

# HOT-243: Chief Scientist Report

Chief Scientist: Susan Curless

**R/V Kilo Moana**

June 25-29, 2012

Cruise ID: **KM 12-13**

Departed: June 25, 2012 at 0855 (HST)

Returned: June 29, 2012 at 0754 (HST)

Vessel: **R/V Kilo Moana**

Master of the Vessel: Captain Rick Meyer

OTG Marine Technicians: Trevor Young and Kuhio Vellalos

## 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-9 Mooring (anchor position 22° 46.071'N 157° 53.956'W) will 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 approximately 3 hours.

Upon arrival to Station Kahe a 1000 lb. weight-test cast to 500 m, one CTD cast to 1000 m, a Hyperpro cast and a hand lowered Niskin cast were to be conducted on the afternoon of June 25th. 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, Seaglider #148 was to be deployed prior to deploying the free-drifting sediment trap array. The sediment trap array was to stay in the water for about 52 hours. This was to be followed by one 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 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 June 27th.

Another free-drifting array (Gas Array) was to be deployed for 24 hours for incubation experiments on June 27th. The Gas Array was to be recovered on June 28th.

A plankton net was to be towed between 1000-1400, and 2200-0200 for 30 minute intervals on June 26th and 27th at Station ALOHA.

The Hyperpro was to be deployed for a half-hour period near noon time on June 25th, 26th and 28th.

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 June 28th.

A trace metal free sample was to be collected by the ATE sampler each day the ship was occupying Station ALOHA.

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 June 28th.

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, 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,  $p\text{CO}_2$  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/BEACH                     |
| Dan Sadler                  | Research Associate      | UH/BEACH                     |
| Brett Updyke                | Research Associate      | UH/BEACH                     |
| Adriana Harlan              | Research Associate      | UH/BEACH                     |
| Sean Jungbluth              | Graduate Student        | UH/BEACH                     |
| Donn Viviani                | Graduate Student        | UH/BEACH                     |
| Shimi Rii                   | Graduate Student        | UH/BEACH                     |
| Blake Watkins               | Marine Engineer         | UH/BEACH                     |
| Christina Johnson           | Undergraduate Intern    | UH/CMORE                     |
| Mitchell Chong              | Undergraduate Intern    | UH/CMORE                     |
| Sandra Martinez-Garcia      | Postdoctoral Researcher | UH/CMORE                     |
| Benedetto Barone            | Postdoctoral Researcher | UH/CMORE                     |
| Daniela Böttjer             | Postdoctoral Researcher | UH/CMORE                     |
| Sara Thomas                 | Graduate Student        | UH/CMORE                     |
| Jefrey Snyder               | Marine Technician       | UH/PO                        |
| Fernando Santiago-Mandujano | Research Associate      | UH/PO                        |
| Alma Castillo-Trujillo      | Graduate Student        | UH/PO                        |
| Joseph Gum                  | Research Associate      | UH/PO                        |
| Jim Foley                   | Marine Educator         | UH/CMORE                     |
| Jon Svenson                 | STARS participant       | Kamehameha Schools Maui      |
| Francesca DePasquale        | STARS participant       | Campbell High School         |
| Haunani Kane                | STARS participant       | Polynesian Voyaging Society  |
| Trevor Young                | Marine Technician       | OTG                          |
| Kuhio Vellalos              | Marine Technician       | OTG                          |
| Ashley Stinson              | MATE Intern             | OTG                          |

### 3. GENERAL SUMMARY

Operations at Station ALOHA were delayed during the first day of the cruise due to complicated weather conditions. The presence of a strong eastward current (~1 kt) combined with high (20-25 kt) easterly winds made keeping the ship on station with appropriate wire angles on array deployments and CTD casts quite difficult. To compensate for the time delays experienced, one 1000 m CTD cast in the 36 hour period was cancelled and therefore the burst period was shortened to only 33 hours. Water needs from the cancelled cast were re-assigned to other casts.

Another slight delay was experienced on the second night at Station ALOHA when a side rail on the Caley Crane energy chain came off during the recovery of the CTD. KM engineers made repairs to the energy chain and the repairs were tested by exercising the crane before another CTD cast was deployed. Movement of the energy chain during CTD operations was then restricted for the remainder of the cruise.

One 1000 m CTD cast was 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 50) with four 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 east of the center of Station ALOHA.

Seaglider #148 was successfully deployed at Station ALOHA on June 25th.

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

The Hyperpro was deployed and recovered successfully three times near noon.

The optical package ACS/AC9/FRRf/LISST was deployed two times during the cruise, once around noon and once in the early morning. The ACS was out for servicing and was not deployed on this cruise. Two LISST's were deployed on the optics cage to test the pressure sensors on both instruments.

The ATE was lost during its first deployment due to station keeping failure. The line securing the ATE to the ship was severed by either the ship's rudder or screw.

The fluorometer, thermosalinograph and the ship's meteorological suite ran without interruption during the cruise. The underway *p*CO<sub>2</sub> system would not operate and requires additional parts for repair. The Caley Crane control and read out monitor in Lab #1 was not working.

Winds were from the east throughout the cruise at 20-25 kts for the first two days of the cruise and 15-20 kts for remainder of the cruise. A strong eastward current was present at Station ALOHA throughout the cruise. Seas were 8-10 ft for the first day of the cruise, and diminished to 6-8 ft for the rest of the cruise.

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

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

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

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

### **June 25, 2012**

0855- Depart Snug Harbor  
0930- Safety briefing with the Captain and Chief Scientist  
1005- Fire and abandon ship drills  
1200- Arrive at Station Kahe, weight cast to 500 m  
1225- End of weight cast  
1241- Hyperpro  
1258- End of Hyperpro  
1306- S1C1, 1000 m CTD cast  
1350- Level wind problem at 905 dbar  
1445- End of cast  
1500- 20 m niskin cast  
1530- Transit to Station ALOHA  
2255- Arrive at Station ALOHA, 2 nm north of the center  
2315- Deploy sea glider 22° 47.97'N 157° 59.94'W  
2330- Deploy Sediment Traps

### **June 26, 2012**

0019- Traps away 22° 48.28'N 157° 59.01'W  
0153- S2C1 1000 m CTD cast  
0320- End of cast  
0445- Deploy PP Array 22° 48.379 'N 158° 1.370'W  
0552- S2C2 PO Deep Cast  
1024- End of cast  
1037- Net Tow  
1109- End  
1116- ATE  
1130- ATE lost under ship and line cut by prop  
1200- Hyperpro  
1210- Second attempt Hyperpro  
1218- End Hyperpro  
1221- Transit to pump ship's tanks  
1340- S2C3 1000 m CTD PO Shallow  
1504- End of cast -twists removed from wire  
1621- S2C4 1000 m CTD  
1735- End of cast -twists removed from wire  
1929- Recover PP array 22° 47.98'N 157° 52.79'W  
1945- Array on board  
2011- S2C5 1000 m CTD  
2130- End of cast -twists removed from wire  
\*\*During recovery, a side panel of the Caley Energy Chain fell onto the back deck. Engineering was called and repairs were made to the energy chain  
2200- Net Tow  
2230- Second Net Tow  
2300- Testing repairs to Caley energy chain  
2340- S2C6 1000 m CTD

### **June 27, 2012**

0104- End of cast -twists removed from wire  
0206- S2C7 1000 m CTD  
0329- End of cast  
0334- Transit 2 nm west to Gas Array deployment site  
0435- Gas Array Deployment 22° 48.13'N 158° 01.82'W  
0512- S2C8 1000 m CTD

0632- End of cast -twists removed from wire  
0756- S2C9 1000 m CTD  
0923- End of cast -twists removed from wire  
1005- Net tow  
1044- End Net tow  
1049- S2C10 1000 m CTD  
1209- End of cast -twists removed from wire \*\*ISUS dropped out on upcast\*\*  
1221- Net Tow  
1249- End Net Tow  
1354- S2C11 1000 m CTD - ISUS unresponsive from 0-220 dbar, and 5 minute delay in data collection on upcast at 900 dbar  
1523- End of cast -twists removed from wire \*\*Once the CTD cast was recovered, the ISUS file collection was checked via computer. Despite data not being seen on the console traces, the data files were complete on the ISUS instrument itself.\*\*  
1700- S2C12 1000 m CTD  
1804- End of cast -twists removed from wire  
1815- Transit to Pump ship's tanks  
1952- S2C13 1000 m CTD -twists removed from wire  
2116- End of Cast- ISUS removed from CTD  
2200- Net Tow  
2235- End of net tow  
2314- S2C14 PO 2nd deep cast

#### **June 28, 2012**

0115- At 9 dbar off true bottom 22° 45.13'N 157° 59.67'W -slow on the upcast due to level wind checking by engineers  
0324- End of Cast -blackish/brown biology on rosette -twists removed from wire  
0337- AC9/FRRf  
0427- End first cast  
0431- AC9/FRRf  
0527- End of second cast  
0530- Transit to recover the Gas Array  
0655- Gas Array recovery 22° 44.901'N 157° 43.81'W  
0722- Array on board  
0723- Transit to Sediment Traps  
0800- Sediment Trap Recovery 22° 44.14'N 157° 36.49'W  
0837- Array on board  
1019- S50C1 200 m yo-yo cast  
1129- Cycle 4 complete  
1133- End of cast -twists removed from wire  
1135- Transit to Station ALOHA  
1230- Hyperpro 1st attempt -did not go deep enough  
1240- Hyperpro 2nd attempt  
1310- AC9/FRRf  
1450- AC9/FRRf on deck  
1500- Transit to Station Kaena  
2030- Arrive at Station Kaena, S6C1 -near bottom CTD  
2245- End of cast  
2251- Transit to Snug Harbor

#### **June 29, 2012**

0700- Arrive H buoy  
0742- First Line  
0754- Arrive Snug Harbor

**HOT program sub-components:**

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

**Ancillary programs:**

|                 |  |     |
|-----------------|--|-----|
| 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  |

**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)                             | Bacterial production and EOC at Station ALOHA  | UH       |
| Dave Karl (via Sandra Martinez-Garcia)                     | Microbial Respiration in the NPSG, and water collection for prochlorococcus culturing  | UH       |
| Matt Church (via Shimi Rii)                                | Investigation of temporal changes in picoeukaryote diversity at Station ALOHA  | UH       |
| Henrieta Dulaiova and Ken Buesseler                        | Japanese radionuclide release sampling   | UH       |
| Rebecca Briggs   | LNSW collection for SOEST Lab for Analytical Biogeochemistry   | UH       |
| Adina Paytan   | O <sup>18</sup> natural abundance  | UCSC     |
| Dave Karl (via Mariona Segura-Noguera)                     | Sample collection for dissolved inorganic and organic nitrogen determination   | UH       |
| Matt Church/Dave Karl (via Sam Wilson and Daniela Böttjer) | Nitrogen fixation methodology comparison, water collection to create 15N enriched seawater, and water collection for culturing media | UH       |
| Dave Karl (via Jim Foley)                                  | Science Teachers Aboard Research Ships (STARS)   | UH       |
| Matt Church (via Church Lab members)                       | N <sub>2</sub> fixation, Primary Production, and Bacterial Production rates in 25 m water at Station ALOHA                           | UH       |
| Matt Church (via Sara Thomas)                              | Chemolithoautotroph experiment   | UH       |
| Matt Church and John Waterbury (via Christina Johnson)     | Slide collection for crocosphaera and heterocystic bacteria associated with diatoms  | UH       |
| Grieg Steward (via Chris Schvarcz)                         | Tangential flow filtration to collect marine viruses, and water collection for culturing media                                       | UH       |