

HOT-245: Chief Scientist Report

Chief Scientist: Susan Curless

R/V Kilo Moana

August 16-20, 2012

Cruise ID: **KM 12-18**

Departed: August 16, 2012 at 0900 (HST)

Returned: August 20, 2012 at 0754 (HST)

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

Master of the Vessel: Captain Rick Meyer

OTG Marine Technicians: Trevor Young and Trevor Goodman

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 August 16th for about 3 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 August 17th, 18th, and 19th.
- 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 19th 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 19th for approximately 3 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 lowered Niskin cast to 20 m were to be conducted on the afternoon of August 16th. 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 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 August 18th.

Another free-drifting array (Gas Array) was to be deployed for 24 hours for incubation experiments on August 18th. The Gas Array was to be recovered on August 19th.

A plankton net was to be towed between 1000-1400, and 2200-0200 for 30 minute intervals on August 17th and 18th at Station ALOHA.

The Hyperpro was to be deployed for a half-hour period near noon time on August 16th, 17th and 19th.

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 19th.

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 19th.

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, close to the HPM mooring to conduct an ACS/AC9/FRRf/LISST cast, and a Hyperpro cast. Once the optics profiles were complete, the ship was to lower a transducer head to communicate with the HPM and receive an acoustic transmission from the mooring.

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
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
Brenner Wai	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
Michelle Wong	Graduate Student	UH/PO
Emily Crigler	Volunteer	NOAA/PO
Jim Foley	Marine Educator	UH/CMORE
Alia Thompson	STARS participant	Kaimuki Middle School
Deborah Clevenger	STARS participant	Waipahu Intermediate
Erin Mendelson	STARS participant	Wheeler Middle School
Trevor Young	Marine Technician	OTG
Trevor Goodman	Marine Technician	OTG

3. GENERAL SUMMARY

Operations at Station ALOHA were conducted as planned. Small delays in the schedule occurred due to slowing of winch speed on casts to adjust the level wind on the Caley winch drum and due to the long transit back to Station ALOHA after recovering the Gas Array and Sediment Trap Array. Two separate issues with the operation of the Caley crane occurred on the cruise but did not affect the overall operational plan of the cruise (See Section 5).

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 Sediment Traps, Primary Production Array, and Gas Array were all deployed and recovered successfully. All arrays drifted to west 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 two times during the cruise, once around noon and once in the early morning.

The ATE was deployed and recovered successfully three times on the cruise. Three trace metal samples were collected.

The fluorometer, thermosalinograph and the ship's meteorological suite ran without interruption during the cruise, but the data were not available on the ship's intranet system because one of the computers (kmsnap) was not working. The underway $p\text{CO}_2$ 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 ~15kts. Seas were 1-2 ft with a 3-5 ft easterly swell. The prevailing currents were to the west of the center of Station ALOHA.

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. A sincere thank you goes to the engineers who worked tirelessly to troubleshoot the problems we experienced with the Caley crane.

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)

August 16, 2012

0858- Depart Snug Harbor
0925- Science Party Briefing with Captain and Chief Scientist
1006- Fire and Abandon Ship Drills
1130- Arrive at Station Kahe
1140- Weight Cast to 500m
1215- End of Weight Cast
1232- Hyperpro Cast #1
1250- Hyperpro Cast #2
1212- Hyperpro Cast #3
1334- S1C1 1000 m CTD
1450- End of cast, 4 twists removed from wire
1503- Niskin cast to 20 m
1509- End of Niskin Cast
1510- Transit to Station ALOHA
2242- Arrive at Station ALOHA, 1 mile NE of center
2310- Begin Sediment Trap Deployment
2330- Sediment Traps Deployed 22° 45.638'N 157° 59.293'W

August 17, 2012

0155- S2C1 1000 m CTD
0230- Stop to fix level wind at 768 dbar on upcast
0249- Stop to fix level wind at 135 dbar on upcast
0305- End of cast
0430- Begin PP array deployment
0501- Deployed PP Array 22° 45.628'N 157° 59.2983'W
0505- Transit to Center
0520- S2C2 PO Deep Cast
0736- Stop to fix level wind at 4220 dbar on upcast
0924- End of cast, 6 twists removed from wire
0925- Transit to pump ship's tanks
1015- Net Tow
1047- End of net tow
1055- ATE
1125- End of ATE
1145- Drive by PP array to check floatation, flotation is good
1200- S2C3 1000 m CTD
1315- End of Cast
1329- Hyperpro
1355- End of Hyperpro, 2 casts completed before 1400 cut off
1400- Hand net tow
1424- Hand net tow complete
1428- S2C4 1000 m CTD
1544- End of cast - removed 4 twists
1600- Transit to pump ship's tanks
1656- S2C5 1000 m CTD
1808- End of cast - removed 2 twists
1910- PP Array Recovery 22° 46.232'N 158° 4.435'W
1929- Array on board
1954- S2C6 1000 m CTD
2104- End of cast - 4 twists removed
2120- Transit to pump ship's tanks
2157- Net Tow
2225- Begin second Net Tow
2258- End of net tow
2309- S2C7 1000 m CTD

August 18, 2012

0013- End of cast - 4 twists removed
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0020- When parking the Caley Crane the power transfer from the belly pack to the console created an error alarm in doghouse. Neither the belly pack nor dog house could control the movement of the crane and the crane remained upright above the winch drum. Engineering was called to troubleshoot the Caley HPU shut down.

0205- It was found that the slew joystick in doghouse had been tapped slightly out of 'neutral' position and since the joystick does not have a spring stop, it was therefore sending out a command that was interfering with the operation of the crane. The joystick was moved into neutral position and normal operation of the crane was resumed from both the doghouse controls and the belly pack.

0210- S2C8 1000 m CTD

0315- End of cast - 4 twists removed

0320- Transit to Gas Array Deployment site, 1 mile north of center

0400- Begin Gas Array deployment

0426- Gas Array deployed 22° 46.055'N 158° 00.003'W

0445- S2C9 1000 m CTD

0550- End of cast - 5 twists removed

0600- Transit to pump ship's tanks

0748- S2C10 1000 m CTD

0900- End of cast - 5 twists removed

1002- Net Tow

1035- End of net tow

1040- ATE

1104- End of ATE

1105- S2C11 1000 m CTD

1212- End of cast - 4 twists removed

1230- Net Tow

1300- End of net tow

1351- S2C12 1000 m CTD

1501- End of cast, 5 twists removed

1510- Transit to pump ship's tanks

1652- S2C13 1000 m CTD

- While getting the crane into the appropriate deployment position, the locking pins for the docking head failed to engage. Engineering was called to investigate and found a proximity switch had failed. Due to the calm conditions, it was decided to proceed with the deployment of the CTD and further work on the proximity switch/replacement of the switch would occur after the cast was completed.

1816- End of cast - 6 twists removed

1929- Captain and Chief Sci met and agreed to continue CTD operations without the locking pins engaged on docking head while engineers continue to investigate proximity switch/fuse tripping problems.

1950- S2C14- 1000 m CTD

-Winch drum stopped at 115 dbar on up cast for level wind problems

2112- End of cast, 5 twists removed

2115- Transit to pump ship's tanks

2200- Net tow

2234- End of Net Tow

2305- S2C15 near bottom CTD

August 19, 2012

0052- At 4805 dbar, 10 m off bottom 22° 44.997'N 158°W

-Level wind problems on upcast at 3771, 2800, 1800, and 760 dbar (when wire was close to inboard drum cheek).

0250- End of cast, 2 twists removed

0300- AC9/FRRf

0450- End of AC9, transit to Gas Array

0600- Gas Array Recovery 22° 45.44'N 158° 11.08'W

0620- Gas Array on board, transit to Sediment Traps

0715- Arrive at Sediment Traps 22° 46.99'N 158° 20.13'W

0745- Sediment traps on board, transit to Station 50

1010- Arrive at Station 50, ATE

1033- End of ATE

1040- S50C1, 200 m yo-yo CTD

1155- End of cast, 5 cycles complete

1200- Transit to HPM site

1250- Hyperpro

1338- End of Hyperpro

1350- AC9/FRRf

1528- End of AC9/FRRf
1603- Transducer deployed
1623- Transducer recovered, communications with HPM were not successful. Although the downloading of data began, the file transfer was not completed.
1630- Transit to Station Kaena
2125- Arrive Station Kaena
2130- S6C1 near bottom CTD
2330- End of cast
2336- Transit to Snug Harbor

August 20, 2012

0700- Hotel buoy
0748- First Line at pier
0754- Arrive Snug Harbor

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
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 ¹⁸ natural abundance	UCSC
Dave Karl (via Mariona Segura-Noguera)	Sample collection for dissolved inorganic and organic nitrogen determination	UH
Dave Karl (via Jim Foley)	Science Teachers Aboard Research Ships (STARS)	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
Matt Church (via Donn Viviani and Dan Sadler)	Methods testing for ocean acidification experiment	UH
Matt Church and Greig Steward	Teaching plating techniques and methodology of DNA extraction from seawater to students of OCN626	UH