HOT 301: Chief Scientist Report

Chief Scientist: Dan Sadler
R/V *Ka'Imikai-O-Kanaloa*
April 16-20, 2018

Cruise ID: **KOK18-01**
Departed: April 16, 2018 at 0802 (HST)
Returned: April 20, 2018 at 1400 (HST)
Vessel: **R/V *Ka'Imikai-O-Kanaloa***
Master of the Vessel: Mike Hoshlyk
OTG Marine Technicians: Trevor Young and Jeff Koch

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 April 16th 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 April 17th – 19th.
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 April 19th.
4) Deep trap recovery (anchor position at 22° 51.971'N, 157° 53.167'W). Recovery of the sediment trap is expected to take approximately 3 hours, with return to the surface expected to take an hour on April 19th.

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

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.

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 April 19th.

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 April 18th.

A plankton net was to be towed three times between 1000-1400, and three times between 2200-0200 for 30 minute intervals on April 17th and 19th at Station ALOHA.

The Hyperpro was to be deployed for a half-hour period near ~1400 on April 16th, 17th, and 19th.

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 April 19th.

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 April 19th.

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 location of the deep sediment trap anchor at 22°51.971' N, 157°53.167' W. Recovery of the sediment trap was expected to take approximately 3 hours, with return to the surface expected to take an hour.

After deep sediment trap recovery operations were complete, the ship was to transit back to Honolulu Harbor, Pier 35.

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**
Karin Björkman	Scientist	UH	Sweden
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
Eric Shimabukuro	Research Associate	UH/SCOPE	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
Jefrey Snyder	Marine Technician	UH	USA
Sasha Wagner	Scientist	NortheasternU	USA
Sara Ferrón-Smith	Scientist	UH	Spain
Macarena Burgos	Scientist	UCádiz	Spain
Wai Ching (Rachel) Chu	Undergraduate Student	UH	Hong Kong
Maximiliano Lee	Undergraduate Student	UH	USA
Kayla Palmer	Undergraduate Student	UH	USA
Trevor Young	Marine Technician	OTG	USA
Jeff Koch	Marine Technician	OTG	USA

3. GENERAL SUMMARY

The cruise schedule was modified due to loss of the ship's port generator in transit to St. ALOHA. This limited ship speed to approximately 4 knots through the water, delaying arrival by 7 hours. CTD operations at ALOHA were prioritized over deployment of floating arrays. The strong westward current and reduced ship speed may have taken the floating arrays out of range for recovery.

The bottom moored sediment traps were successfully recovered. However, the beacon buoy became entangled under the bow during the initial approach. It was removed by divers at Pier 35.

Due to reduced ship speed, HOT-301's schedule was amended as follows:

- Deployment of the WireWalker, Tuesday, April 17th 0000, was cancelled.
- Deployment of the sediment trap array, Tuesday, April 17th 0100, was cancelled.
- Deployment of the primary production array was moved to Wednesday, April 18th 0430
- Deployment of the Gas Array, Wednesday, April 18th, was cancelled.
- S2C1, primary production, was moved to Wednesday April 18th
- Two 1000 m CTD were removed from the 36 hour burst sampling period.

One 1000 m CTD cast was completed at Station Kahe. One 200 m CTD, two near bottom CTD casts and ten 1000 m CTD casts were conducted at Station ALOHA. One 300 m CTD cast was completed near the WHOTS mooring (Station 52).

Five net tows for the core HOT zooplankton collection were completed successfully; three 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.

Winds during the cruise were mostly from the NE with speeds of 18-24 kts. The seas were 6-10 ft.

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

1. WireWalker - cancelled
2. Floating sediment trap array - cancelled
3. Gas Array - cancelled
4. Primary Production array was delayed a day
5. One day-time net tow - cancelled
6. WHOTS yoyo cast was shortened to 1 cycle
7. PUR CTD cast cancelled

4. R/V *Kilo Moana* 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. We commend Chief Engineer Carlin and his team for their continuous effort to fix the port generator. Their

timely updates were very helpful in re-scheduling operations so that we got maximum science completed given the circumstance.

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

We also appreciate that the Marine Center gave additional time to complete the cruise due to propulsion delays.

5. DAILY REPORT OF ACTIVITIES (HST)

16 April 2018

0802 Depart Pier 35
0830 Emergency and Abandon ship drill
0845 Safety and Science Briefing
1110 Arrive St. Kahe
1116 Weight cast to 500 m
1205 Hyperpro cast
1307 Start S1C1 CTD cast to 1000m
1422 End S1C1
1425 Underway to ALOHA.
2035 Lost ship power during transit. Ship stopped.
2055 Power restored. Transit resumed at 3.6 knots
2220 Lost power again. Restored immediately after. Intermittent outages.

17 April 2018

0935 Arrive St. ALOHA
0950 Start S2C1 CTD cast to near bottom
1351 End cast
1533 Start S2C2 CTD cast to 1000m
1656 End cast
1754 S2C3 CTD cast to 1000m
2002 S2C4 CTD cast to 1000m
2206 Net tow at 22° 47.252’ N, 157° 58.916’ W
2239 Net tow
2314 S2C5 CTD cast to 1000m

18 April 2018

0152 S2C6 CTD cast to 1000m
0455 Deploy PP array 22° 46.186’ N, 158° 00.0639’ W
0556 S2C7 CTD cast to 1000m
0802 S2C8 CTD cast to 1000m
1003 Net tow 22° 46.317’ N, 157° 59.530’ W
1100 Net tow 22° 46.612’ N, 157° 59.122’ W
1111 S2C9 CTD cast to 1000m
1215 Net tow 22° 47.651’ N, 157° 58.852’ W
1325 Hyperpro cast
1402 S2C10 CTD cast to 1000m

1613 S2C11 CTD cast to 1000m
1730 Transit to PP array
1840 Recover PP array 22° 44.70’ N, 158° 12.90’ W
1908 Transit to ALOHA center for deep cast
2105 S2C12 combined HPLC with deep cast

19 April 2018

0305 Transit to deep sediment trap location
0415 Deploy optics cage - 3 cycles
0530 Continue transit to deep traps
0645 Arrive deep traps
0800 Glass balls on surface. Begin recovery.
0830 Trap line caught under bow
1050 Sediment traps on board
1124 All gear on board - transit to WHOTS
1438 Arrive WHOTS, S52C1 CTD cast to 300m
1540 Transit Pier 35

20 April 2018
1400 Arrive Pier 35

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
Sasha Wagner	Constraining the source of oceanic dissolved black Carbon using compound-specific stable carbon isotopes	Northeastern University
Brian Glazer	MESH Lab custom sensor loggers (pressure, temperature, light)	UH