

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, *p*CO₂ system, underway fluorometer and the meteorological package.

2. SCIENCE PERSONNEL

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

Scott Ferguson

Marine Technician

OTG

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, *p*CO₂ 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
 1951- S2C14 1000 m CTD
 2106- End of Cast. Two twists removed from the CTD wire after the cast - ISUS removed from 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:

Investigator	Project	Institution
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 ₂ dynamics and intercalibration	SIO
Paul Quay	DI ¹³ 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
Henrieta Dulaiova and Ken Buesseler	Japanese radionuclide release sampling	UH
Adina Paytan	O ¹⁸ natural abundance	UCSC
Dave Karl (via Mariona Segura-Noguera)	Sample collection for dissolved inorganic and organic nitrogen determination	UH
Matt Church (via Church Lab members)	N ₂ fixation, Primary Production, and Bacterial Production rates in 25 m water at Station ALOHA	UH
Matt Church and John Waterbury (via Christina Johnson)	Slide collection for crocosphaera and heterocystic bacteria associated with diatoms	UH
Dave Karl (via Sandra Martinez-Garcia)	Heterotrophic bacteria limitation experiment	UH
Paul Kemp (via Lydia Baker)	Effects of nutrients on diatom-bacterial interactions	UH
Matt Church/Dave Karl (via Daniela Bottjer and Sam Wilson)	Nitrogen Fixation Methodology Comparison	UH
Matt Church (via Shimi Rii)	Investigation of temporal changes in picoeukaryote diversity at Station ALOHA	UH
Dave Karl (via Karin Bjorkman)	ATP uptake experiment	UH
Hilary Close	Preliminary trial of plankton cell-sorting/natural 15N Analysis	UH/SOEST
Grieg Steward (via Christopher Schvarcz)	Viral Dynamics in the Oligotrophic Open Ocean, Station ALOHA	UH
Dave Karl (via Ken Doggett and Ger Van den Engh)	Fluorescence Properties of Prochlorococcus	UH/B/D Biosciences