

HOT-248: Chief Scientist Report

Chief Scientist: Fernando Santiago-Mandujano

R/V Kilo Moana

2-6 December, 2012

Cruise ID: **KM 12-27**

Departed: 2 December at 0918 (HST)

Returned: 6 December at 0742 (HST)

Vessel: **R/V Kilo Moana**

Master of the Vessel: Captain Gray Drewry

OTG Marine Technicians: Trevor Goodman, Trevor Young, Jeff Koch, Jennie Mowatt

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 December 2nd 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 December 3rd, 4th, and 5th.
- 3) Station 50, the site of WHOTS-9 Mooring (anchor position 22° 46.071'N 157° 53.956'W) was to be occupied on December 5th 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 December 5th for approximately 3 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 2nd. 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 December 4th.

Another free-drifting array (Gas Array) was to be deployed for 24 hours for incubation experiments on December 4th. The Gas Array was to be recovered on December 5th.

A plankton net was to be towed between 1000-1400, and 2200-0200 for 30 minute intervals on December 3rd and December 4th at Station ALOHA.

The Hyperpro was to be deployed for approximately 45 minutes near noon time on December 2nd, 3rd, and 5th 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 December 5th.

A trace metal free sample was to be collected by the ATE sampler on December 3rd at Station ALOHA.

Water from various depths in the mixed layer was to be collected with a deck-board diaphragm pump at 1300 on December 3rd, 4th, and 5th.

Communications with the HOT Profiler Mooring (HPM) and data downloading were to be conducted on December 4th.

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 5th.

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
Lance Fujieki	Research Associate	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
Sam Wilson	Research Specialist	UH/CMORE
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
Joseph Gum	Research Associate	UH/PO
Daniel McCoy	Research Associate	UH/PO
James Berles	Teacher, volunteer	Alpena CC/PO
Robert Bidigare	Scientist	UH
John Bullister	Scientist	NOAA-PMEL

Dave Wisegarver
Trevor Goodman
Trevor Young
Jennie Mowatt
Jeff Koch

Technician
Marine Technician
Marine Technician
Marine Technician
Marine Technician

NOAA-PMEL
OTG
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OTG

3. GENERAL SUMMARY

Operations at Station ALOHA were conducted as planned, except that one of the Repeta pump samplings scheduled for December 3rd had to be cancelled due to time constraints.

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 trawl winch with the 0.681 wire and the A-frame were used for CTD operations because the Caley system was not operational.

The Sediment Traps, Primary Production Array, and Gas Array were all deployed and recovered successfully. The Primary Production array drifted 0.8 nm northwestward, and the other two arrays drifted southwestward to near the edge of Station ALOHA circle.

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 December 2nd, 3rd, and 5th.

The optical package ACS/AC9/FRRf/LISST was deployed four times on December 5th, two back to back deployments in the early morning, and two at around noon.

The ATE was deployed at Station ALOHA on December 3rd.

Sampling with the deck-board diaphragm pump was conducted on December 4th and 5th.

Communications with the HPM and data downloading were successfully conducted on December 4th.

The fluorometer, thermosalinograph, *p*CO₂ system, and the ship's meteorological suite ran without interruption during the cruise. The broad band/narrow band Ocean Surveyor ADCP was working correctly during the cruise, but the Workhorse ADCP was out of service.

Winds were from the south throughout the cruise at 10-20 kts with a 5-8 ft swell. A thunderstorm hit us for about 2 hours late night on December 4th with heavy rain, lightning, and wind gusts up to 35 kt.

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 Drewry and the ship's crew showed enthusiasm, concern, and dedication to our scientific mission.

Technical support during this cruise was very good. OTG personnel were available to assist in our work during the cruise.

5. DAILY REPORT OF ACTIVITIES (HST)

December 2, 2012

0840- All aboard. Turning ship around to load Flow Cytometer van on starboard deck

0918- Depart Snug Harbor

1010- Safety briefing with the Captain and Chief Scientist

1030- Fire and abandon ship drills
1140- Arrive at Station Kahe, weight cast to 1000 m
1340- Hyperpro cast (3 cycles)
1413- End of Hyperpro
1424- S1C1, 1000 m CTD cast.
1602- End of cast.
1610- Transit to Station ALOHA
2317- Arrive at Station ALOHA
2348- Deployed Sediment Traps (22° 40.025'N, 157° 59.976'W)

December 3, 2012

0153- S2C1 1000 m CTD cast.
0308- End of cast.
0519- Deployed PP Array 22° 40.808'N, 157° 59.976'W
0525- Transit to pump ship's tanks
0630- S2C2 PO Deep Cast.
0830- At 5 m off the bottom (22° 44.997'N, 157° 59.987'W)
1042- End of cast.
1104- Net Tow starts
1134- End net tow
1206- ATE starts
1231- End ATE
1235- Hyperpro cast (3 cycles)
1315- End Hyperpro
1327- S2C3 1000 m CTD PO Shallow
1504- End of cast.
1506- Transit to pump ship's tanks
1630- S2C4 1000 m CTD.
1755- End of cast.
1833- Recover PP array 22° 41.516'N 158° 0.589'W
1849- Array on board
1903- S2C5 1000 m CTD
2025- End of cast.
2026- Transit to pump ship's tanks
2118- S2C6 1000 m CTD
2234- End of cast.

December 4, 2012

0009- S2C7 1000 m CTD
0125- End of cast.
0142- Net tow start
0203- End Net tow
0226- S2C8 1000 m CTD.
0343- End of cast.
0420- Gas Array Deployment 22° 40.133'N 158° 0.294'W
04576- S2C9 1000 m CTD
0630- End of cast.
0635- Transit to pump ship's tanks
0753- S2C10 1000 m CTD
0905- End of cast.
1000- Net tow start
1032- End Net tow
1048- S2C11 1000 m CTD
1210- End of cast.
1220- Net Tow start
1255- End Net Tow

1300- Deck-board diaphragm pump sampling
 1407- End pump sampling
 1418- S2C12 1000 m CTD
 1539- End of cast.
 1542- Transit to pump ship's tanks
 1642- S2C13 1000 m CTD
 1752- End of cast.
 1800- Transit to Station HPM site
 1816- Data communications with HPM. ADCP turned off during this operation.
 1836- Transit to pump ship's tanks
 1840- ADCP turned on
 1957- S2C14 1000 m CTD
 2110- End of Cast.
 2200- Net Tow
 2234- Net Tow
 2300- End of net tow
 2300- Heavy rain on station, lightning
 2325- S2C15 PO 2nd deep cast

December 5, 2012

0127- At 10 m off the bottom 22° 45.008'N 157° 59.977'W
 0335- End of Cast.
 0345- AC9/FRRf
 0426- End first cast
 0430- AC9/FRRf
 0515- End of second cast
 0630- Gas Array recovery 22° 40.69'N 158° 3.28'W
 0700- Transit to pump ship's tanks
 0720- Sediment Trap Recovery 22° 39.53'N 158° 5.93'W
 0800- Array on board
 1000- AC9/FRRf
 1100- AC9/FRRf on deck, start second deployment
 1150- End cast
 1200- Hyperpro cast (3 cycles)
 1237- End cast
 1250- Deck-board diaphragm pump sampling
 1352- End pump sampling
 1407- S50C1 200 m yo-yo cast
 1550- End of cast, 5 cycles completed
 1600- Transit to Station Kaena
 2130- Arrive at Station Kaena, S6C1 –near bottom CTD
 2340- End of cast
 2344- Transit to Snug Harbor

December 6, 2012

0700- Arrive H buoy
 0742- Arrive Snug Harbor starboard side to pier, unload Flow Cytometer van
 0824- Turn around ship port side to pier, full offload.

6. HOT program sub-components:

Investigator	Project	Institution
Matt Church	Core Biogeochemistry	UH
Dave Karl		
Bob Bidigare		
Roger Lukas	Hydrography	UH
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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
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 Daniela del Valle)	Vitamin mixing experiment	UH/CMORE
Matt Church (via Shimi Rii)	Investigation of temporal changes in picoeukaryote diversity at Station ALOHA	UH
Grieg Steward (via Christopher Schvarcz)	Viral Dynamics in the Oligotrophic Open Ocean, Station ALOHA	UH
Erica Goetze	Temporal stability of copepod populations at Station ALOHA	UH
Dave Karl (via Ken Doggett and Ger Van den Engh)	Fluorescence Properties of Prochlorococcus	UH/B/D Biosciences
Bruce Howe, Ethan Roth (via PO group)	ISFET ph/pCO ₂ sensor integration into an ALOHA Seaglider	UH
John Bullister, Dave Wisegarver	Global Repeat Hydrographic/CO ₂ /Tracer surveys in Support of CLIVAR and Global Cycle objectives: Carbon Inventories and Fluxes	NOAA-PMEL
Robert Bidigare	Upper ocean mixing rates and Xantophyll cycle pigment dynamics	UH
Paul Bienfang, Scott Grant (via Brett Updyke)	Microbial Growth Study	UH