HOT-238: Chief Scientist's Report

Chief Scientist: Craig Nosse
R/V *Kilo Moana*
December 18-22, 2011

Cruise ID: **KM 11-31**
Departed: December 18, 2011 at 0900 (HST)
Returned: December 22, 2011 at 0750 (HST)
Vessel: **R/V *Kilo Moana***
Master of the Vessel: Captain Richard Meyer
OTG Marine Technicians: Ben Colello 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 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 (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 was to be occupied on the 4th day of the cruise for about 2 hours.

Upon arrival to Station Kahe a 1000 lb. weight-test cast to 1000 m, one CTD cast to 1000 m, and a Hyperpro cast were to be conducted on the afternoon of December 18th. 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 Productivity 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 casts was to be conducted after the deployment of the Primary Productivity Array, followed by 1000 m CTD casts at strict 3 hour intervals for at least 36 hours for continuous and discrete data collection, with another full-depth CTD cast at 2300 on December 20th.

Another free-drifting array (Gas Array) was to be deployed for 24 hours for incubation experiments on December 20th. The Gas Array was to be recovered on December 21st.

An Automated Trace Element (ATE) sampler was to be deployed on the afternoon of December 19th to a depth of 10 m.

A plankton net was to be towed between 1000-1400, and 2200-0200 for 30 minute intervals on December 19th and 20th at Station ALOHA.

The Hyperpro was to be deployed for a half-hour period near noon time on December 18th, 19th and 21st.

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 time of December 21st.

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 December 21st.

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 completed, the ship was to re-position within Station ALOHA to conduct an ACS/AC9/FRRf/LISST cast, a Hyperpro cast, and one trace metal free Go-Flo cast.

Once operations at Station ALOHA were completed, 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, meteorological suite, and underway fluorometer. The underway *p*CO2 is not working properly aboard the *Kilo Moana* but a MAPCO2 system was to be installed for the cruise to make measurements. Also, a tower was to be erected on the port bow of the ship to make underway CO measurements.

2.0. SCIENCE PERSONNEL

Participant	**Title**	**Affiliation/HOT Group**
Susan Curless	Research Associate	UH/BEACH
Adriana Harlan	Research Associate	UH/BEACH
Dan Sadler	Research Associate	UH/BEACH
Brett Updyke	Research Associate	UH/BEACH
Donn Viviani	Graduate Student	UH/BEACH
Blake Watkins	Marine Engineer	UH/BEACH
Benjamin Rubin	Intern	UH/CMORE
Sandra Martinez-Garcia	Postdoctoral Researcher	UH/CMORE
Sam Wilson	Postdoctoral Researcher	UH/CMORE
Sara Thomas	Graduate Student	UH/CMORE
Brenner Wai	Graduate Student	UH/CMORE
Jefrey Snyder	Marine Technician	UH/PO
Cameron Fumar	Research Associate	UH/PO
Craig Nosse	Research Associate	UH/PO
Joseph Gum	Research Technician	UH/PO
Branden Obra	Research Technician	UH/PO
Colette Kerry	Graduate Student	UH/PO
Byron Blomquist	Associate Researcher	UH
Bettina Voelker	Researcher	Colo – Mines
Robin Schneider	Graduate Student	Colo – Mines
Ben Colello	Marine Technician	OTG
Kuhio Vellalos	Marine Technician	OTG

3. GENERAL SUMMARY

The 1000 m CTD cast at Station Kahe could not be completed as the winch level wind failed during the weight-test cast. It was determined that a connector wire for the level wind proximity switch needed to be replaced. By the time repairs were completed and tested, there was not enough time available to conduct the 1000 m CTD cast at Station Kahe without affecting the rest of the cruise schedule.

Planned science operations at Station ALOHA were compromised due to heavy weather conditions and a Japanese research vessel operating at Station ALOHA within the projected drift track of free-drifting arrays. Upon arrival at Station ALOHA, the Sediment Trap Array was not deployed as weather conditions were marginal and the Japanese research vessel *Hakuho Maru* was postioned in the Northwest of the Station ALOHA circle. Surface currents were tending north, and strong 25 knot winds were blowing from the east. The *Hakuho Maru* did not move off station until about 0200 on December 20th. With the drift track cleared, preparations were made to deploy the Primary Productivity Array but weather conditions still remained poor and the forecast were for strengthening winds so the array was not deployed.

Operations not completed due to failed ship's equipment:
1000 m CTD cast at Station Kahe

Operations not completed due to weather conditions and obstructed drift track:
Sediment Trap Array
Gas Array

Operations not completed due to weather conditions:
Primary Productivity Array

Two near bottom CTD casts, twelve 1000 m CTD casts and one 200 m CTD cast were conducted at Station ALOHA. One 200 m yo-yo CTD cast (with five cycles) was completed near the WHOTS mooring (Station 52). One near bottom cast was conducted at Station Kaena.

Five net tows for the core HOT zooplankton collection were completed successfully; three during the day and two during the night. A third night net tow was called off to build some time in the schedule in case weather conditions worsened even further.

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 in the early morning and once around noon.

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

The trace metal free Go-Flo was conducted successfully.

The fluorometer, thermosalinograph and the ship's meteorological suite ran without interruption during the cruise. The MAPCO2 system performed properly during the cruise as well as the tower mounted CO sensor.

Winds were from the east throughout the cruise in the 20-25 knot range, with squall lines producing 30+ knot gusts when they came through. Swell was about 10-12 feet.

We arrived at Snug Harbor for off-loading on December 22nd at 0750 (HST).

4. R/V *Kilo Moana* OFFICERS AND CREW, TECHNICAL SUPPORT

R/V *Kilo Moana* provided a very stable platform despite the heavy weather conditions. The motion compensation feature of the Caley CTD system enables CTD operations in conditions not suited for other ships. The CTD wire is still showing a strong tendency to twist. This has been observed in other HOT cruises using this wire during the year.

Captain Meyer and the ship's crew were very easy to work with and made sure to accommodate all of our scientific needs.

OTG personnel were available at any time to assist in our work.

5. DAILY REPORT OF ACTIVTIES (HST)

18 December 2011

0900 Depart Snug Harbor
0940 Safety briefing
1010 Fire and abandon ship drills
1150 Arrive Station Kahe
1200 Start Weight Cast
1220 All stop on winch at 262 m of downcast
1225 Engineers called as level wind has failed
1315 Recovering weight so repairs can continue
1335 Weight on board
1343 Hyperpro cast
1443 Restart weight cast
1600 Transit to Station ALOHA
2357 Arrive Station ALOHA

19 December 2011

0015 Stand-down from Sediment Trap deployment
0030 S2C1 - 200 m CTD cast
0337 S2C2 - 4800 m CTD cast
0538 Bottom of deep cast. 4808 db, 7 m from bottom at
22 45.00 N, 158 00.01 W
0608 3 bad wire wraps on winch drum taken out while CTD at 3760 dbar
0755 Transit to pump tanks
0943 S2C3 - 1000 m CTD cast
1130 Net tow
1215 Net tow
1251 S2C4 - 1000 m CTD cast
1425 Transit to pump tanks
1540 ATE
1608 S2C5 - 1000 m CTD cast
1852 S2C6 - 1000 m CTD cast
2156 S2C7 - 1000 m CTD cast
2321 Net tow

20 December 2011

0000 Net tow
0058 S2C8 - 1000 m CTD cast
0225 Transit to pump tanks
0229 R/V *Hakuho Maru* leaves station to recover arrays
0344 S2C9 - 1000 m CTD cast
0643 S2C10 - 1000 m CTD cast
0810 Transit to pump tanks
0945 S2C11 - 1000 m CTD cast
1110 Net tow
1205 Hyperpro cast
1255 S2C12 - 1000 m CTD cast
1551 S2C13 - 1000 m CTD cast
1713 Transit to pump tanks
1848 S2C14 - 1000 m CTD cast
2155 S2C15 - 4800 m near bottom CTD cast with a maximum pressure reached at 4808 dbar, 7 meters off the bottom at 22 45.00 N, 157 59.59 W

21 December 2011

0230 AC9/ACS/FRRF
0450 Trace metal free Go-Flo cast
0655 S52C1 - 200 m CTD yo-yo
1025 AC9/ACS/FRRF
1215 Hyperpro cast
1330 Transit to Station Kaena
1813 S6C1 – 2500 m near bottom CTD cast
1913 Bottom of cast reached at 2460 dbar, 6 meters off the bottom at 21 50.79 N, 158 21.85 W
2015 Transit to Snug Harbor

22 December 2011

0750 Arrive Snug Harbor – Full offload

HOT program sub-components:

Investigator	Project	Institution
Matt Church Dave Karl Bob Bidigare	Core Biogeochemistry	UH
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 Donn Viviani)	Bacterial production and EOC at Station ALOHA	UH
Dave Karl (via Sandra Martinez-Garcia)	Microbial respiration in the NPSG	UH
Henrieta Dulaiova and Ken Buesseler	Japanese radionuclide release sampling	UH
Matt Church/Dave Karl (via Sam Wilson)	Nitrogen fixation methodology comparison	UH
Barry Huebert (via Byron Blomquist)	Sea tests for carbon monoxide flux measurements using the LGR ICOS analyzer	UH
Bettina Voelker and Robin Schneider	Biological controls on reactive oxygen species in the oligotrophic ocean	Colo – Mines
Matt Church (via Sara Thomas)	Chemolithoautotrophic growth in the upper mesopelagic	UH/CMORE
Matt Church (Via Brenner Wai)	Nitrifying Archaea experiments	UH/CMORE