HOT 290: Chief Scientist Report

Chief Scientist: Tara M. Clemente
R/V *Ka'Imikai-O-Kanaloa*
February 21-15, 2017

Cruise ID: **KOK17-02**
Departed: February 21, 2017 at 0805 (HST)
Returned: February 25, 2017 at 0825 (HST)
Vessel: **R/V *Ka'Imikai-O-Kanaloa***
Master of the Vessel: Mike Hoshlyk
OTG Marine Technicians: Sonia Brugger and Trevor Young

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 February 21st 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 February 22nd, 23rd, and 24th.
3) Station 50, the site of WHOTS-13 Mooring (anchor position 22° 47.24' N, 157° 54.45' W) was to be occupied on February 24th 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 February 24th for approximately 3 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 February 21st. 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 one 200 m cast to collect water for the Primary Productivity Array and one 100m cast to collect water for the Diazotrophy Growth Rate Array. These cast were to be followed by the deployment of the free-drifting Net Trap to collect sinking particles for 24hrs, the free-drifting Primary Productivity Array to incubate insitu for 12 hours and the Diazotrophy Growth Rate Array to incubate insitu for 48hrs. 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 February 22nd.

Another free-drifting array (Gas Array) was to be deployed for 24 hours for incubation experiments on February 22nd. The Gas Array was to be recovered on February 23rd.

An Automated Trace Element (ATE) sampler was to be deployed to a depth of 10 m on February 22nd.

A plankton net was to be towed three times between 1000-1400, and three times between 2200-0200 for 30 minute intervals on February 21st and 22nd at Station ALOHA.

The Hyperpro was to be deployed for a half-hour period near ~1400 on February 20th, 221st, and 23rd.

An optics package including a SeaBird Seacat with temperature, conductivity, fluorometer and pressure sensors, 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 on February 23rd.

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, the Gas Array and the Diazatrophy Growth Rate Array on the morning of February 23rd.

After recovering the arrays, the ship was to transit to Station ALOHA to conduct a 1000m CTD. Once that operation was complete, the ship was to transit to Station 50 to conduct a one-hour 200 m CTD yo-yo cast. Once operations at Station 50 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 Pier 35.

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	Citizenship
Susan Curless	Research Associate	UH	USA
Alexa Nelson	Research Associate	UH	USA
Dan Sadler	Research Associate	UH	USA
Brenner Wai	Research Associate	UH	USA
Blake Watkins	Marine Engineer	UH	USA
Tim Burrell	Research Associate	UH	New Zealand
Tara Clemente	Research Associate	UH	USA
Eric Shimabukuro	Research Associate	UH	USA
Ryan Tabata	Research Associate	UH	USA
Andrew King	Research Associate	UH	USA
Svetlana Naratov	Graduate Student	UH	USA
Fernando Santiago-Mandujano	Research Associate	UH	USA
Jefrey Snyder	Marine Technician	UH	USA
Andrew Tokuda	GES undergraduate	UH	USA
Morgan Linney	Graduate Student	UH	USA
Gerarda Terlouw	Post Graduate Trainee	UH	The Netherlands
Kendra Turk	Research Scientist	UCSC	USA
Andrea Caputo	PhD Candidate	Stockholm Uni.	Italy
Sonia Brugger	Marine Technician	OTG	USA
Trevor Young	Marine Technician	OTG	USA

3. GENERAL SUMMARY

Operations during the cruise were conducted as planned with modifications due to rough seas and strong winds at Station ALOHA. Departure from Pier 35 was on time and operations at Station Kahe were completed successfully. Winds from the E at 25-30 kts and 10-12 ft seas were present during transit to Station ALOHA

after passing Kaena Point. We arrived at Station ALOHA two hours later than scheduled (0205 on February 22nd) due to an increase in transit time resulting from head seas.

Upon arriving at Station ALOHA on the morning of February 22nd, winds were steady at 25-30 kts (with higher gusts) and the swell was 8-10 ft. Deployments of the sediment traps, the primary productivity array, and the Diazotrophy growth rates array were cancelled until further notice upon observing conditions on station.

At first-light, after assessing conditions and discussing with the Captain, it was determined safe to deploy the CTD for the deep cast. The deep CTD cast was conducted, however the ship had trouble holding station and we drifted ~4 miles NW of center. The first cast of the 36-hour CTD burst period was deployed 3-hours later than planned. Despite this delay, the number casts planned to be conducted during the period were all completed successfully with modifications.

The daytime net tow on February 22nd was cancelled and the primary productivity array deployment was rescheduled for Thursday morning February 23rd in place of the gas array and the hyperpro cast was rescheduled for 1300 on February 23rd, however due to CTD level wind issues causing a ~2-hour delay to the schedule the hyperpro was cancelled and two CTD casts S2C12 and S2C13 were shortened to 200m casts to make up time in the schedule.

The primary productivity array was deployed successfully on the morning of February 23rd, in place of the Gas Array. The sediment trap array with attached SeapHOx were scheduled to be deployed after the primary productivity array; however, due to the challenging conditions experienced it was decided to forgo deployment.

The CTD winch experienced issues with the level wind on S2C9. The level wind stopped functioning on the up cast at ~ 400m due to a broken chain on the level wind drive. Engineering replaced the broken chain. The repair took ~ 2hrs and the level wind continued working properly throughout the remainder of the cruise.

One 1000 m CTD cast was completed at Station Kahe. Two 200 m CTD, two near bottom CTD casts and eleven 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 CTD cast was completed at Station Kaena.

The Sediment Trap, Diazotrophy Growth Rate and Gas Arrays were not deployed due to rough weather conditions.

The Primary Production Array was 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.

Two Hyperpro casts (three cycles each) were successfully conducted two times around the scheduled 1330-1430 time slot on February 21st and 24th.

The optical package (Sea Bird Seacat/ Fluorometer /LISST), was deployed once in the early morning on February 24th. The cast was conducted successfully.

The ADCP and the ship's meteorological suite ran without interruption during the cruise.

The thermosalinograph was NOT working during the cruise.

The DI water system failed towards the end of the cruise.

The -80 freezer was loaded the morning of departure and accidently plugged into 110 instead of 240, therefore the freezer did not come down to temperature. Our samples were placed on pre-purchased dry ice until the engineers took a look at the power connection and discovered the -80 was plugged into the wrong outlet. Once the freezer came down to the proper temperature samples were then transferred and stored in the -80 for the remainder of the cruise.

Winds and seas during the cruise were mostly from the ENE. Wind speeds were ~20-30kts and seas were ~6-10ft.

We arrived at Pier 35 for off-loading on February 25th, at 0825 (HST).

The following operations were cancelled due to the rough seas and winds experienced during the cruise in order to preserve the safety of the personnel and equipment:

1. The Sediment Trap Array Deployment was cancelled
2. The Diazotrophy Growth Rate Array was cancelled
3. The Gas Array deployment was cancelled.
4. The CTD cast associated with the Gas Array was cancelled

The following operations were cancelled or delayed due problems with equipment:

1. The ATE would not communicate so the cast was cancelled.
2. Two 1000m CTD casts were shortened to 200m due to delays caused by the CTD winch level wind chain break.
3. One out of three hyperpo casts (three cycles each) were cancelled due delays caused by the CTD winch level wind chain break.
4. The SeapHOx did not record data due to an unknown instrument shut off.

The following were problems experienced with ships equipment:

1. The thermosalinograph was NOT working during this cruise.
2. The CTD winch level wind chain broke during S2C9 causing ~ 2 hour delay
3. -80 was plugged into wrong power receptacle and fixed mid way through cruise.
4. DI Water system failed towards the end of the cruise.

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

The R/V *Ka'Imikai-O-Kanaloa* continues to provide good ship support for our work. Captain Mike Hoshlyk and the entire ship's crew showed enthusiasm, concern, and dedication to our scientific mission. A special thank you to John Carlin and the engineering team for fixing the CTD winch level wind chain when needed during our cruise along with the -80 Freezer.

Technical support during this cruise was marginal. The OTG personnel were available most times to assist in our work during the cruise. **Before the next cruise on the R/V *Ka'Imikai-O-Kanaloa*, it is requested that the problems with the underway thermosalinograph and DI water system be fixed and operational.**

5. DAILY REPORT OF ACTIVITIES (HST)

February 21, 2017
0805 Depart Pier 35
0840 Fire and Abandon Ship Drills
0855 Secured from Drills
0857 Safety Briefing

1120 Arrive Station Kahe
1130 Weight cast to 500m
1157 End of weight cast
1207 Start HyperPro: 21°20.371 N, 158°16.423 W
1250 End of HyperPro
1306 S1C1 1000m CTD cast
1406 S1C1 End
1409 Transit to Station ALOHA

February 22, 2017
0205 Arrive at Station ALOHA center, weather too rough to deploy arrays
0757 S2C1 near bottom CTD
1016 10m off the bottom, ship having trouble holding station, 2 miles NW from center
1223 S2C1 End, 4 miles NW from center
1328 Hand Net Tow Start
1338 Hand Net Tow End
1340 Transit back to center of Station ALOHA
1438 S2C2 1000m CTD cast
1603 End S2C2
1710 S2C3 1000m CTD
18019 End S2C3
1955 S2C4 1000m CTD
2106 End S2C4
2210 Net tow
2235 Net tow end
2240 Net tow
2311 Net tow end
2312 S2C5 1000m CTD

February 23, 2017
0026 End S2C5
0208 S2C6 1000m CTD
0312 End S2C6
0415 Start PP Array Deployment
0500 PP array released: 22°45.03 N, 158°1.68 W
0505 Transit to Station ALOHA center
0545 S2C7 1000m CTD
0641 End S2C7
0801 S2C8 1000m CTD
0855 End S2C8
1000 Net tow
1025 Net tow end
1030 ATE not deployed, unable to establish communication.
1035 Net tow
1100 Net tow end
1115 S2C9 1000m CTD
1155 Noticed tension spikes on CTD exceeding 1200lbs, all stop on the upcast at 404m
1210 Level wind not functioning, bind on forward side of drum, need to pay out.
1215 Broken chain on level wind drive
1230 Engineering replacing broken chain, pay out to 637.8m to where bind stops, cable is ok, no data transmission problems.
1425 S2C9 coming up slow

1453 End S2C9
1524 S2C10 1000m CTD
1632 End S2C10
1744 S2C11 1000m CTD
1858 End S2C11
1900 Transit to recover PP array
2027 Begin PP array recovery: 22°45.947 N, 158°14.059 W
2045 PP array recovered
2050 Transit to Station ALOHA
2205 S2C12 200m CTD
2236 End S2C12
2240 Start Net tow
2310 End Net tow
2359 S2C13 200m CTD

February 24, 2017
0028 End S2C13
0156 S2C14 1000m CTD
0300 End S2C14
0320 Deploy Optics package
0511 Optics package recovered
0512 Transit to center of ALOHA
0600 S2C15 near bottom CTD
0755 Near bottom, max pressure 4800 dbar; 22°46.565 N, 158°01.190 W
0937 End S2C15
0940 Transit towards WHOTS-13 buoy
1006 Start Net Tow
1033 End Net Tow
1034 Transit to WHOTS-13 buoy
1055 Arrive WHOTS-13 buoy, due W of mooring
1114 S50C1 200m Yo-Yo
1239 End S50C1, 5 cycles complete
1336 Start Hyperpro
1451 End of Hyperpro
1500 Transit Station Kaena
0959 Arrive Station Kaena
2205- S6C1 near bottom CTD

February 25, 2017
0012- End S6C1
0015- Transit Pier 35
0825- Arrive Pier 35

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	Diversity and activities of nitrogen-fixing microorganisms	UH
Sam Wilson	Reduced gases in the upper ocean: The cycling of methane, sulfide and nitrous oxide. Intercomparison of dissolved methane and nitrous oxide.	UH
Sara Ferrón-Smith	Determination of gross primary production from the euphotic zone in situ, using the drifting primary production array	UH
Dave Caron	SCOPE: DNA collection	USC
Ed DeLong	SCOPE: DNA and Viral DNA collection	UH
Dan Repeta	SCOPE: DOM collection	WHOI
Angelique White	SCOPE: Diazatroph Microscopy, Underway C-STAR	OSU
Morgan Linney	Water Collected for Dissolved ATP	UH
Kendra Turk	SCOPE: Water collected for diazotrophy growth rate experiments and flow cytometry population sorts to enrich UCYN-A using FACS.	UCSC
Andrea Caputo	Genomic and morphologial diversity of marine planktonic diatom-cyanobacteria symbioses.	Stockholm Uni