HOT-246: Chief Scientist Report

Chief Scientist: Fernando Santiago-Mandujano

R/V Kilo Moana

13-17 September, 2012

Cruise ID: KM 12-20
Departed: 13 September at 0900 (HST)
Returned: 17 September at 0755 (HST)

Vessel: R/V Kilo Moana
Master of the Vessel: Captain Gray Drewry
OTG Marine Technicians: Ben Colello 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 September 13th 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 September 14th, 15th, and 16th.
3) Station 50, the site of WHOTS-9 Mooring (anchor position 22° 46.071’N 157° 53.956’W) was to be occupied on September 16th 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 September 16th 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 was to be conducted on the afternoon of September 13th. 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 September 15th.

Another free-drifting array (Gas Array) was to be deployed for 24 hours for incubation experiments on September 14th. The Gas Array was to be recovered on September 15th.

A plankton net was to be towed between 1000-1400, and 2200-0200 for 30 minute intervals on September 14th and September 15th at Station ALOHA.

The Hyperpro was to be deployed for approximately 45 minutes near noon time on September 13th, 14th, and 16th to collect three profiles during each deployment.

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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 September 16th.

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

Communications with the HOT Profiler Mooring (HPM) and data downloading were to be conducted on September 15th.

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 16th.

After recovering the arrays, the ship was to transit to Station ALOHA to conduct ACS/AC9/FRRf/LISST casts, and Hyperpro casts, 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 back to Snug Harbor.

The following instruments were to collect data throughout the cruise: shipboard ADCP, thermosalinograph, pCO₂ system, underway fluorometer and the meteorological package.

2. SCIENCE PERSONNEL

<table>
<thead>
<tr>
<th>Participant</th>
<th>Title</th>
<th>Affiliation/HOT Group</th>
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<tbody>
<tr>
<td>Susan Curless</td>
<td>Research Associate</td>
<td>UH/BEACH</td>
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<tr>
<td>Dan Sadler</td>
<td>Research Associate</td>
<td>UH/BEACH</td>
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<tr>
<td>Brett Updyke</td>
<td>Research Associate</td>
<td>UH/BEACH</td>
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<tr>
<td>Adriana Harlan</td>
<td>Research Associate</td>
<td>UH/BEACH</td>
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<tr>
<td>Karin Björkman</td>
<td>Research Specialist</td>
<td>UH/BEACH</td>
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<tr>
<td>Donn Viviani</td>
<td>Graduate Student</td>
<td>UH/BEACH</td>
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<tr>
<td>Shimi Rii</td>
<td>Graduate Student</td>
<td>UH/BEACH</td>
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<tr>
<td>Blake Watkins</td>
<td>Marine Engineer</td>
<td>UH/BEACH</td>
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<tr>
<td>Daniela Böttjer</td>
<td>Postdoctoral Researcher</td>
<td>UH/CMORE</td>
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<tr>
<td>Benedetto Barone</td>
<td>Postdoctoral Researcher</td>
<td>UH/CMORE</td>
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<tr>
<td>Hilary Close</td>
<td>Researcher</td>
<td>UH/SOEST</td>
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<tr>
<td>Ken Doggett</td>
<td>Research Associate</td>
<td>UH/CMORE</td>
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<tr>
<td>Ger Van den Engh</td>
<td>Scientist</td>
<td>B/D BioSciences/CMORE</td>
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<tr>
<td>Christopher Schvarcz</td>
<td>Graduate Student</td>
<td>UH/CMORE</td>
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<tr>
<td>Jeffrey Snyder</td>
<td>Marine Technician</td>
<td>UH/PO</td>
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<tr>
<td>Fernando Santiago-Mandujano</td>
<td>Research Associate</td>
<td>UH/PO</td>
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<tr>
<td>Cameron Fumar</td>
<td>Research Associate</td>
<td>UH/PO</td>
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<tr>
<td>Branden Obra</td>
<td>Research Associate</td>
<td>UH/PO</td>
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<tr>
<td>Justin Smith</td>
<td>Research Assistant</td>
<td>UH/PO</td>
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<tr>
<td>Daniel McCoy</td>
<td>Volunteer</td>
<td>UH/PO</td>
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<tr>
<td>Ben Colello</td>
<td>Marine Technician</td>
<td>OTG</td>
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<tr>
<td>Daniel Fitzgerald</td>
<td>Marine Technician</td>
<td>OTG</td>
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3. GENERAL SUMMARY

Operations at Station ALOHA were conducted as planned.

One 1000 m CTD cast was completed at Station Kahe. Two near bottom CTD casts and thirteen 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 five cycles completed. One near bottom cast was completed at Station Kaena.

The Caley emergency stop was accidentally activated during two CTD recoveries (see Section 5), apparently caused by rough handling of the belly-pack controls.

The Sediment Traps, Primary Production Array, and Gas Array were all deployed and recovered successfully inside the ALOHA circle. All arrays drifted to the west/northwest 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.

Hyperpro casts (3 cycles each) were conducted on September 13th, 14th, and 16th.

The optical package ACS/AC9/FRRf/LISST was deployed four times on September 16th, two back to back deployments in the early morning, and two at around noon.

The ATE was deployed at Station ALOHA on September 14th, 15th, and 16th, however only two samples were obtained.

Communications with the HPM and data downloading were successfully conducted on September 15th.

The fluorometer, thermosalinograph, pCO2 system, and the ship’s meteorological suite ran without interruption during the cruise. The Caley Crane control and read out monitor in Lab #1 was not working.

Winds were from the east throughout the cruise at 10-18 kts with smooth seas. A westward current was present at Station ALOHA throughout 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 Drewery 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)

September 13, 2012
0900- Depart Snug Harbor
0945- Safety briefing with the Captain and Chief Scientist
1030- Fire and abandon ship drills
1130- Arrive at Station Kahe, weight cast to 500 m
1204- End of weight cast
1217- Hyperpro cast (3 cycles)
1300- End of Hyperpro
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1311- S1C1, 1000 m CTD cast.
1430- End of cast. Two twists removed from the CTD wire after the cast.
1439- Transit to Station ALOHA
2250- Arrive at Station ALOHA
2314- Deployed Sediment Traps (22° 47.972’N, 157° 57.546’W)

September 14, 2012
0246- S2C1 1000 m CTD cast.
0300- End of cast. Three twists removed from the CTD wire after the cast.
0458- Deployed PP Array 22° 48.003’N, 157° 57.546’W
0541- S2C2 PO Deep Cast.
0718- At 4 m off the bottom (22° 45.025’N, 157° 59.996’W)
0917- End of cast. Six twists removed from the CTD wire after the cast.
0930- Transit to pump ship's tanks
1015- Net Tow starts
1047- End net tow
1056- ATE starts
1140- End ATE
1207- S2C3 1000 m CTD PO Shallow
1327- End of cast. Five twists removed from the CTD wire after the cast.
1339- Hyperpro cast (3 cycles)
1411- End Hyperpro
1523- S2C4 1000 m CTD PO Shallow. Cast delayed due to second temperature sensor problems. Replaced sensor cable.
1622- End of cast.
1657- S2C5 1000 m CTD
1816- End of cast. Two twists removed from the CTD wire after the cast.
1855- Recover PP array 22° 48.146’N 157° 59.187’W
1911- Array on board
0915- Transit to pump ship's tanks
1959- S2C6 1000 m CTD
2115- End of cast.
2200- Net Tow
2233- End net tow
2235- Second Net Tow
2300- End net tow
2302- S2C7 1000 m CTD

September 15, 2012
0012- End of cast. After the CTD came on deck, the Caley emergency stop was activated when the OTG operator set the belly-pack controller down on deck after switching control. The system worked fine after re-booting.
0148- S2C8 1000 m CTD.
0252- End of cast. The Caley emergency stop was activated again when the belly-pack was set down on deck with the CTD at 5 dbar before recovery. Five twists removed from the CTD wire after the cast.
0435- Gas Array Deployment 22° 48.589’N 157° 57.375’W
0457- S2C9 1000 m CTD
0550- End of cast. Four twists removed from the CTD wire after the cast
0559- Transit to pump ship's tanks
0753- S2C10 1000 m CTD
0854- End of cast. Four twists removed from the CTD wire after the cast
1002- Net tow start
1034- End Net tow
1040- ATE sample start
1110- End ATE
1113- S2C11 1000 m CTD
1227- End of cast. Three twists removed from the CTD wire after the cast
1248- Net Tow start  
1319- End Net Tow  
1354- S2C12 1000 m CTD  
1510- End of cast. Five twists removed from the CTD wire after the cast  
1520- Transit to Station HPM site  
1620- Data communications with HPM, about 100 m from the HPM buoy. Data emailed to APL by OTG technician  
1652- S2C13 1000 m CTD  
1805- End of cast. Four twists removed from the CTD wire after the cast  
1810- Transit to pump ship's tanks  
2106- S2C14 1000 m CTD  
2200- Net Tow  
2231- End of net tow  
2251- S2C15 PO 2nd deep cast  

**September 16, 2012**  
0037- At 8 dbar off the bottom 22° 44.999'N 158° 0.008'W  
0227- End of Cast. Two twists removed from the CTD wire after the cast  
0302- AC9/FRRf  
0351- End first cast  
0354- AC9/FRRf  
0444- End of second cast  
0611- Gas Array recovery 22° 49.466'N 158° 0.074'W  
0626- Transit to pump ship's tanks  
0807- Sediment Trap Recovery 22° 48.001'N 158° 5.786'W  
0819- Array on board  
0942- ATE deployment  
1009- End ATE  
1015- AC9/FRRf  
1106- AC9/FRRf on deck, start second deployment  
1155- End cast  
1212- Hyperpro cast (3 cycles)  
1247- End cast  
1324- S50C1 200 m yo-yo cast  
1432- End of cast, 5 cycles completed  
1440- Transit to Station Kaena  
1945- Arrive at Station Kaena, S6C1 –near bottom CTD  
2145- End of cast  
2200- Transit to Snug Harbor  

**September 17, 2012**  
0700- Arrive H buoy  
0745- First Line  
0755- Arrive Snug Harbor  

6. **HOT program sub-components:**

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<tr>
<th>Investigator</th>
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<tr>
<td>Matt Church</td>
<td>Core Biogeochemistry</td>
<td>UH</td>
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<tr>
<td>Dave Karl</td>
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<td>Bob Bidigare</td>
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<td>Roger Lukas</td>
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<td>Mike Landry</td>
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<td>Ricardo Letelier</td>
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### Ancillary programs:

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<td>Charles Keeling</td>
<td>CO$_2$ dynamics and intercalibration</td>
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<td>Paul Quay</td>
<td>D$_{13}$C</td>
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<tr>
<td>Matt Church</td>
<td>Diversity and activities of nitrogen-fixing microorganisms</td>
<td>UH</td>
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### Additional programs:

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<tr>
<td>Dave Karl (via Sam Wilson)</td>
<td>Reduced gases in the upper ocean: The cycling of methane, sulfide and nitrous oxide</td>
<td>UH/Moore</td>
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<tr>
<td>Matt Church (via Donn Viviani)</td>
<td>Bacterial production and EOC at Station ALOHA</td>
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<td>Henrieta Dulaiova and Ken Buesseler</td>
<td>Japanese radionuclide release sampling</td>
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<td>Adina Paytan</td>
<td>O$^{18}$ natural abundance</td>
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<tr>
<td>Dave Karl (via Mariona Segura-Noguera)</td>
<td>Sample collection for dissolved inorganic and organic nitrogen determination</td>
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<tr>
<td>Matt Church (via Church Lab members)</td>
<td>N$_2$ fixation, Primary Production, and Bacterial production rates in 25 m water at Station ALOHA</td>
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<tr>
<td>Matt Church and John Waterbury (via Christina Johnson)</td>
<td>Slide collection for crocosphaera and heterocystic bacteria associated with diatoms</td>
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<tr>
<td>Dave Karl (via Sandra Martinez-Garcia)</td>
<td>Heterotrophic bacteria limitation experiment</td>
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<td>Paul Kemp (via Lydia Baker)</td>
<td>Effects of nutrients on diatom-bacterial interactions</td>
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<tr>
<td>Matt Church/Dave Karl (via Daniela Bottjer and Sam Wilson)</td>
<td>Nitrogen Fixation Methodology Comparison</td>
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<tr>
<td>Matt Church (via Shimi Rii)</td>
<td>Investigation of temporal changes in picoeukaryote diversity at Station ALOHA</td>
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<td>Dave Karl (via Karin Bjorkman)</td>
<td>ATP uptake experiment</td>
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<td>Hilary Close</td>
<td>Preliminary trial of plankton cell-sorting/natural 15N Analysis</td>
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<td>Grieg Steward (via Christopher Schvarcz)</td>
<td>Viral Dynamics in the Oligotrophic Open Ocean, Station ALOHA</td>
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<tr>
<td>Dave Karl (via Ken Dogget and Ger Van den Engh)</td>
<td>Fluorescence Properties of Prochlorococcus</td>
<td>UH/B/D Biosciences</td>
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