

# HOT-247: Chief Scientist Report

Chief Scientist: Brett Updyke

**R/V *Kilo Moana***

06-10 October, 2012

Cruise ID: **KM 12-23**

Departed: 06 October at 0900 (HST)

Returned: 10 October at 0734 (HST)

Vessel: **R/V *Kilo Moana***

Master of the Vessel: Captain Gray Drewry

OTG Marine Technicians: Trevor Goodman and Daniel 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 October 6<sup>th</sup> for about 3.5 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 October 7<sup>th</sup>, 8<sup>th</sup> and 9<sup>th</sup>.
- 3) Station 50, the site of WHOTS-9 Mooring (anchor position 22° 46.071'N 157° 53.956'W) was to be occupied on October 9<sup>th</sup> 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 October 9<sup>th</sup> for approximately 3 hours.

Upon arrival to Station Kahe a 1000 lb. weight-test cast to 1000 m, one CTD cast to 1000 m, one Hyperpro cast and one 20 m handheld Niskin cast were to be conducted on the afternoon of October 6<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 a 1000 m CTD cast for preparation of the Primary Productivity Array. This cast was 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 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 October 8<sup>th</sup>.

Another free-drifting array (Gas Array) was to be deployed for a 24 hour *in situ* incubation experiment on October 8<sup>th</sup>. The Gas Array was to be recovered on October 9<sup>th</sup>.

Time and weather permitting, a malfunctioning Apex float was to be recovered at Station ALOHA.

A plankton net was to be towed between 1000-1400, and 2200-0200 for 30 minute intervals on October 7<sup>th</sup> and October 8<sup>th</sup> at Station ALOHA.

A handheld plankton net was to be towed at 1300 for 30 minutes on October 7<sup>th</sup>.

The Hyperpro was to be deployed for approximately 45 minutes near noon time on October 6<sup>th</sup>, 7<sup>th</sup>, and 9<sup>th</sup> to collect three profiles during each deployment.

A trace metal free sample was to be collected by the ATE sampler at 1030 on October 8<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 in the early morning and around noon on October 9<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 October 9<sup>th</sup>.

After recovering the arrays, the ship was to transit to Station ALOHA to conduct a 200 m CTD cast followed by two ACS/AC9/FRRf/LISST profiles and a Hyperpro cast, after which the ship was to transit to Station 50 to conduct a one-hour 200 m CTD yo-yo 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 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>
Susan Curless	Research Associate	UH/ Biogeochem
Lance Fujieki	Research Associate	UH/ Biogeochem
Dan Sadler	Research Associate	UH/ Biogeochem
Brett Updyke	Research Associate	UH/ Biogeochem
Adriana Harlan	Research Associate	UH/Biogeochem
Blake Watkins	Marine Engineer	UH/Biogeochem
Sean Jungbluth	Graduate Student	UH/Biogeochem
Donn Viviani	Graduate Student	UH/Biogeochem
Shimi Rii	Graduate Student	UH/Biogeochem
Christopher Schvarcz	Graduate Student	UH/CMORE
Sandra Martinez-Garcia	Postdoctoral Researcher	UH/CMORE
Benedetto Barone	Postdoctoral Researcher	UH/CMORE
Jefrey Snyder	Marine Technician	UH/PO
Fernando Santiago-Mandujano	Research Associate	UH/PO
Cameron Fumar	Research Associate	UH/PO
Brandon Obra	Research Associate	UH/PO
Michael Grissom	Graduate Student	UH/PO
Catalina Rubiano	Undergraduate Student	UH/PO
Jim Foley	Marine Educator	UH/CMORE
Ryan Kagami	STARS participant	Kailua Intermediate School
Jacqueline O'Donnell	STARS participant	Kamaile Academy
Diane Tom-Ogada	STARS participant	Farrington High School
Trevor Goodman	Marine Technician	OTG
Dan Fitzgerald	Marine Technician	OTG

### 3. GENERAL SUMMARY

Operations at Station ALOHA were conducted as planned according to a modified cruise schedule due to a medical emergency on board. A member of the ship's crew was evacuated at Waianae small boat harbor shortly after operations at Station Kahe were complete. Arrival at Station ALOHA was delayed by approximately 2 hours, therefore delaying the deployment of the Sediment Traps. The first CTD cast at Station ALOHA (s2c1) was shortened to 200 m in order to stay on schedule. Both of the near bottom CTD casts at Station ALOHA resulted in kinked .322" wire near the CTD rosette and had to be re-terminated. A problem with the level wind on the Caley winch developed during the upcast of the near bottom CTD cast at Station Kaena. Heave compensation was disengaged for the remainder of the upcast and the problem was subsequently corrected by changing out a worn roller on the level wind.

One 1000 m CTD cast was completed at Station Kahe. Two near bottom CTD casts, twelve 1000 m CTD casts and two 200 m CTD casts were conducted at Station ALOHA. One 200 m yo-yo CTD cast was completed near the WHOTS mooring (Station 50) with five cycles completed. One near bottom cast was completed at Station Kaena.

The Sediment Traps, Primary Production Array, and Gas Array were all deployed and recovered successfully. All arrays drifted to the WNW of their respective deployment locations.

The Apex float was recovered successfully.

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

One handheld plankton net tow was completed on October 7<sup>th</sup>.

Hyperpro casts (3 cycles each) were conducted on October 6<sup>th</sup>, 7<sup>th</sup>, and 9<sup>th</sup>.

The ATE was successfully deployed at Station ALOHA on October 8<sup>th</sup>.

Communications with the HPM and data downloading were successfully conducted on October 8<sup>th</sup>.

The optical package ACS/AC9/FRRf/LISSST was deployed four times on October 9<sup>th</sup>, two back to back deployments in the early morning, and two starting at 1000.

The fluorometer, thermosalinograph, *p*CO<sub>2</sub> system, and the ship's meteorological suite ran without interruption during the cruise. However, the external thermosalinograph temperature showed suspicious variability indicating problems with the flow in the system. Also, the Caley crane control and read out monitor in Lab #1 was not working.

Winds were from the Southwest throughout the cruise at 5-10 kts and then increased to 15-20 kts starting on the evening of October 7<sup>th</sup> with smooth seas. There was a Northwesterly swell of 6-10 ft on October 9<sup>th</sup>. A westward current was present at Station ALOHA throughout the cruise.

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

The officers and crew of the R/V *Kilo Moana* showed enthusiasm and concern for our work as well as flexibility regarding changes in our cruise plan. Due to a medical emergency, one of the ship's crew members had to be evacuated. Despite this setback, we were able to complete all scientific objectives and the ship's crew, being one man down, modified their watch schedule to keep the cruise on track.

The marine technicians were always available during the cruise to support our work. Thanks to their efforts the underway pCO<sub>2</sub> system has been repaired and was operational throughout this cruise. Additionally, one of the ship's data acquisition computers (KMSNAP) has been repaired and is operational. However, there were some end-of-cruise data script problems associated with the repair of KMSNAP which OTG has corrected.

## 5. DAILY REPORT OF ACTIVITIES (HST)

### October 6, 2012

0900 Depart Snug Harbor  
0930 Captain's safety briefing  
1012 Fire and abandon ship drills  
1115 Arrive Station Kahe  
1130 Weight cast to 1000 m  
1228 End weight cast  
1245 Three Hyperpro casts  
1328 End Hyperpro  
1346 S1C1 1000 m CTD cast  
1447 End of cast  
1500 20 m Niskin cast  
1506 End of Niskin cast  
1630 Arrive Waianae small boat harbor to drop off crew member  
1745 Transit to Station ALOHA

### October 7, 2012

0105 Arrive Station ALOHA – 3 nm North of center  
0124 Sediment traps deployed (22° 48.061'N, 157° 59.975'W)  
0200 S2C1 200 m CTD cast  
0229 End of cast  
0415 Primary Production array deployed (22° 46.993'N, 157° 59.995'W)  
0445 S2C2 near bottom CTD cast  
0804 End of cast, CTD wire re-terminated due to kinks  
0815 Transit to Apex float  
0918 Apex float recovered  
0930 Transit to pump tanks  
1025 Net tow  
1103 End net tow  
1124 S2C3 1000 m CTD cast  
1246 End of cast, 2 twists removed from CTD wire  
1300 Three Hyperpro casts  
1343 End Hyperpro  
1413 S2C4 1000 m CTD cast  
1517 End of cast  
1534 Hand net tow  
1540 Transit to pump tanks  
1705 S2C5 1000 m CTD cast  
1817 End of cast  
1911 Primary Production array recovered (22° 47.720'N, 158° 05.846'W)  
1948 Transit to pump tanks  
2045 S2C6 1000 m CTD cast  
2155 End of cast  
2210 Net tow  
2238 Begin second net tow  
2309 End net tow  
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2328 S2C7 1000 m CTD cast

**October 8, 2012**

0028 End of cast  
0113 Transit to pump tanks  
0216 S2C8 1000 m CTD cast  
0313 End of cast, 2 twists removed from CTD wire  
0427 Gas array deployed (22° 46.925'N, 158° 00.327'W)  
0459 S2C9 1000 m CTD cast  
0557 End of cast, 4 twists removed from CTD wire  
0615 Transit to pump tanks  
0803 S2C10 1000 m CTD cast  
0902 End of cast, 4 twists removed from CTD wire  
1000 Net tow  
1040 End net tow  
1043 ATE  
1111 End ATE  
1122 S2C11 1000 m CTD cast  
1221 End of cast, 2 twists removed from CTD wire  
1242 Net tow  
1312 End of net tow  
1400 S2C12 1000 m CTD cast  
1508 End of cast, 3 twists removed from CTD wire  
1520 Transit to pump tanks  
1613 Begin HPM communications, transducer in the water  
1621 HPM transducer on board, communications successful  
1659 S2C13 1000 m CTD cast  
1758 End of cast, 4 twists removed from CTD wire  
2000 S2C14 1000 m CTD cast  
2113 End of cast, 3 twists removed from CTD wire  
2200 Net tow  
2235 End net tow  
2320 S2C15 near bottom CTD cast

**October 9, 2012**

0255 End of cast, re-terminated CTD wire due to kink  
0315 Two AC9/FRRF casts  
0407 Begin second AC9/FRRf cast  
0458 End of AC9/FRRf cast  
0625 Gas array recovered (22° 48.69'N, 158° 08.04'W)  
0715 Sediment traps recovered (22° 50.177'N, 158° 12.948'W)  
0718 Transit to station ALOHA  
0910 S2C16 200 m CTD cast  
0932 End of cast, 3 twists removed from CTD wire  
0950 Two AC9/FRRF casts  
1043 Begin second AC9/FRRF cast  
1133 End of AC9/FRRF cast  
1154 Three Hyperpro casts  
1239 End of Hyperpro  
1310 S50C1 200 m yo-yo cast  
1430 End of cast, 5 cycles completed  
1440 Transit to Station Kaena  
2010 Arrive Station Kaena  
2013 S6C1 near bottom CTD cast  
2318 End of cast  
2325 Transit to Snug Harbor

**October 10, 2012**

0642- Arrive Hotel buoy

0724- First Line

0734- Arrive Snug Harbor

**6. HOT program components:**

<b>Investigator</b>	<b>Project</b>	<b>Institution</b>
Matt Church	Core Biogeochemistry	UH
Dave Karl		
Bob Bidigare		
John Dore		
Roger Lukas	Hydrography	Montana State
Mike Landry	Zooplankton dynamics	UH
Ricardo Letelier	Optical measurements	SIO

**Ancillary programs:**

Ralph Keeling	CO <sub>2</sub> dynamics and intercalibration	SIO
Paul Quay	DI <sup>13</sup> C	UH
Matt Church/ Ricardo Letelier	Diversity and activities of nitrogen-fixing microorganisms	UH/OSU

**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 Donn Viviani)	Coupling between bacterial production and primary production at Station ALOHA	UH
Henrieta Dulaiova	Japanese radionuclide release sampling	UH
Adina Paytan	O <sup>18</sup> natural abundance	UCSC
Matt Church (via Shimi Rii)	Investigation of temporal changes in picoeukaryote diversity at Station ALOHA	UH
Dave Karl (via Sandra Martinez-Garcia)	Microbial respiration in the NPSG; Heterotrophic bacteria limitation experiment	UH
Dave Karl (via Jim Foley)	Science Teachers Aboard Research Ships (STARS)	UH
Grieg Steward (via Christopher Schvarcz)	Viral Dynamics in the Oligotrophic Open Ocean, Station ALOHA	UH
Dave Karl (via Daniela del Valle)	Mixing experiment investigating differential microbial vitamin uptake	UH
Erica Goetze	Temporal stability of copepod populations at Station ALOHA	UH