

HOT-236: Chief Scientist Report

Chief Scientist: Susan Curless

R/V Ka'Imikai-O-Kanaloa

November 3-7, 2011

Cruise ID: **KOK 11-13**

Departed: November 3, 2011 at 0800 (HST)

Returned: November 7, 2011 at 0720 (HST)

Vessel: **R/V Ka'Imikai-O-Kanaloa**

Master of the Vessel: Captain Clary Gutzeit

OTG Marine Technicians: Trevor Goodman and Jeff Koch

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 2nd, 3rd, and 4th days of the cruise.
- 3) Station 52, the site of WHOTS-8 Mooring, approximate anchor position 22°40.1572'N, 157°57.0225'W, was to be occupied on the 4th 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 will be occupied on the 4th 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, and a Hyperpro cast were to be conducted on the afternoon of November 3rd. 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 shallow CTD cast to 200 m, and one 1000 m cast (to collect water for the Primary Production Array). These two casts were 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 November 6th.

Another free-drifting array (Gas Array) was to be deployed for 24 hours for incubation experiments on November 5th. The Gas Array was to be recovered on November 6th.

An Automated Trace Element (ATE) sampler was to be deployed the afternoon of November 4th to a depth of 10 m.

A plankton net was to be towed between 1000-1400, and 2200-0200 for 30 minute intervals on November 4th and 5th at Station ALOHA.

The Hyperpro was to be deployed for a half-hour period near noon time on November 3rd, November 5th and 6th.

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 around noon time on November 5th and 6th and in the early morning of November 6th.

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 November 6th.

After recovering the arrays, the ship was to transit to Station 52 to conduct a one-hour 200 m CTD yo-yo cast. Once operations at Station 52 were complete, the ship was to re-position within Station ALOHA to conduct an ACS/AC9/FRRf/LISST cast, a Hyperpro cast, and one 1000 m CTD 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, ship's two anemometers, and the underway fluorometer.

2. SCIENCE PERSONNEL

Participant	Title	Affiliation/HOT Group
Karin Björkman	Research Specialist	UH/BEACH
Susan Curless	Chief Scientist – Res. Assoc.	UH/BEACH
Ken Doggett	Research Associate	UH/CMORE
Sandra Martinez-Garcia	Postdoctoral Researcher	UH/BEACH
Katie Nichols	Volunteer	BEACH
Shimi Rii	Graduate Student	UH/BEACH
Benjamin Rubin	Intern	CMORE
Dan Sadler	Research Associate	UH/BEACH
Brett Updyke	Research Associate	UH/BEACH
Donn Viviani	Graduate Student	UH/BEACH
Blake Watkins	Marine Engineer	UH/BEACH
Cameron Fumar	Research Associate	UH/PO
Jefrey Snyder	Marine Technician	UH/PO
Craig Nosse	Research Associate	UH/PO
Joseph Gum	Research Associate	UH/PO
Edward Park	Volunteer	WCC/PO
Trevor Goodman	Marine Technician	OTG
Jeffrey Koch	Marine Technician	OTG

3. GENERAL SUMMARY

Operations throughout the cruise were conducted as scheduled with multiple delays experienced throughout the first day of operations at Station ALOHA. Heavy winds and seas combined with poorly

laid wire wraps on the winch drum and the need for ship re-positioning between CTD casts (due to drifting away from the center during CTD casts and proximity to arrays) created a 4 hour delay in the schedule.

To compensate for the lost time, one 1000 m CTD cast in the 36 hour burst period was cancelled, and the water needs from two core casts were combined. One day time net tow was not completed due to delays in operations causing the time window for daytime tows to expire.

One 1000 m CTD cast was completed at Station Kahe. Two near bottom CTD casts, thirteen 1000 m and one 200 m CTD casts were conducted at Station ALOHA. One 200 m yo-yo CTD cast was completed near the WHOTS mooring (Station 52) but only five of the six planned cycles were completed. One near bottom cast was conducted at Station Kaena.

The floating sediment trap array, primary production array, and gas array were all deployed and recovered successfully.

There was a slight complication in recovering the gas array when after the surface float line was hooked on initial approach, the surface buoy and line of floats became lodged under the ship. Pulling the hooked part of the line forward and further drifting of the ship allowed the line to come free and resulted in only minor damage to the lights on the buoy.

The gas and primary production arrays drifted to the NW of the center of Station ALOHA. The sediment trap array drifted due north of the center of Station ALOHA.

Five net tows for the core HOT zooplankton collection were completed successfully, two 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 three times during the cruise, twice around noon and once in the early morning. The DH4 did not work on two of the three deployments.

The ATE was successfully deployed and a trace metal free sample was collected.

The fluorometer, thermosalinograph and the ship's anemometers ran without interruption during the cruise. The ship's ADCP was collected data during the trip, but the velocity measurements were not correct due to issues with the substitute deck box.

Winds were from the East throughout the cruise holding at 20-25 knots with gusts up to 30 knots. The swell was 8-10 feet with a sea state of 5 throughout the cruise. Scattered squalls were experienced throughout most of the cruise with several periods of torrential rain.

We arrived at Snug Harbor for off-loading on November 7th, at 0720 (HST).

4. R/V *Ka'imikai-O-Kanaloa* OFFICERS AND CREW, TECHNICAL SUPPORT

The R/V *Ka'imikai-O-Kanaloa* continues to maintain excellent ship support for our work. Captain Gutzeit 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 at any time to assist in our work.

5. DAILY REPORT OF ACTIVITIES (HST)

November 3, 2011

0757- All lines off
0800- Depart Snug Harbor
0835- Fire and abandon ship drills
0900- Science Party briefing
1115- Arrive at Station Kahe, weight cast to 500 m
1145- End of Weight cast
1200- Hyperpro
1215- Hyperpro cast was bad, cap left on sensor
1230- Hyperpro attempt #2
1245- Hyperpro complete
1253- S1C1 1000 m CTD cast
1315- End of cast
1320- Transit to Station ALOHA
2330- Arrive 3 miles south of the center of station ALOHA

November 4, 2011

0005- Deployment of the Sediment Traps 22° 42.599'N 158° 00.093'W
0032- S2C1 200 m CTD
0114- End of cast
0226- S2C2 1000 m CTD cast
0345- End of cast
0445- Sediment Trap tracking due north, PP array deployment location changed to 1 mile west of center
0450- Ship re-positioning
0520- Begin deployment of PP array 22° 45.03'N 158° 01.20'W
0550- Array released 22° 45.45'N 158° 01.91'W
0634- S2C3 PO deep cast, conducted 1 mile south and 0.5 miles east of center. Sediment Traps 0.4 miles from center.
0638- Deployment of cast delayed, approximately 10 bad wire wraps on winch drum caused by insufficient tension on wire during CTD deployment.
0702- Poor wire wraps cleared, CTD in the water
0835- At bottom, 22° 45.342'N 157° 59.740'W
1030- End of cast
1055- Net Tow
1130- End of tow
1304- S2C4 1000 m CTD cast
1430- End of cast
1500- Primary Oxygen sensor replaced
1550- ATE
1558- S2C5 1000 m CTD cast
1717- End of cast
1826- First attempt to retrieve the PP array unsuccessful, ship too far away from float lines
1833- PP Array Recovered 22° 51.190'N 158° 03.564'W
1906- Ship pumping tanks without notifying science party
1955- S2C6 1000 m CTD cast
2013- Raining sideways
2057- End of cast
2207- Net Tow
2254- S2C7 1000 m CTD cast

November 5, 2011

0005- End of cast
0010- Net tow
0150- S2C8 1000 m CTD cast

0300- End of cast
0410- Begin Gas Array deployment 22° 45.12'N 158° 01.08'W
0445- Gas Array deployment complete, transit towards center
0500- S2C9 1000 m CTD cast
0605- End of cast, bottle #18 did not fire
0756- S2C10 1000 m CTD cast
0857- End of cast
1005- Net Tow
1037- End of net tow
1054- S2C11 1000 m CTD cast
1155- End of cast
1203- Hyperpro
1217- End of Hyperpro
1245- AC9/FRRf
1335- AC9/FRRf complete
1351- S2C12 1000 m CTD cast
1502- End of cast - Rosette was swinging upon recovery and top of niskins hit the boom at least twice while the package was recovered. Samples from niskins 2,3, 21, 23 and 24 may have been exposed to air.
1652- S2C13 1000 m CTD cast
1806- End of cast
1951- S2C14 1000 m CTD cast
2101- End of cast
2202- Net Tow
2300- S2C15 near bottom CTD cast

November 6, 2011

0041- At 4804 dbar, 9 m off the bottom 22° 46.288'N 158° 0.220'W
0240- End of cast
0315- AC9/FRRf 22° 47.95 158° 0.18'W
0350- End AC9, Transit to Sediment Traps
0620- Sediment Trap Recovery 22° 59.75'N 158° 0.716'W
0700- Traps on board, transit to Gas Array
0735- Gas Array Recovery 22° 58.22'N 158° 07.11'W
0820- Primary oxygen sensor swapped back to original sensor for further testing.
1039- S52C1 WHOTS 200 m yo-yo cast
1140- End of cast, 5 cycles complete
1150- Hyperpro
1210- End of Hyperpro
1214- AC9/FRRf
1252- End of AC9
1255- S2C16 1000 m CTD cast
1403- End of cast
1405- Transit Station Kaena
2050- Arrive Station Kaena
2058- Near Bottom CTD cast
2250- End of cast
2255- Transit to 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
Various CMORE PI's	Microbial RNA/DNA collection	UH/CMORE
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 Shimi Rii)	Investigation of temporal changes in picoeukaryote diversity at Station ALOHA	UH
Matt Church (via Donn Viviani)	Bacterial production and EOC at Station ALOHA	UH
Henrieta Dulaiova and Ken Buesseler	Japanese radionuclide release sampling	UH
John Zehr (via Anne Thompson and Brandon Carter)	UCYN-A ecology	UCSC
Matt Church/Dave Karl (via Daniela Böttjer and Sam Wilson)	Nitrogen Fixation methodology comparison	UH
Jennifer McKay	Collection of "zero" d18O Seawater for stable isotope standard	OSU
Dave Karl (via Daniela del Valle)	Sample collection for methylphosphonate production methodology experiments	UH
Dave Karl (via Ken Doggett)	Light/dark adaptation and leucine uptake of prochlorococcus via flow cytometry	UH
Dave Karl (via Sandra Martinez-Garcia)	Microbial Respiration in the NPSG	UH
Dave Karl (via Karin Björkman and Daniela Böttjer)	Water collection for pre-CMORE BAGS cruise nutrient mixing experiment	UH/CMORE