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

##### **September 24, 2011**

0855 Depart Snug Harbor  
0945 Safety Meeting / Science Meeting  
1030 Fire and Emergency / Abandon Ship drills  
1140 Arrive Station Kahe  
1145 Docking head is slow in tilting forward properly at beginning of weight-test cast  
1210 Oscillating tension spikes seen during upcast of weight-test cast, ship's engineers work to troubleshoot  
1408 Hyperpro cast  
1445 Docking head will not move forward at beginning of S1C1 1000 m CTD cast  
1505 CTD recovered  
1745 Ship's engineers discover failed power amplifier for CTD docking head  
1830 "Workaround" amplifier fails during testing  
1900 Transit to Snug Harbor  
2300 Arrive Snug Harbor – Science Party disembarks

##### **September 25, 2011**

1200 HOT PIs and Chief Scientist meet at Snug Harbor for new docking head workaround demonstration  
1330 Begin to recall Science Party  
1600 Captain informed by Chief Scientist that Science Party will arrive at 1900  
1900 Science Party reconvenes  
2000 Unable to depart Snug Harbor as planned due to ship traffic in channel  
2023 Depart Snug Harbor  
2123 Arrive to test site outside Honolulu Harbor – weight-test cast #1 to 500 dbar  
2129 Tension spikes reproduced – Vic Polidoro troubleshooting  
2221 Weight-test cast #2 to 500 dbar  
2315 Transfer Vic Polidoro to UH small boat, begin transit to Station ALOHA

##### **September 26, 2011**

0908 Arrive Station ALOHA

0910 S2C1 1000 m CTD cast  
0916 Caley error: "Level wind motor has tripped", system has to be reset  
1046 Two HOT net tows (back to back)  
1205 Hyperpro cast  
1215 Freshwater restriction imposed  
1240 AC9/FRRf  
1327 S2C2 1000 m CTD cast  
1524 Transit to pump tanks – freshwater restriction lifted after pumping  
1644 Hand net tow  
1708 S2C3 1000 m CTD cast  
1850 Transit to pump tanks  
1954 S2C4 1000 m CTD cast  
2002 Caley error: "Level wind motor has tripped", system has to be reset  
2136 UH Zoology net tow  
2207 HOT net tow  
2250 S2C5 1000 m CTD cast

### **September 27, 2011**

0016 Two HOT net tows (back to back)  
0152 S2C6 1000 m CTD cast  
0159 Crane not slewing – belly pack not working  
0212 Belly pack repaired  
0355 AC9/FRRf  
0519 Primary productivity array deployed at 22 44.936 N, 158 0.612 W  
0532 S2C7 1000 m CTD cast  
0651 Transit to pump tanks  
0756 S2C8 1000 m CTD cast  
0805 Caley error: "Level wind motor has tripped", system has to be reset  
1002 HOT net tow  
1045 S2C9 1000 m CTD cast  
1056 Caley error: "Level wind motor has tripped", system has to be reset  
1200 Freshwater restriction imposed  
1247 Hyperpro  
1318 AC9/FRRf  
1407 S2C10 Near Bottom CTD cast  
1535 Winch wire slowed to inspect wire wraps  
1558 Bottom of downcast reached (8 m from the seafloor) at 22 45.016 N, 158 0.060 W  
1559 All stop at 4774 dbar of upcast as level wind is making bad wraps  
1811 Transit to pump tanks and recover primary productivity array (freshwater restriction lifted after recovery of array)  
1907 Primary productivity array recovered at 22 40.794 N, 158 7.438 W  
1926 Transit to Snug Harbor

### **September 28, 2011**

0730 Arrive Snug Harbor – offload

**HOT program sub-components:**

<b>Investigator</b>	<b>Project</b>	<b>Institution</b>
* Matt Church	Core Biogeochemistry	UH
* Bob Bidigare		
* Dave Karl		
* 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

**Additional programs:**

* 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/Dave Karl (via Sam Wilson)	Nitrogen fixation methodology comparison	UH
Erica Goetze (via Kristin Halbert)	Plankton copepod samples	UH

\* Denotes HOT program sub-components, ancillary programs and additional programs that were compromised due to decreased amount of science time at Station ALOHA.