

HOT-270: Chief Scientist Report

Chief Scientist: Susan Curless

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

March 27-31, 2015

Cruise ID: **KOK 15-03**

Departed: March 27, 2015 at 0748 (HST)

Returned: March 31, 2015 at 0905 (HST)

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

Master of the Vessel: Captain Don Jack

OTG Marine Technicians: Trevor Young 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 March 27th 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 March 28th, 29th, and 30th.
- 3) Station 50, the site of WHOTS-11 Mooring (anchor position 22° 45.981'N 157° 53.964'W) was to be occupied on March 30th 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 March 30th 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 March 27th. 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 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 March 29th.

Another free-drifting array (Gas Array) was to be deployed for 24 hours for incubation experiments on March 29th. The Gas Array was to be recovered on March 30th.

An Automated Trace Element (ATE) sampler was to be deployed to a depth of 10 m on March 29th.

A plankton net was to be towed three times between 1000-1400, and three times between 2200-0200 for 30 minute intervals on March 28th and 29th at Station ALOHA.

The Hyperpro was to be deployed for a half-hour period near noon time on March 27th, 28th, and 30th.

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 March 30th.

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 March 30th.

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 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 Snug Harbor.

The following instruments were to collect data throughout the cruise: shipboard ADCP, thermosalinograph, ship's two anemometers, and the underway fluorometer.

2. SCIENCE PERSONNEL

Participant	Title	Affiliation
Susan Curless	Research Associate	UH
Dan Sadler	Research Associate	UH
Lance Fujieki	Research Associate	UH
Christopher Schvarcz	Graduate Student	UH
Brenner Wai	Research Associate	UH
Alexa Nelson	Research Associate	UH
Blake Watkins	Marine Engineer	UH
Jefrey Snyder	Marine Technician	UH
Fernando Santiago-Mandujano	Research Associate	UH
Daniel McCoy	Research Associate	UH
Robert (Walt) Deppe	Research Associate	UH
*Aura Coffman	Undergraduate Student	UH
*Kapono Gaughen	Undergraduate Student	UH
Catherine Morgan	Undergraduate Student	UH
Eric Shimabukuro	Research Associate	UH/SCOPE
Tara Clemente	Field Operations Coordinator	UH/SCOPE
Steve Tottori	Marine Technician	OTG
Trevor Young	Marine Technician	OTG

*In case of possible cruise extension, participant disembarked on 03-29-15 due to school obligations.

3. GENERAL SUMMARY

Operations at Station Kahe were slightly delayed when during the weight cast it was noticed that one of the sheaves on the Markey winch was not rotating and frozen in place. The weight was recovered and repairs were made to get the sheave rotating freely. Operations continued with the re-deployment of the weight cast. Another slight delay was experienced during the second weight cast to free the wire from being caught under a bolt. The 1000 m CTD at Station Kahe was conducted without incidents.

Operations at Station ALOHA were initially compromised due to slow transit speeds and then significantly compromised by CTD communication problems resulting in ~23 hours of lost science time.

To compensate for the slow transit speed and late arrival on station, the planned 1000 m CTD cast to obtain water for the primary productivity array was shortened to 200 m to assure the array would be deployed before sunrise.

Operations then continued as planned until during the deep CTD cast bottle #1 would not fire. After several attempts to fire the bottle, it was thought that modem communication with the carousel had been lost. At 4643 dbar on the upcast all communication with the CTD was lost. Power to the CTD was turned off and the instrument package was recovered. Extensive systematic troubleshooting indicated that the CTD was faulty. An inspection of the CTD circuitry revealed several capacitors on the CTD seacable interface board and modem board were shorted and burned out. There is some indication that this was caused by a small amount of water inside the CTD housing, possibly caused by a leaking bulkhead connector. The secondary CTD was put into place within the rosette frame and midway through the testing process communication to the instrumentation was lost. At that time arrangements were made to borrow OTG's CTD fish and return to Haleiwa small boat harbor to obtain the equipment. The borrowed equipment was installed on our rosette frame and tested during the transit back to Station ALOHA. Upon arrival on station, the rebuilt package was deployed and obtained both water samples and data successfully. Operations then continued on a modified and compressed cruise plan aimed at collecting as much of the core objectives as possible in what ship time remained.

One 1000 m CTD cast was completed at Station Kahe. Two near bottom CTD casts, seven 1000 m CTD casts, and one 200 m CTD cast were conducted at Station ALOHA. One 200 m yo-yo CTD cast was completed near the WHOTS mooring (Station 50) with four cycles completed.

The Sediment Traps and Primary Production Array were deployed and recovered successfully.

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

The Hyperpro casts (three cycles each) were successfully conducted three times around the scheduled 1400-1430 time slot on March 27th, 28th, and 30th.

The optical package was deployed one time during the cruise, in the early morning on March 30th.

The ATE was successfully deployed on March 28th.

The ship's fluorometer, anemometers, ADCP and thermosalinograph ran without interruption during the cruise.

Winds during the cruise were from the east at ~15-20kts. Seas were 3-5ft from the east and a ~5ft easterly swell was present throughout the cruise.

We arrived at Snug Harbor for off-loading on March 31th, at 0905 (HST).

Planned operations that were not completed:

- 36 hour burst CTD period
- Gas Array
- Second near bottom CTD cast for oxygen and deep DNA samples
- Day time optics profile
- One day time net tow
- 24 hr sampling period for oxygen and argon ratios
- Sample collection for PUR
- Station Kaena near bottom CTD profile

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

The R/V *Ka'Imikai-O-Kanaloa* continues to maintain good ship support for our work. Captain Jack and the ship's crew showed enthusiasm, concern, and dedication to our scientific mission. A special thank you goes out to the ship's crew for accommodating a trip back to Oahu to pick up equipment and for being so understanding of the various changes to the cruise plan throughout the trip.

Technical support during this cruise was great. Ship board techs Trevor and Steve were both available at any time to assist in our work and were both very helpful throughout the troubleshooting and CTD rebuilding process. Thank you to Scott Ferguson for allowing us to borrow the OTG CTD gear. Thank you to Craig Nosse for orchestrating the packing of all needed equipment, and thank you to both Craig Nosse and Matt Church for meeting us in Haleiwa to drop off of the borrowed equipment. Our work at Station ALOHA could not have continued without your help.

5. DAILY REPORT OF ACTIVITIES (HST)

March 27, 2015

0748- Depart Snug
0825- Fire and abandon ship drills
0855- Safety briefing with Captain
0910- End of safety meeting
1115- Weight cast to 500m, @200m winch experiencing problems with sheave rotation, begin bringing weight back on board
1136- Weight on board
1216- Hyperpro
1234- 2nd cast of hyperpro, winch repairs complete
1256- Hyperpro recovered
1305- Weight cast to 500m, wire caught under bolt, delay of 10 minutes, operations continue
1345- Weight recovered
1423- S1C1 1000 m CTD
1551- End of cast
1602- Transit Station ALOHA

March 28, 2015

0154- Arrive ALOHA, 3 nm southwest of center
0159- Start Sediment Trap Deployment
0222- Array released 22°42.277'N 158°00.966'W
0240- S2C1 200 m CTD
0321- End of cast
0410- PP Array deployment 22°44.117'N 158°0.389'W
0425- PP Array released
0454- S2C2 near bottom CTD cast
0630- Seasave not registering, unable to fire bottle #1 at the bottom of the deep cast, modem communication with carousel lost.
0650- Lost all communication with CTD, @4643 dbar on the upcast, CTD brought on board for troubleshooting
1035- Net Tow deployed
1057- Net Tow recovered
1103- Net Tow deployed
1133- Net Tow recovered
1208- Switch to secondary CTD
1256- Hyperpro
1246- CTD communications still not working, troubleshooting continues
1255- End of Hyperpro
1356- ATE
1424- End of ATE
1430- ATE re-deployed
1500- End ATE

1850- Primary Production Array Recovered 22° 46.3'N 158°0.65'W

1855- Transit to Haleiwa

March 29, 2015

0420- Arrive Haleiwa

0620- Small boat deployed – In case the cruise was extended to complete core work, Kapono Gaughen and Aura Coffman disembarked due to school obligations.

0645- Small boat recovered

0700- Transit Station ALOHA

1508- Arrive ALOHA

1511- S2C3 1000m CTD

1632- End of cast

1759- S2C4 near bottom CTD

1934- Near bottom, 22° 44.768'N 157° 59.944'W @4800dbar. No altimeter on package.

2150- End of cast

2205- Net Tow deployed

2228- Net Tow recovered

2230- Net Tow deployed

2257- Net Tow recovered

2300- Net Tow deployed

2330- Net Tow recovered

2339- S2C5 1000 m CTD

March 30, 2015

0056- End of cast

0140- S2C6 1000 m CTD

0301- End of cast

0315- Optics

0409- Recover and re-deploy

0456- End of optics

0515- S2C7 1000 m CTD

0612- End of cast

0654- S2C8 1000 m CTD

0751- End of cast

0844- S50C1 200 m yo-yo

0945- End of cast

1001- S2C9 1000 m CTD

1117- End of cast

1204- S2C10 1000 m CTD

1314- End of cast

1320- Hyperpro

1404- End of Hyperpro

1405- Transit to sediment traps

1615- Arrive Sediment Traps

1630- Begin Recovery 22°53.1'N 158°21.1'W

1648- Array on board

1700- Transit Snug Harbor

March 31, 2015

0715- Delayed entry to harbor due to ship traffic

0815- Heading in to Honolulu harbor

0905- 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
Christopher Schvarcz	Viral Dynamics at Station ALOHA	UH
Erica Goetze	Temporal stability of copepod populations at Station ALOHA	UH
SCOPE	Sample collection for DNA analysis	UH
Charles Bachy	Prasinovirus isolation	MBARI