

# **HOT 260: Chief Scientist Report**

Chief Scientist: Brett Updyke

**R/V *Kilo Moana***

February 13 – February 17, 2014

Cruise ID: **KM1406**

Departed: 13 February at 0900 (HST)

Returned: 17 February at 0812 (HST)

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

Master of the Vessel: Captain Jay Chavez

OTG Marine Technicians: Jeff Koch, Justin Smith, and Steve Tottori

## **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 February 13<sup>th</sup> 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 February 14<sup>th</sup>- 16<sup>th</sup>.
- 3) Station 52, the site of WHOTS-10 Mooring (anchor position 22° 40.12'N 157° 57.01'W) was to be occupied on February 16<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 February 16<sup>th</sup> for approximately 2 hours.

Upon arrival to Station Kahe a 1300 lb. weight-test cast to 500 m, one CTD cast to 1000 m, a Hyperpro cast, and a hand-deployed Niskin cast to 20 m were to be conducted on the afternoon of February 13<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 56 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 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 February 15<sup>th</sup>.

Another free-drifting array (Gas Array) was to be deployed for 24 hours for incubation experiments on February 15<sup>th</sup>. The Gas Array was to be recovered on February 16<sup>th</sup>.

A plankton net was to be towed between 1000-1400, and 2200-0200 for 30 minute intervals on February 14<sup>th</sup> and 15<sup>th</sup> at Station ALOHA. A hand net tow was to be deployed for approximately 15 minutes on the afternoon of February 15<sup>th</sup>.

The Hyperpro was to be deployed for approximately 45 minutes at 1400 hours on February 13<sup>th</sup>, 14<sup>th</sup>, and 16<sup>th</sup> to collect three profiles during each deployment.

A package including a Wet Labs AC9 and ACS, 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 at 1000 hours on February 16<sup>th</sup>.

A trace metal free sample was to be collected by the ATE sampler on February 15<sup>th</sup> at Station ALOHA.

After the 36 hour burst period of CTD work at Station ALOHA was accomplished, the ship was to transit to recover the free-floating Gas Array and the Sediment Trap Array on the morning of February 16<sup>th</sup>.

After recovering the arrays, the ship was to transit to Station ALOHA to conduct an AC9/FRRf cast. After these operations were complete, the ship was to transit to Station 52 to conduct a one-hour 200 m CTD yo-yo cast and surface instrument intercomparisons. After the yo-yo cast was complete, the ship was to transit to Station ALOHA for a Hyperpro cast at 1400 hours.

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 suite.

## 2. SCIENCE PERSONNEL

<b>Participant</b>	<b>Title</b>	<b>Affiliation</b>
Dan Sadler	Research Associate	UH
Lance Fujieki	Research Associate	UH
Susan Curlless	Research Associate	UH
Adriana Harlan	Research Associate	UH
Brett Updyke	Research Associate	UH
Blake Watkins	Marine Engineer	UH
Stuart Goldberg	Postdoctoral Researcher	UH
Jefrey Snyder	Marine Technician	UH
Joseph Gum	Research Associate	UH
Cameron Fumar	Research Associate	UH
Daniel McCoy	Research Associate	UH
Damion Rosbrugh	Undergraduate Student	UH
Kapono Gaughen	Undergraduate Student	UH
Brenner Wai	Technician	UH
William McQuiston	Intern	UH
David Ho	Professor	UH
Ben Hickman	Technician	UH
Eugene Gorman	Research Associate	LDEO
Jim Foley	Marine Educator	UH
Kimberlee Stewart	Teacher	Kapaa High School
Elizabeth Eubanks	Teacher	Pope High School
Robyn Ehrlich	Teacher	Kihei Public Charter School
Jeff Koch	Marine Technician	OTG
Justin Smith	Marine Technician	OTG
Steve Tottori	Marine Technician	OTG

### 3. GENERAL SUMMARY

Operations at Station ALOHA were conducted mostly as planned. One 1000 m CTD cast during the 36 hour period of burst sampling was canceled due to weather delays. One 1000 m CTD cast and one 20 m Niskin cast were completed at Station Kahe. Two near bottom CTD casts and twelve 1000 m CTD casts were conducted at Station ALOHA. One 200 m yo-yo CTD cast was completed near the WHOTS mooring (Station 52) with four cycles completed. One near bottom cast was completed at Station Kaena.

The Dynacon trawl winch with the 0.681" wire and the A-frame were used for CTD operations.

The Sediment Traps, Primary Productivity Array and Gas Array were all deployed and recovered successfully.

Five of the six planned net tows for the core HOT zooplankton collection were completed successfully; three during the day, and two during the night. One nighttime net tow was unsuccessful due to a badly torn net on account of the rough weather conditions on the evening of February 14<sup>th</sup>. One hand net tow was successfully completed.

Hyperpro casts (3 cycles each) were conducted on February 13<sup>th</sup>, 14<sup>th</sup>, and 16<sup>th</sup>.

The optical package ACS/AC9/FRRf/LISST was deployed twice (1 cycle each) on February 16<sup>th</sup> in the early morning and at 1000 hours. Typically, 2 cycles are performed during each deployment of the optical package; one with the ACS and AC9 filters attached and one without the filters attached. This is done to resolve total, dissolved, and particulate measurements. Both the ACS and the AC9 were removed from the optical package for repair/calibration, therefore only 1 cycle per deployment was necessary.

The ATE sampler was deployed and one trace metal free seawater sample was collected.

The underway thermosalinograph, fluorometer,  $p\text{CO}_2$  system, and the ship's meteorological suite ran without interruption during the cruise. The Ultrasonic anemometer showed an 8-10 kt positive offset to the port and starboard anemometers. The broad band/narrow band Ocean Surveyor ADCP and the Workhorse ADCP were working correctly during the cruise.

Winds at Station ALOHA were mostly 20-25 kts starting from the northeast on February 14<sup>th</sup> and gradually shifting to southerlies by the evening of February 16<sup>th</sup>. There was a brief period of sustained 35 kt winds with gusts over 40 kts on the night of February 14<sup>th</sup>. Seas were slight to moderate, varying with the wind, and there was a northerly to northeasterly swell of 6-10 ft throughout the cruise.

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

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

Technical support during this cruise was very good. OTG personnel were available to assist in our work during the cruise.

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

#### **February 13, 2014**

0900 - Depart Snug Harbor

0945 - Safety briefing with Captain

1020 - Fire and abandon ship drills  
1147 - Arrive Station Kahe  
1205 - Start weight cast to 500m  
1247 - End weight cast  
1303 - Start Hyperpro cast  
1341 - End Hyperpro  
1351 - Start s1c1 CTD cast to 1000m  
1520 - End s1c1  
1525 - Start 20m Niskin cast  
1533 - End 20m Niskin cast; transit to Station ALOHA

#### **February 14, 2014**

0015 - Arrive Station ALOHA  
0020 - Start Sediment Trap deployment  
0104 - Sediment Trap deployed (22° 45.0'N, 158° 02.20'W)  
0203 - Start s2c1 CTD cast to 1000m  
0337 - End s2c1  
0428 - Start Primary Productivity array deployment  
0444 - PP array deployed (22° 45.060'N, 158° 01.020'W)  
0510 - Start s2c2 near-bottom CTD cast  
0713 - 9m off bottom (22° 45.015'N, 157° 59.975'W)  
0930 - End s2c2  
0935 - Transit to pump ship's tanks  
1039 - Net tow delayed to replace leaking hydraulic hose on A-frame  
1118 - Start net tow  
1140 - End net tow  
1155 - Start s2c3 CTD cast to 1000m  
1339 - End s2c3  
1346 - Start Hyperpro cast  
1430 - End Hyperpro cast  
1453 - Start s2c4 CTD cast to 1000m  
1625 - End s2c4  
1706 - Start s2c5 CTD cast to 1000m  
1845 - End s2c5  
1850 - Transit to Primary Production array  
1933 - Start recovery of PP array  
1939 - First recovery attempt failed  
1952 - Start 2nd approach  
2012 - PP array recovered (22° 43.022'N, 158° 02.088'W)  
2023 - Transit to pump ship's tanks  
2111 - Arrive Station ALOHA  
2136 - Bridge indicates trouble with DP  
2142 - Start s2c6 CTD cast to 1000m  
2321 - End s2c6  
2330 - Start net tow

#### **February 15, 2014**

0006 - End net tow; net was torn in half, cancel 2nd net tow  
0147 - Start s2c7 CTD cast to 1000m  
0155 - Tag line caught on rosette; recover and redeploy  
0203 - s2c7 in the water  
0329 - End s2c7

0426 - Start deployment of Gas array  
0441 - Gas array deployed (22° 45.082'N, 158° 02.217'W)  
0500 - Start s2c8 CTD to 1000m  
0607 - End s2c8  
0610 - Transit to pump ship's tanks  
0752 - Start s2c9 CTD to 1000m  
0920 - End s2c9  
1017 - Start ATE deployment  
1041 - End ATE  
1100 - Start s2c10 CTD to 1000m  
1212 - End s2c10  
1230 - Start net tow  
1258 - End net tow  
1302 - Start net tow  
1333 - End net tow  
1335 - Transit to pump ship's tanks  
1425 - Start s2c11 CTD cast to 1000m  
1556 - End s2c11  
1557 - Start hand net tow  
1610 - End hand net tow  
1652 - Start s2c12 CTD cast to 1000m  
1812 - End s2c12  
1952 - Start s2c13 CTD cast to 1000m  
2125 - End s2c13  
2200 - Start net tow  
2230 - End net tow  
2233 - Start net tow  
2305 - End net tow; transit to center  
2312 - Start s2c14 near bottom CTD cast

### **February 16, 2014**

0138 - 8m off the bottom (22° 44.893'N, 158° 09.005'W)  
0332 - End s2c14  
0347 - Start AC9/FRRf  
0447 - End AC9/FRRf  
0459 - Start ACO hydrophone calibrations  
0528 - End hydrophone calibrations  
0533 - Transit to Gas array  
0702 - Gas array recovered (22° 45.506'N, 158° 09.005'W)  
0709 - Transit to Sediment Traps  
0800 - Start Sediment Traps recovery  
0845 - Sediment Traps recovered (22° 38.163'N, 158° 06.19'W)  
0847 - Transit to Station 52  
1000 - Start AC9/FRRf  
1052 - End AC9/FRRf  
1109 - Start s52c1 CTD yo-yo cast to 200 m  
1255 - End s52c1  
1330 - Start Hyperpro  
1403 - End Hyperpro  
1506 - Transit to Station Kaena  
2018 - Arrive Station Kaena  
2024 - Start S6C1 CTD cast to near bottom

2238 - End S6C1  
2242 - Transit to Snug Harbor

**February 17, 2013**

0704 - Arrive H buoy

0812 - All fast port side to, full offload

6. HOT PROGRAM SUB-COMPONENTS:

<b>Investigator</b>	<b>Project</b>	<b>Institution</b>
Matt Church Dave Karl Bob Bidigare	Core biogeochemistry	UH
John Dore	Biogeochemistry QA/QC	MSU
Roger Lukas	Hydrography	UH
Mike Landry	Zooplankton dynamics	SIO
Ricardo Letelier	Optical measurements	OSU
<b>Ancillary programs:</b>		
Andrew Dickson	CO <sub>2</sub> dynamics and intercalibration	SIO
Paul Quay	DI <sup>13</sup> C	UW
Matt Church & Ricardo Letelier	Diversity and activities of nitrogen-fixing microorganisms	UH
Sam Wilson	Reduced gases in the upper ocean: The cycling of methane, sulfide and nitrous oxide	UH
Sara Ferrón-Smith	O <sub>2</sub> /Argon measurements	UH
Christopher Schvarcz	Viral dynamics in the oligotrophic open ocean, Station ALOHA	UH
Stuart Goldberg	Duplicate flow cytometry sample collection for method comparison	UH
Erica Goetze	Temporal stability of copepod populations at Station ALOHA	UH
David Ho, Benjamin Hickman, Eugene Gorman	Automated continuous measurement of CFC and SF <sub>6</sub> saturation in surface waters	UH/LDEO
Boaz Luz	Tracing deep water with isotopes of dissolved O <sub>2</sub>	Hebrew Univ. of Jerusalem/ LDEO

Kendra Turk-Kubo	Symbiotic interactions between a nonphotosynthetic cyanobacterium and a unicellular alga	UCSC
Jim Foley	STARS program	UH
John Casey, Paul Bienfang	Surface seawater collection for culturing work	UH