

HOT-244: Chief Scientist Report

Chief Scientist: Fernando Santiago-Mandujano

R/V *Kilo Moana*

July 30-August 3, 2012

Cruise ID: **KM 12-16**

Departed: July 30, 2012 at 0855 (HST)

Returned: August 3, 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 July 30th 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 July 31st and August 1st and 2nd.
- 3) Station 50, the site of WHOTS-9 Mooring (anchor position 22° 46.071'N 157° 53.956'W) was to be occupied on August 2nd 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 August 2nd 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 July 30th. 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 300 m CTD cast to collect samples for incubation experiments, 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 August 2nd.

Another free-drifting array (Gas Array) was to be deployed for 24 hours for incubation experiments on August 1st. The Gas Array was to be recovered on August 2nd.

A plankton net was to be towed between 1000-1400, and 2200-0200 for 30 minute intervals on July 31st and August 1st at Station ALOHA.

The Hyperpro was to be deployed for approximately 45 minutes near noon time on July 30th, 31st, and August 2nd to collect three profiles during each deployment.

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 August 2nd.

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 August 2nd.

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

Participant	Title	Affiliation/HOT Group
Susan Curless	Research Associate	UH/BEACH
Brett Updyke	Research Associate	UH/BEACH
Adriana Harlan	Research Associate	UH/BEACH
Karin Björkman	Research Specialist	UH/BEACH
Sean Jungbluth	Graduate Student	UH/BEACH
Donn Viviani	Graduate Student	UH/BEACH
Blake Watkins	Marine Engineer	UH/BEACH
Christina Johnson	Undergraduate Intern	UH/CMORE
Benedetto Barone	Postdoctoral Researcher	UH/CMORE
Sara Thomas	Graduate Student	UH/CMORE
Jefrey Snyder	Marine Technician	UH/PO
Fernando Santiago-Mandujano	Research Associate	UH/PO
Cameron Fumar	Research Associate	UH/PO
Joseph Gum	Research Associate	UH/PO
Svetlana Natarov	Grad Student, Volunteer	UH/PO
Trevor Young	Marine Technician	OTG
Kuhio Vellalos	Marine Technician	OTG

3. GENERAL SUMMARY

Operations at Station ALOHA were conducted as planned. A bending in the CTD wire caused by operator error during stowing of the Caley crane after the first cast at Station ALOHA, caused a slight delay in the deployment of the primary productivity cast (S2C2) as the wire had to be re-terminated. The cable was rapidly re-terminated by J. Snyder, which prevented a major change in the schedule, as this happened at a critical time right before the primary productivity water collection and subsequent time-dependent array deployment.

In an attempt to prevent twisting of the CTD wire, caused possibly by rosette spinning by the ship's wake while the CTD is sitting at 5 m for bottle firing, bottles that are usually collected at 5 dbar were collected at 10 dbar for all casts, except for the casts sampling water for the primary productivity and gas arrays (S2C2 and S2C9). This did not seem to solve the wire twisting problem, as twists had to be removed from the wire almost after every cast (see section 5)

One of the science group members received a slight arm injury when the cover of one of the incubators was left unattended and fell on their arm. The person received medical attention by the First mate, and an incident report was filled.

One 1000 m CTD cast was completed at Station Kahe. Two near bottom CTD casts, thirteen 1000 m CTD casts, and one 300 m cast 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 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.

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

The optical package ACS/AC9/FRRf/LISST was deployed four times on August 2nd, twice back to back deployments around noon and twice back to back deployments in the early morning.

The ATE was deployed at Station ALOHA on July 31st and August 1st and 2nd, but only two trace metal samples were successfully collected.

The fluorometer, thermosalinograph and the ship's meteorological suite ran without interruption during the cruise; however the data were not available in the ship's intranet system because one of the computers (kmsnap) was not working. The underway *p*CO₂ 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 eastnortheast throughout the cruise at 15-20 kts. A strong northwestward current was present at Station ALOHA throughout the cruise. Seas were 4-6 ft during 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)

July 30, 2012

0900- Depart Snug Harbor
0945- Safety briefing with the Captain and Chief Scientist
1000- Fire and abandon ship drills
1200- Arrive at Station Kahe, weight cast to 500 m
1240- End of weight cast
1245- Hyperpro (3 cycles)
1325- End of Hyperpro
1328- S1C1, 1000 m CTD cast.
1450- End of cast. Two twists removed from the CTD wire after the cast. The ship's engineers were watching and fine tuning the new level wind on the Caley winch drum during the weight cast and the CTD cast at Station Kahe.
1455- Transit to Station ALOHA
2245- Arrive at Station ALOHA
2254- Deployed Sediment Traps (22° 45.69'N, 157° 59.18'W)
2336- S2C1 300 m CTD cast.
2414- End of cast. The CTD wire was bent while stowing away the crane with temporary zero tension in the wire. When tension was reapplied, a twist near the drum came tight, bending the wire. The section with the bends was cut and the wire was re-terminated.

July 31, 2012

0207- S2C2 1000 m CTD cast
0315- End of cast
0430- Deployed PP Array 22° 45.79'N, 157° 58.59'W
0530- S2C3 PO Deep Cast.
0720- At 4 m off the bottom (22° 45.028'N, 157° 59.966'W)
0930- End of cast. Five twists removed from the CTD wire after the cast.
0935- Transit to pump ship's tanks
1030- Net Tow starts
1104- End net tow
1140- ATE starts
1208- End ATE
1209- S2C4 1000 m CTD PO Shallow
1320- End of cast. Four twists removed from the CTD wire after the cast.
1330- Hyperpro
1405- End Hyperpro
1427- S2C5 1000 m CTD PO Shallow
1529- End of cast. Four twists removed from the CTD wire after the cast.
1600- Transit to pump ship's tanks
1659- S2C6 1000 m CTD
1807- End of cast. Six twists removed from the CTD wire after the cast.
1900- One of the science group members received a slight arm injury when the cover of one of the incubators fell on their arm.
1915- Recover PP array 22° 49.47'N 158° 1.02'W
1938- Array on board
1951- S2C7 1000 m CTD
2103- End of cast. Three twists removed from the CTD wire after the cast.
2159- Net Tow
2226- End net tow
2230- Second Net Tow
2253- End net tow
2258- S2C8 1000 m CTD

August 1, 2012

0011- End of cast
0151- S2C9 1000 m CTD
0258- End of cast. Five twists removed from the CTD wire after the cast.
0426- Gas Array Deployment 22° 46.69'N 157° 59.24'W
0500- S2C10 1000 m CTD
0602- End of cast. Five twists removed from the CTD wire after the cast
0800- S2C11 1000 m CTD
0858- End of cast. Four twists removed from the CTD wire after the cast
0900- Transit to pump ship's tanks
1000- Net tow start
1035- End Net tow
1046- ATE sample start
1115- End ATE
1119- S2C12 1000 m CTD
1218- End of cast. Five twists removed from the CTD wire after the cast
1230- Net Tow start
1305- End Net Tow
1350- S2C13 1000 m CTD
1504- End of cast. Three twists removed from the CTD wire after the cast
1656- S2C14 1000 m CTD
1804- End of cast. Four twists removed from the CTD wire after the cast
1830- Transit to pump ship's tanks
1953- S2C15 1000 m CTD -twists removed from wire
2058- End of Cast. Three twists removed from the CTD wire after the cast - ISUS removed from CTD
2200- Net Tow
2235- End of net tow
2306- S2C16 PO 2nd deep cast

August 2, 2012

0044- At 8 dbar off the bottom 22° 44.994'N 158° 0.004'W
0233- End of Cast.
0301- AC9/FRRf
0354- End first cast
0355- AC9/FRRf
0446- End of second cast
0545- Gas Array recovery 22° 48.43'N 158° 4.36'W
0610- Array on board
0645- Sediment Trap Recovery 22° 53.10'N 158° 9.70'W
0710- Array on board
0857- ATE deployment
0925- End ATE
1030- S50C1 200 m yo-yo cast
1042- End of cast, 5 cycles completed
1043- Transit to Station HPM site
1145- AC9/FRRf
1240- AC9/FRRf on deck, start second deployment
1330- End cast
1340- Hyperpro cast
1416- Data communications with HPM, about 100 m from the HPM buoy. Data emailed to APL by OTG technician
1500- Transit to TAAM site.
1510- Acoustic signal sent to TAAM release, reply received
1530- Transit to Station Kaena
2010- Arrive at Station Kaena, S6C1 –near bottom CTD

2210- End of cast – jelly fish found in rosette frame
 2226- Transit to Snug Harbor

August 3, 2012

0700- Arrive H buoy
 0742- First Line
 0754- 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 (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
Stuart Donachie, Lloyd Hihara (via Jan Kealoha)	Characterizing Microbiologically Induced Corrosion in Seawater/Biodiesel Mixtures	UH