HOT-283: Chief Scientist Report

Chief Scientist: Susan Curless
R/V *Ka'Imikai-O-Kanaloa*
April 13-17, 2016

Cruise ID: **KOK16-04**
Departed: April 13, 2016 at 0845 (HST)
Returned: April 17, 2016 at 0713 (HST)
Vessel: **R/V *Ka'Imikai-O-Kanaloa***
Master of the Vessel: Captain Ross Barnes
OTG Marine Technicians: Jeff Koch and Sonia Brugger

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 April 13th 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 April 14th, 15th, and 16th.
3) Station 52, the site of WHOTS-12 Mooring (anchor position 22° 40.061' N, 157° 56.9654' W) was to be occupied on April 16th 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 April 16th for approximately 3 hours.

Upon arrival to Station Kahe a 500 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 April 13th. 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. As the ship departed Station Kahe, three SLDMB floats were to be deployed to map an eddy feature located off the west side of Oahu.

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 200 m cast for incubation experiments and one 1000 m cast to collect water for 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, and 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 April 16th.

Another free-drifting array (Gas Array) was to be deployed for 24 hours for incubation experiments on April 15th. The Gas Array was to be recovered on April 16th.

An Automated Trace Element (ATE) sampler was to be deployed to a depth of 10 m on April 15th.

A plankton net was to be towed three times between 1000-1400, and three times between 2200-0200 for 30 minute intervals on April 14th and 15th at Station ALOHA.

The Hyperpro was to be deployed for a half-hour period near noon time on April 13th, 14th, and 16th.

An optics package including a Wet Labs AC9, 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 April 16th.

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 April 16th.

After recovering the arrays, the ship was to transit to Station ALOHA to conduct an optics cast. Once that operation was complete, 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 a Hyperpro 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, the underway fluorometer, and the ship's anemometers.

2. SCIENCE PERSONNEL

Participant	Title	Affiliation
Susan Curless	Research Associate	UH
Brenner Wai	Research Associate	UH
Blake Watkins	Marine Engineer	UH
Brie Maillot	Technician	UH
Alexa Nelson	Research Associate	UH
Dan Sadler	Research Associate	UH
Greyson Adams	Research Associate	UH
Eric Shimabukuro	Research Associate	UH
Tara Clemente	Research Associate	UH
Jefrey Snyder	Marine Technician	UH
Daniel McCoy	Research Associate	UH
Robert (Walt) Deppe	Research Associate	UH
Fernando Santiago-Mandujano	Research Associate	UH
Jay Chitnis	Undergraduate Student	UH
Elena Kazamia	Postdoctoral Researcher	MIT
Jessie Berta-Thompson	Postdoctoral Researcher	MIT
Anne Thompson	Research Scientist	Institute for Systems Biology
Allison Lee	Research Associate	Institute for Systems Biology
Jeff Koch	Marine Technician	OTG
Sonia Brugger	Marine Technician	OTG

3. GENERAL SUMMARY

Operations during the cruise were compromised due to weather conditions. After departure delays, equipment delays at Station Kahe, and a rough weather transit to Station ALOHA, we arrived late (0315 on April 14th) and to unfavorable conditions. With ~20 kt winds, 10-12 ft swell and moderate 6-8 ft seas, and a cold front forecasted to move through station on array recovery day, the decision was made by the Captain and Chief

Scientist to not deploy arrays. As the cruise continued, weather conditions improved and the forecasted track of the cold front changed allowing for the ~12 hr deployment of the Primary Production Array on the morning of April 15th.
Operations not completed due to weather: Sediment Trap Array and Gas Array

One 1000 m CTD cast was completed at Station Kahe. One 200 m CTD, two near bottom CTD casts and twelve 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 four cycles completed. One near bottom CTD cast was completed at Station Kaena.

The Primary Production Array was deployed and recovered successfully on April 15th.

Six net tows for the core HOT zooplankton collection were completed successfully; three during the day and three during the night.

The ATE was not deployed due to instrument communication errors.

The Hyperpro casts (three cycles each) were successfully conducted four times around the scheduled 1400-1430 time slot on April 13th, 14th, 15th, and 16th. The casts at Station Kahe were conducted without the PAR sensor working. Troubleshooting by D.Sadler resolved this issue which was due to USB port connectivity.

The optical package (ACS/Sea Bird Seacat/LISST) was deployed two times during the cruise, once around noon and once in the early morning on April 16th. The LISST did not save data files during any of the casts.

The ship's primary anemometer was not working during this cruise; the science party was notified by the Captain on departure day. A 30 minute departure delay for anemometer repairs was offered, but with the delays due to clogs in the gray water system, it was decided that the secondary anemometer would be sufficient.

The ship's ADCP, fluorometer, and thermosalinograph operated throughout the cruise.
There were two interruptions to the thermosalinograph data logging; one from 0650-1650 April 15th, and one from 0049-0600 April 17th. Troubleshooting by J.Koch and J.Snyder brought the system back on-line after the first outage.

Winds during the cruise were from the NE at 20 kts during the first two days of the cruise. Winds started to ease to 10-15 kts for the last two days of the cruise. The swell was 10-12 ft during the first two days of the cruise with 8-10 ft seas. The swell then dropped to 7-8 ft and seas also decreased to 4-6 ft during the last two days of the cruise.

We arrived at Snug Harbor for partial off-loading on April 17th, at 0713 (HST). Remaining equipment was offloaded on April 18th.

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

The R/V *Ka'Imikai-O-Kanaloa* continues to maintain very good ship support for our work. Captain Ross and the ship's crew showed flexibility, enthusiasm, concern, and dedication to our scientific mission. A special thank you to John Carlin for fixing the Milli-Q water system that went down during our cruise.

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

5. DAILY REPORT OF ACTIVITIES (HST)

April 13, 2016
0740- Departure delayed due to clog in gray water system.
0822- Notified by Captain that the main anemometer is broken, secondary is okay.
0840- Gangway away
0845- Depart Snug Harbor
0923- Fire and abandon ship drills
0955- Secure from drills
1010- Safety Briefing with Captain
1200- Arrive Station Kahe – weight cast to 500m
1233- Weight recovered
1253- Hyperpro cast – PAR sensor not functioning, cast conducted without PAR reading.
This problem was fixed by plugging in the USB connection to the sensor into a different USB port.
1417- Hyperpro Recovered
1435- S1C1 1000 m CTD
1548- End of cast
1554- Drifter 1 deployed 21° 20.715'N 158° 16.536'W
1555- Drifter 2 deployed 21° 20.811'N 158° 16.654'W
1557- Drifter 3 deployed 21° 20.913'N 158° 16.594'W
1558- Transit Station ALOHA

April 14, 2016
0315- Arrive Station ALOHA – weather conditions on station assessed and decision was made to not deploy arrays based on current conditions and forecasted conditions for recovery day.
0333- S2C1 200 m CTD
0403- End of cast
0450- S2C2 near bottom CTD
0644- 4m off the bottom 22° 44.443'N 158° 0.073'W
0845- End of cast
1052- S2C3 1000 m CTD
1224- End of cast
1240- Net tow
1314- Net tow recovered
1333- Hyperpro
1410- End of Hyperpro
1419- S2C4 1000 m CTD
1527- End of cast
1656- S2C5 1000 m CTD
1819- End of cast
1958- S2C6 1000 m CTD
2119- End of cast
2205- Net Tow
2236- End of tow
2239- Net Tow
2310- End of tow
2314- S2C7 1000 m CTD

April 15, 2016
0030- End of cast
0157- S2C8 1000 m CTD
0310- End of cast
0415- PP Array Deployment begins
0431- Array Released 22° 45.109'N 158° 1.076'W
0457- S2C9 1000 m CTD
0556- End of cast

0615- Transit to pump ship's tanks
0650- Thermosalinograph not logging – not noticed until 1400 by PO group - OTG notified.
0802- S2C10 1000 m CTD
0916- End of cast
1000- Net Tow
1038- End of tow
1100- S2C11 1000 m CTD
1210- End of cast
1216- Net tow
1247- End of tow
1300- Hyperpro
1344- End of Hyperpro
1357- S2C12 1000 m CTD
1400- OTG notified that thermosalinograph not logging.
1506- End of cast
1650- Thermosalinograph back up and logging. Troubleshooting may have caused brief logging stoppage of all underway data systems.
1659- S2C13 1000 m CTD
1802- End of cast
1803- Transit to PP array
1910- Primary Production Array Recovered 22° 41.625'N 158° 5.776'W
1922- End of recovery
1925- Transit to ALOHA
1958- S2C14 1000 m CTD
2125- End of cast
2208- Net Tow
2237- End of tow
2259- S2C15 near bottom CTD

April 16, 2016
0059- 10m off the bottom 22° 45.789'N 157° 59.995'W
0243- End of cast
0324- Optics deployed
0420- Optics recovered, filters in place, re-deployed
0517- Optics recovered
1002- Optics deployed
1050- Optics recovered, filters in place, re-deployed
1143- Optic recovered
1144- Transit to WHOTS
1211- S52C1 200 m Yo-Yo
1315- End of cast
1320- Hyperpro
1410- End of Hyperpro
1415- Transit Station Kaena
2005- Arrive at Station Kaena
2013- S6C1 near bottom CTD
2245- End of cast
2250- Transit Snug Harbor

April 17, 2016
0046- Thermosalinograph not logging; noticed at 0600 by J.Snyder
0713- Arrive Snug Harbor

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
Sara Ferrón-Smith	Determination of net community production from the diurnal variability of O2/Argon ratios	UH
Ed DeLong	SCOPE: DNA collection	UH
Angelique White	SCOPE: Diazatroph Microscopy	OSU
Virginia Armbrust	SCOPE: Seaflow Underway Flow Cytometer	UW
Victoria Futch	SLDMB float deployement	UH
Solange Duhamel	Surface seawater for culture media	Lamont-Doherty Columbia University
Kyle Edwards	Surface seawater for media	UH
Elena Kazamia and Jessie Berta-Thompson	Isolation of microbial communities from ALOHA	MIT
Anne Thompson	Microbial ecology of coexisting ecotypes	Institute for Systems Biology