HOT 258: Chief Scientist Report

Chief Scientist: Brett Updyke
R/V *Kilo Moana*
December 19 – December 23, 2013

Cruise ID: **KM1323**
Departed: 19 December at 0845 (HST)
Returned: 23 December at 0746 (HST)
Vessel: **R/V *Kilo Moana***
Master of the Vessel: Captain Gray Drewry
OTG Marine Technicians: Trevor Young and Daniel Fitzgerald

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 19th 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 20th- 22nd.
3) Station 52, the site of WHOTS-10 Mooring (anchor position 22° 40.12'N 157° 57.01'W) was to be occupied on December 22nd 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 22nd for approximately 2 hours.

Upon arrival to Station Kahe a 1300 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 December 19th. 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 56 hours. This was to be followed by two net tows and 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 Productivity 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 21st.

Another free-drifting array (Gas Array) was to be deployed for 24 hours for incubation experiments on December 21st. The Gas Array was to be recovered on December 22nd.

A plankton net was to be towed between 1000-1400, and 2200-0200 for 30 minute intervals on December 20th and 21st at Station ALOHA.

The Hyperpro was to be deployed for approximately 45 minutes at 1400 hours on December 19th, 20th, and 22nd 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 at 1000 hours on December 22nd.

A trace metal free sample was to be collected by the ATE sampler on December 21st at 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 Gas Array and the Sediment Trap Array on the morning of December 22nd.

After recovering the arrays, the ship was to transit to Station ALOHA to conduct an AC9/FRRf cast. After these operations were complete, the ship was to transit to Station 52 to conduct a one-hour 200 m CTD yo-yo cast and surface instrument intercomparisons. After the yo-yo cast was complete, the ship was to transit to Station ALOHA for a Hyperpro cast at 1400 hours.

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, pCO_2 system, underway fluorometer and the meteorological suite.

2. SCIENCE PERSONNEL

Participant	**Title**	**Affiliation**
Dan Sadler	Research Associate	UH
Karin Björkman	Research Specialist	UH
Blake Watkins	Marine Engineer	UH
Susan Curless	Research Associate	UH
Adriana Harlan	Research Associate	UH
Brett Updyke	Research Associate	UH
Benedetto Barone	Postdoctoral Researcher	UH
Stuart Goldberg	Postdoctoral Researcher	UH
Jefrey Snyder	Marine Technician	UH
Joseph Gum	Research Associate	UH
Cameron Fumar	Research Associate	UH
Daniel McCoy	Research Associate	UH
Damion Rosbrugh	Undergraduate Student	UH
Ken Doggett	Research Associate	UH
Anne Thompson	Scientist	B/D Biosciences
Erica Goetze	Assistant Professor	UH
Russ Hopcroft	Professor	UAF
Chris Schvarcz	Graduate Student	UH
Sara Thomas	Graduate Student	UH
Trevor Young	Marine Technician	OTG
Dan Fitzgerald	Marine Technician	OTG

3. GENERAL SUMMARY

Operations at Station ALOHA were conducted as planned. 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 52) with three cycles completed. One near bottom cast was completed at Station Kaena.

The Dynacon trawl winch with the 0.681" wire and the A-frame were used for CTD operations.

The Sediment Traps, Primary Productivity Array and Gas Array were all deployed and recovered successfully.

Six net tows for the core HOT zooplankton collection were completed successfully; three during the day, and three during the night. Thirteen net tows for ancillary copepod egg production and metagenetic experiments were completed successfully.

Hyperpro casts (3 cycles each) were conducted on December 19th, December 20th, and December 22nd.

The optical package ACS/AC9/FRRf/LISST was deployed twice (2 cycles each) on December 22nd in the early morning and at 1000 hours.

The ATE sampler was deployed and one trace metal free seawater sample was collected.

The underway thermosalinograph, fluorometer and the ship's meteorological suite ran without interruption during the cruise. The Ultrasonic anemometer showed wind direction glitches sporadically during the cruise. The broad band/narrow band Ocean Surveyor ADCP and the Workhorse ADCP were working correctly, however the underway pCO_2 system was not operational during the cruise.

Winds were from the east starting at 15 kts and decreased throughout the cruise to about 6 knots on December 22nd. Seas were slight to moderate with a 6-8 ft swell.

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 Gray Drewry 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)

December 19, 2013
0845 - Depart Snug harbor
0915 - Safety briefing with the Captain
1000 - Fire and boat drill
1138 - Arrive at Station Kahe
1143 - Start weight cast to 500 m
1229 - End weight cast
1254 - Start S1C1 CTD cast to 1000 m
1413 - End S1C1
1421 - Start Hyperpro cast

1458 - End Hyperpro cast
1502 - Transit to Station ALOHA
2258 - Arrive at Station ALOHA
2303 - Start sediment traps deployment
2323 - Sediment traps deployed (22° 44.991' N, 158° 03.227' W)
2337 - Start net tow for Erica Goetze

December 20, 2013
0010 - End net tow
0011 - Start net tow (Erica Goetze)
0044 - End net tow
0150 - Start S2C1 CTD cast to 1000 m
0313 - End S2C1
0421 - Start primary productivity array deployment
0436 - Primary productivity array deployed (22° 45.011' N, 158° 02.028' W)
0438 - Transit to center of ALOHA
0501 - Start S2C2 CTD cast to near-bottom
0658 - 10 m off bottom (22° 45.053' N, 157° 59.979' W)
0857 - End S2C2
0900 - Transit to pump tanks
1010 - Start net tow (HOT)
1040 - End net tow
1114 - Start S2C3 CTD cast to 1000 m
1242 - End S2C3
1318 - Start net tow (Erica Goetze)
1352 - End net tow
1402 - Start Hyperpro cast
1443 - End Hyperpro
1455 - Start S2C4 CTD cast to 1000 m
1611 - End S2C4
1650 - Start S2C5 CTD cast to 1000 m
1805 - End S2C5
1830 - Start Primary Productivity array recovery
1838 - Ship's line fell off the array
1858 - Start 2nd recovery attempt
1912 - PP array recovered (22° 43.921' N, 158° 02.291' W)
1915 - Transit to pump ship's tanks
2000 - Start S2C6 CTD cast to 1000 m
2129 - End S2C6
2159 - Start net tow #1 (HOT)
2228 - End net tow #1 / start net tow #2
2257 - End net tow #2
2300 - Start S2C7 CTD cast to 1000 m

December 21, 2013
0016 - End S2C7
0026 - Start net tow #1 (Erica Goetze)
0118 - End net tow #1 / Start net tow #2
0148 - End net tow #2
0156 - Start S2C8 CTD cast to 1000 m
0316 - End S2C8

0400 - Deploy gas array (22° 42.57' N, 158° 02.53' W)
0451 - Start S2C9 CTD cast to 1000 m
0618 - End S2C9
0620 - Transit to pump ship's tanks
0755 - Start S2C10 CTD cast to 1000 m
0910 - End S2C10
0957 - Start net tow (HOT)
1030 - End net tow
1035 - Deploy ATE
1058 - Recover ATE
1102 - Start S2C11 CTD cast to 1000 m
1116 - End S2C11
1226 - Start net tow (HOT)
1257 - End net tow
1302 - Start net tow (Erica Goetze)
1333 - End net tow
1334 - Start net tow (Erica Goetze)
1359 - End net tow
1402 - Start net tow (Erica Goetze)
1432 - End net tow
1439 - Start S2C12 CTD cast to 1000 m
1609 - End S2C12
1610 - Transit to pump ship's tanks
1657 - Start S2C13 CTD cast to 1000 m
1810 - End S2C13
1944 - Start net tow (Erica Goetze)
1959 - End net tow
2001 - Start S2C14 CTD cast to 1000 m
2116 - End S2C14
2120 - Transit to center of Station ALOHA
2130 - Start net tow (Erica Goetze)
2200 - End net tow
2208 - Start net tow (HOT)
2238 - End net tow
2243 - Start net tow (Erica Goetze)
2300 - End net tow
2301 - Transit to center of Station ALOHA
2308 - Start S2C15 CTD cast to near-bottom

December 22, 2013
0110 - 5 m off the bottom (22° 44.976’ N, 157° 59.987’ W)
0254 - End S2C15
0308 - Start AC9/FRRf
0454 - Recover AC9/FRRf
0500 - Transit to Gas Array
0600 - Gas Array recovered (22° 41.994’ N, 158° 01.483’ W)
0607 - Transit to Sediment Trap Array
0655 - Sediment Trap Array recovered (22° 44.567’ N, 158° 03.733’ W)
0705 - Transit to pump ship's tanks
0845 - Start S52C1 CTD yo-yo cast to 200 m
0956 - End S52C1

1006 - Start AC9/FRRf profile
1155 - Recover AC9/FRRf
1209 - Start net tow (Erica Goetze)
1220 - End net tow
1355 - Start Hyperpro profile
1445 - End Hyperpro
1500 - Start net tow (Erica Goetze)
1511 - End net tow
1514 - Transit to Station Kaena
2005 - Arrive Station Kaena
2008 - Start S6C1 CTD cast to near bottom
2210 - End S6C1
2215 - Transit to Snug Harbor

December 23, 2013
0653 - Arrive H buoy
0746 - All fast port side to, full offload

6. HOT program sub-components:

Investigator	**Project**	**Institution**
Matt Church Dave Karl Bob Bidigare	Core biogeochemistry	UH
John Dore	Biogeochemistry QA/QC	MSU
Roger Lukas	Hydrography	UH
Mike Landry	Zooplankton dynamics	SIO
Ricardo Letelier	Optical measurements	OSU
Ancillary programs:		
Andrew Dickson	CO_2 dynamics and intercalibration	SIO
Paul Quay	$DI^{13}C$	UW
Matt Church & Ricardo Letelier	Diversity and activities of nitrogen-fixing microorganisms	UH
Sam Wilson	Reduced gases in the upper ocean: The cycling of methane, sulfide and nitrous oxide	UH
Karin Björkman	Phosphate retention in microbes and size specific bacterial production	UH
Erica Goetze & Russ Hopcroft	Temporal stability of copepod populations at Station ALOHA, metagenetic methods development, egg production experiments, and live imaging	UH, UAF
Ken Doggett & Anne Thompson	Prochlorococcus in the water column	UH, B/D Biosciences

Sara Ferrón-Smith	O_2/Argon measurements	UH
Christopher Schvarcz	Viral dynamics in the oligotrophic open ocean, Station ALOHA	UH