HOT 302: Chief Scientist Report

Chief Scientist: Dan Sadler
R/V *Ka'Imikai-O-Kanaloa*
May 14-18, 2018

Cruise ID: **KOK18-03**
Departed: May 14, 2018 at 0820 (HST)
Returned: May 18, 2018 at 1115 (HST)
Vessel: **R/V *Ka'Imikai-O-Kanaloa***
Master of the Vessel: Mike Hoshlyk
OTG Marine Technicians: Julianna Diehl, Rob Palomares and Elizabeth Ricci

1. SCIENTIFIC OBJECTIVES

The objective of the cruise is to maintain a collection of hydrographic and biogeochemical data at the Hawaii Ocean Time-series (HOT) stations. Three stations will be occupied and during the cruise along with the recovery of the deep moored traps, events will occur in the following order:

1) Station 1, referred to as Station Kahe, is located at 21° 20.6'N, 158° 16.4'W and will be occupied on May 14th 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 will be occupied May 15th – 17th.
3) Station 52, the site of WHOTS-14 Mooring (anchor position 22° 40.01'N 157° 57.09'W) will be occupied on for about one hour on May 17th.
4) Deep trap deployment (anchor position at 22° 51.971'N, 157° 53.167'W). Deployment of the sediment trap is expected to take approximately 3 hours, along with 1 hour to triangulate the anchor position.

NOTE: No operations at Station 6, Kaena, due to time requirements for the deployment of the deep sediment traps.

Upon arrival to Station Kahe a ~1300 lb. weight-test cast to 500 m, one CTD cast to 1000 m, one hand held net tow for the Caron lab and a Hyperpro cast were to be conducted on the afternoon of April 16th. 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.

In transit, a deep ARGOS float was to be deployed approximately 10 nm south of Station ALOHA.

Upon arrival to Station ALOHA, the WireWalker was to be deployed followed by the free-drifting sediment trap array. These two arrays were to stay in the water for about 54 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 centered over Station ALOHA, 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 May 16th.

The lowered-ADCP was to collect current measurements on down- and up-cast. The LADCP, operating in single ping at 4 Hz, was to record measurements internally and data was to be downloaded after each cast via RS422 connection.

The free-drifting Gas array was to be deployed for 24 hours for incubation experiments on May 16th.

A plankton net was to be towed three times between 1000-1400, and three times between 2200-0200 for 30 minute intervals on May 15th and 16th at Station ALOHA.

The Hyperpro was to be deployed for a half-hour period near ~1400 on May 14th, 15th, and 16th.

An optics package including a package consisting of 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 May 16th.

After the optics package and 36 hour burst period of CTD work at Station ALOHA was accomplished, the ship was to transit to recover the Gas array, the WireWalker and the Sediment Trap array on the morning of May 17th.

After recovering the arrays, , the ship was to transit to Station 52 to conduct a one-hour 200 m CTD yo-yo cast. The ship was to remain 0.25 nm, downwind and down current from Station 52, after completion of the CTD yo-yo to gather one hour of shipboard ADCP for comparison to WHOTS-14 ADCP data. 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 the deep sediment trap deployment site at 22°51.971' N, 157°53.167' W. Deployment of the sediment trap was expected to take approximately 3 hours, with another hour to triangulate the anchor postition.

After deploying the deep sediment trap, the ship was to transit back to Honolulu Harbor, Pier 35.

In transit, a deep ARGOS float was to be deployed approximately 10 nm south of Station ALOHA.

The following instruments were to collect data throughout the cruise: shipboard ADCP, thermosalinograph, underway fluorometer, transmissometer, the meteorological package.

2. SCIENCE PERSONNEL

Participant	Title	Affiliation	Citizenship
Alex Nelson	Research Associate	UH	USA
Dan Sadler– Chief Scientist	Research Associate	UH	USA
Carolina Funkey	Research Associate	UH	USA
Blake Watkins	Marine Engineer	UH	USA
Kendra Brooks	Research Associate	UH	USA
Fernando Santiago-Mandujano	Research Associate	UH	USA
Kellen Rosburg	Research Associate	UH	USA
Ryan Tabata	Research Associate	UH	USA
Svetlana Natarov	Research Assistant	UH	USA
Ksenia Trifonova	Research Assistant	UH	Germany
Jefrey Snyder	Marine Technician	UH	USA
Macarena Burgos	Scientist	UCádiz	Spain
Tim Burrell	Research Assistant	UH	New Zealand
Tara Clemente	Research Assistant	UH	USA
Morgan Linney	Graduate Student	UH	USA
Solomon Chen	Undergraduate Student	UH	USA
Elizabeth Steffen	Scientist	NOAA	USA
Rob Palomeres	Marine Technician	OTG	USA

Julianna Diehl	Marine Technician	OTG	USA
Elizabeth Ricci	Marine Technician	OTG	USA

3. GENERAL SUMMARY

A late departure from Pier 35 due to harbor traffic combined with ship traffic en route, delayed arrival at St. Kahe. After successfully completing station activities we proceeded to St. ALOHA . A deep Argo float was deployed just south of St. ALOHA. The Wirewalker and sediment traps were deployed in the southern section of St. ALOHA drifted slowly southward, remaining in the station circle. The primary production array and Hyperpro cast were shifted to the next day as we did not arrive in time to get the PP array in the water before sunrise.

An injury occurred during the optics cast and the ship diverted to Haleiwa Harbor to disembark the passenger for medical treatment. The Wirewalker and floating sediment traps were recovered along the way. The ship proceeded back to station were all water column work was completed, deep moored sediment traps deployed and the anchor position fixed. Station 52 (WHOTS) was occupied and a second deep Argo float deployed.

One 1000 m CTD cast was completed at Station Kahe. One near bottom CTD casts and nine 1000 m CTD casts were conducted at Station ALOHA. One 300 m CTD cast was completed near the WHOTS mooring (Station 52).

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

The ADCP, underway fluorometer, thermosalinograph, transmissometer and the ship's meteorological suite ran without interruption during the cruise. The ADCP data collection was interrupted during the moored sediment trap deployment (about 7 hours, it was not turned back on after the deployment until we noticed that it was off). The bottom depth was not available in some of the casts because the 12 KHz was not setup properly. After OTG set it up properly later in the cruise we had bottom depth in some of the casts. The Seabeam was not operating so couldn't be used for bottom depth.

The KOK continued to operate at reduced speed due to electrical issues with the generators. The bridge kept shaft speeds below 185 rpm resulting in cruising speeds of 6-7 knots. The lower speed delayed arrival at St. ALOHA enough that the primary production cast had to be rescheduled and eventually cancelled due to the medical transit.

Winds during the cruise were mostly from the E with speeds of 8-15 kts. The seas were 2-4 ft.

The following operations were affected due to the medical diversion to Haleiwa Harbor:

1. Gas Array - cancelled
2. Primary Production – postponed due to late arrival then cancelled due to medical diversion
3. One day and one night net tows - cancelled
4. WHOTS yoyo cast was shortened to 1 cycle
5. Both Hyperpro casts at St. ALOHA were canceled
6. Wirewalker and floating sediment trap deployments were abbreviated.
7. A second deep CTD was not performed
8. The 36 hour CTD cycle was interrupted by the transit and not completed.

The injury incurred during the optics cast was reported to the Captain and UH Marine Center. A full accident report was filed by the Captain. Safety procedures were discussed with the science party during the post-cruise meeting.

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 Hoshlyk and the ship's crew showed flexibility, enthusiasm, concern, and dedication to our scientific mission.

Technical support during this cruise was very good. OTG personnel were available to assist in our work during the cruise. In particular, the were responsive to fixing a glitchy internet connection.

We also appreciate that the Marine Center allowed us to return to station after the medical evacuation and complete our work.

5. DAILY REPORT OF ACTIVITIES (HST)

14 May 2018

0820 Depart Pier 35
0910 Safety and Abandon Ship Drills
0930 Safety and Science Meeting
1141 Arrive St. Kahe
1152 Weight cast to 500 m
1230 Hyperpro
1315 Deep Argo float practice deployment
1320 Finished practice deployment
1348 Begin S1C1 CTD to 1000m
1500 End cast
1505 Transit to ALOHA

15 May 2018

0240 Deep Argo float deployment at 22° 29.955'N, 158° 4.103'W
0247 Resume transit to St. ALOHA
0430 Deployed Wirewalker at 22° 39.96'N, 158° 1.722'W
0521 Deployed sediment traps at 22° 42.217'N, 158° 1.722'W
0630 Begin S2C1 near bottom CTD cast
1025 End cast
1035 Net tow 1
1105 Net tow 2
1223 Begin S2C2 1000m CTD
1335 End cast
1423 Begin S2C3 1000m CTD
1532 End cast
1649 Begin S2C4 1000m CTD
1801 End cast
1959 Begin S2C5 1000m CTD
2105 End cast

2200 Net tow 3
2235 Net tow 4
2311 Begin S2C6 1000m CTD

16 May 2018

0018 End cast
0106 Start optics at 22° 45.2935'N, 158° 00.5350'W
0200 OTG tech hurt hand during optics operations. Bridge and Captain contacted.
0240 End optics at 22° 45.7959'N, 158° 00.5350'W
0308 Begin S2C7 CTD 1000m CTD
0424 End cast
0552 Begin sediment trap recovery at 22° 42.021'N, 158° 01.474'W
0631 End recovery
0800 Begin Wirewalker recovery at 22° 39.61'N, 158° 01.402'W
0830 Transit to Haleiwa for medical transfer
0942 Deployed deep Argos float at 22° 30.750'N, 158° 01.402'W
0945 Resumed transit to Haleiwa
1715 Arrived Haleiwa. Transfered OTG tech ashore in small boat along with one additional science party.
1805 Transt to St. ALOHA

17 May 2018

0315 Arrive St. ALOHA
0323 Begin S2C8 1000m CTD cast
0430 End cast
0539 Begin S2C9 1000m CTD
0650 End cast
0726 Begin S2C10
0841 End cast
0846 Transit to deep trap deployment site
1115 Begin deep trap deployment at 22° 49.714'N, 157° 56.091'W
1300 Released anchor at 22° 51.285', 157° 55.491'W
1330 Begin anchor triangulation
1538 End anchor triangulation, transit to WHOTS site
1632 Begin S52C1
1659 End cast
1802 Transit to Honolulu Harbor
Deep Argo float deployed at

18 May 2018

Arrive Pier 35
1115 Post-cruise meeting

HOT program sub-components:

Investigator	Project	Institution
Dave Karl	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
Matthew McCarthy Tom Guilderson	Sediment trap samples to look at amino acid-based paleo proxies to examine propagation of exported production into coral polyps and skeletons.	UCSC
Matt Church	Diversity and activities of nitrogen-fixing microorganisms	UM/FLBS
Sam Wilson	Reduced gases in the upper ocean: The cycling of methane, sulfide 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: Protistan biodiversity, tropic activities, culturing	USC
Ed DeLong	SCOPE: DNA and Viral DNA collection, Single cell genomic flow cytometry sample collection	UH
Dan Repeta	SCOPE: DOM collection	WHOI
Angelique White	SCOPE: C-STAR, IFCB and LISST to record nano-plankton special diversity	OSU
Grieg Steward	Three dimensional model system of mixotrophic Phytoplankton, its prey and a giant virus infecting them	UH
Dave Karl	Mixing Experiment	UH
Karin Bjorkman & Sara Ferrón-Smith	Comparison of 14C-assimilation and gross O2 production, and effects on respiration at different light intensities.	UH
Brian Glazer	MESH Lab custom sensor loggers (pressure, temperature, light)	UH

Gregory Johnson	Deep Argo Floats	NOAA/PMEL