HOT-279: Chief Scientist Report

Chief Scientist: Dan Sadler

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

7-11 December, 2015

Cruise ID: **KOK 15-16**
Departed: 7 December at 0830 (HST)
Returned: 11 December at 0748
Vessel: **R/V *Ka'Imikai-O-Kanaloa***
Master of the Vessel: Captain Don Jack
OTG Marine Technicians: Jeff Koch and Steve Tottori

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 7th 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 8th to 10th.
3) Station 52, the site of WHOTS-12 Mooring (anchor position 22° 40.061' N, 157° 56.9654' W) was to be occupied on December 10th 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 10th for approximately 2 hours.

Upon arrival to Station Kahe a 400 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 7th. The single CTD cast was to be conducted to collect a continuous profile 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 53 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 9th.

Another free-drifting array (Gas Array) was to be deployed for 24 hours for incubation experiments on December 9th. The Gas Array was to be recovered on December 10th.

A plankton net was to be towed between 1000-1400, and 2200-0200 for 30 minute intervals on December 8th and 9th at Station ALOHA.

The Hyperpro (a profiling unit with one up-looking and one down-looking hyperspectral radiometer, a WET Labs ECO-BB2F triplet, temperature and conductivity sensors), was to be deployed on December 7th, 8th, and 10th.

A trace metal free sample was to be collected by the ATE sampler on December 9th 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 10th.

After recovering the arrays, the ship was to transit to Station ALOHA to Station 52 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, fluorometer, and the ship's anemometer.

2. SCIENCE PERSONNEL

Participant	**Title**	**Affiliation**
Lance Fujieki	Research Associate	UH
Dan Sadler	Research Associate	UH
Brenner Wai	Research Associate	UH
Alex Nelson	Research Associate	UH
Blake Watkins	Marine Engineer	UH
Brie Maillot	Technician	UH
Karin Björkman	Research Specialist	UH
Roman Battisti	Technician	UH
Eric Shimabukuro	Research Associate	UH
Greyson Adams	Research Associate	UH
Jim Burkitt	Research Associate	UH
Ken Doggett	Research Associate	UH/CMORE
Jefrey Snyder	Marine Technician	UH
Fernando Santiago-Mandujano	Research Associate	UH
Daniel McCoy	Research Associate	UH
R. Walter Deppe	Research Associate	UH
Ryan Kagami	Teacher	Kailua Intermediate
Matt Dwyer	Volunteer	UH
Jeff Koch	Marine Technician	OTG
Steve Tottori	Marine Technician	OTG

3. GENERAL SUMMARY

Operations during the cruise were conducted as planned with the following exceptions. The CTD wire snapped at the end of the weight cast resulting in the loss of the test weight and electrical termination. The Kahe CTD cast was cancelled and the wire re-terminated in route to St. ALOHA to keep on schedule. Heavy weather caused cancellation of the second deep cast, an optics cast, a Hyperpo cast, the

WHOTS cast, and St. Kaena. Rough conditions during recovery of the Sediment Trap array caused the traps to spill and fill with surface water. The samples were unusable and not processed.

The CTD squirt boom was moving slowly during CTD deployment and recoveries due to hydraulic system issues. It failed to retract at the end of the deep cast until additional hydraulic fluid was added to the reservoir delaying recovery for 15 minutes. The ship reported that the boom is due for a full overhaul.

Science Van #24 had electrical breaker issues that made the van unusable. It's science operations were completed in the ships Clean Lab.

One near bottom CTD casts and thirteen 1000 m CTD casts were conducted at Station ALOHA.

The Primary Production Array, and Gas Array were all deployed and recovered successfully. The Sediment Traps Array samples were comprised during recovery.

Six net tows were completed successfully; three during the day, and three during the night.

The ATE was successfully deployed on December 9th.

Two Hyperpro casts (three cycles each) were successfully completed. The first on December 7th at St. Kahe and the second on December 8th at St. ALOHA.

Three SLDMB drifters were deployed according to plan on December 7th after leaving Station Kahe.

The underway thermosalinograph system, the underway fluorometer, and the ADCP functioned correctly during the cruise.

The ship's anemometer ran without interruption during the cruise.

Winds were light and variable at the beginning of the cruise with a small north swell. Wind and swell built steadily during the cruise with the approach of a cold front. By Wednesday night winds were gusting over 30 knots and remained high for the rest of the cruise causing rough sea conditions.

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 Don Jack and the ship's crew showed flexibility, enthusiasm, concern, and dedication to our scientific mission. A special thanks goes out to the chief engineer and his staff who were able to keep the squirt boom operational.

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)

Monday, December 7, 2015

0730 OTG informed CS that the UPS supporting the Nobeltec computer and MARS sytems was down. Replacement units were found and installed.
0830 Departing Snug Harbor

0900 Fire and Safety drills
0930 Safety meeting with Captain
1130 Arrive St. Kahe
1149 Begin weight cast to 1000 m.
Weight lost on upcast. Winch payout wasn't zeroed at surface. After instructing winch to come up to 5m below surface, the weight came out of the water at ~60m/min and parted the wire at the squirt boom with winch readout at 20.8m.

1300 Hyperpro cast at 21° 20.48'N 158° 16.42'W
1325 Hyperpro recovered
1345 Drifter 1 deployed at 21° 20.916'N, 158° 16.419'W
1346 Drifter 2 deployed at 21° 20.997'N, 158° 16.444'W
1347 Drifter 3 deployed at 21° 21.067'N, 158° 16.472'W

1350 Meeting with captain, Chief scientist, OTG, winch operator, Snyder and McCoy to discuss evolution of the weight cast and steps to prevent future issues. Found that the winch display was not reading properly. The wire zero was not confirmed at the surface. OTG to write new weight cast protocol.

1400 Begin transit to St. ALOHA. CTD cast cancelled to stay on schedule. Reterminating wire in-transit.
2344 Arrive ALOHA
0000 Deploying sediment traps
0053 Sediment trap array released at 22°N 45.027'W, 158°n 3.515'W
0158 Begin S2C1 to 1000m. Deployment delayed due to level wind adjustment. Bottom depth incorrect. Suggested OTG change sound velocity to correct offset.
0317 End cast
0415 Begin primary production array deployment at 22°N 45.16'W, 158°N 01.1'W
0430 PP deployment complete. Reposition to center of circle
0456 Begin S2C2 to 4500m
0650 4m off bottom at 22°N 45.072'W, 158°N 00.136'W
0845 Squirt boom not retracting after CTD came out of water. Resubmersing to 5 dbar to troubleshoot issue.
0901 End of cast. Added hydraulic fluid to boom, working again.
0910 Transit to pump tanks. Isus installed on rosette
1057 Begin S2C3 1000m CTD. Start of 36 hour period
1230 Net tow at 22°44.96N', 158° 00.09'W
1315 End net tow
1330 Start Hyperpro at 22°45.17N', 157° 59.60'W
1412 End Hyperpro
1421 Begin S2C4 CTD to 1000m
1531 End cast
1625 Begin S2C5 CTD to 1000m
1730 End cast
1735 Transit to primary production array
1815 Begin PP recovery at 22°47.273N', 158° 2.2'W
1828 PP recovered

1953 Begin S2C6 1000m CTD
2108 End cast
2159 Start net tow at 22°45.796N', 158° 3.267'W
2227 End net tow
2231 Start net tow at 22°45.710N', 158° 2.629'W
2302 End net tow
2309 Begin S2C7 1000m CTD

Wednesday, December 9, 2015

0012 End cast
0158 Begin S2C8 1000m CTD
0259 End cast
0402 Deploying gas array at 22°45.198N', 158°
0420 End GA deployment
0508 Begin S2C9 1000m CTD
0604 End cast
0605 Transit to pump tanks
0821 Begin S2C10 1000m CTD
0927 End cast
1001 Net tow at 22° 44.730'N, 158° 04.520'W
1035 End net tow
1045 Start ATE at 22° 44.52'N, 158° 03.92'W
1107 ATE recovered
1112 Begin S2C11 CTD to 1000m
1215 End cast
1225 Net tow at 22° 44.66'N, 158° 03.76'W
1300 End net tow
1357 Begin S2C12 CTD to 1000m
1509 End cast
1654 Begin S2C13 CTD to 1000m
1759 End of cast
1959 Begin S2C14 CTD to 1000m
2117 End of cast
2205 Start net tow at 22° 44.564'N, 158° 1.524'W
2230 End net tow
2300 Cancelled S2C15 due to borderline conditions with winds gusting over 30 knots

Thursday, December 10, 2015

0315 Begin optics cast at 22° 47.82'N, 157° 59.80'W
0405 Optics recovered
0412 Re-deploy optics at 22° 48.09'N, 157° 58.86'W
0510 Optics recovered. Transit to gas array
0620 Arrive gas array, begin recovery at 22° 49.22'N, 158° 04.29'W
0700 Transit to Sediment Traps
0755 Recovering sediment traps at 22° 54.331'N, 158° 07.584'W
Trap samples were spilled due challenging sea conditions.
0819 Transit to WHOTS mooring

1000 Cancelled optics cast
1248 Cancelled S52C1 due to large swell and wind gusts over 30 knots.
Cancelled Hyperpro due to rough conditions.
1300 Begin transit to St. Kaena
2030 Arrive Kaena. CTD cast cancelled for rough conditions. Resumed transit to Honolulu.

Friday, December 11, 2015

0700 At HH buoy
0748 Secured dockside Snug Harbor

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 inter-calibration	SIO
Paul Quay	$DI^{13}C$	SIO
Matt Church	SCOPE: Diversity and activities of nitrogen-fixing microorganisms	UH
Sam Wilson	SCOPE: Reduced gases in the upper ocean: The cycling of methane, sulfide and nitrous oxide	UH
Erica Goetze	Temporal stability of copepod populations at Station ALOHA	UH
Sara Ferron-Smith	SCOPE: Determination of net community production from the diurnal variability of O2/Argon ratios	UH
Ed DeLong	SCOPE: DNA collection	UH
Angel White	SCOPE: Diazotroph microscopy sampling	OSU
Virginia Armbrust	SCOPE: Seaflow Underway Flow Cytometer	UW
Victoria Futch	SLDMB float deployement	UH

Benedetto Barone	SCOPE: Evaluation of eukaryotic phytoplankton size	UH
Roman Battisti	SCOPE: DOC leaching	UH
Kyle Edwards	Surface seawater for culturing	UH