

# **HOT-286: Chief Scientist Report**

Chief Scientist: R. Walter Deppe

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

August 8-12, 2016

Cruise ID: **KOK 16-11**

Departed: August 8, 2016 at 0807 (HST)

Returned: August 12, 2016 at 0645 (HST)

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

Master of the Vessel: Captain Mike Hoshlyk

OTG Marine Technicians: Trevor Young and Jeff Koch

## **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 August 8th 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 August 9th, 10th, and 11th.
- 3) Station 50, the site of WHOTS-13 Mooring (anchor position 22° 47.24' N, 157° 54.45' W) was to be occupied on August 11th 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 August 11th for approximately 3 hours.

Upon arrival to Station Kahe a ~450 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 August 8th. 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 a 1000 m cast to collect water for the Primary Productivity Array. This cast was to be followed by the deployment of the free-drifting Net Trap to collect sinking particles for 24hrs and 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 August 10th.

Another free-drifting array (Gas Array) was to be deployed for 24 hours for incubation experiments on August 10th. The Gas Array was to be recovered on August 11th.

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

A plankton net was to be towed three times between 1000-1400, and three times between 2200-0200 for 30 minute intervals on August 9th and 10th at Station ALOHA.

The Hyperpro was to be deployed for a half-hour period near ~1400 on August 8th, 9th, and 11th.

An optics package including a Wet Labs AC9, a SeaBird Seacat, Wet Labs Fluorometer, 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 August 11th.

Surface net tows were to be hand-deployed off the stern for about 10 minute periods eight times during the cruise, three on August 9<sup>th</sup>, three on August 10<sup>th</sup>, and two on August 11<sup>th</sup>.

A manta trawl for collecting plastic was to be towed behind the ship at scheduled times during the cruise. Three tows were to be conducted for a half-hour period between CTD casts at Station ALOHA on August 9<sup>th</sup> and 10<sup>th</sup>.

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 August 11th.

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 Pier 35.

The following instruments were to collect data throughout the cruise: shipboard ADCP, thermosalinograph, the underway fluorometer, and the ship's anemometers. An ultra-filtration system was to be connected to an outlet of the underway seawater system to sample continuously throughout the cruise

## 2. SCIENCE PERSONNEL

<b>Participant</b>	<b>Title</b>	<b>Affiliation</b>	<b>Citizenship</b>
Susan Curless	Research Associate	UH	USA
Alexa Nelson	Research Associate	UH	USA
Karin Björkman	Research Specialist	UH	Sweden
Dan Sadler	Research Associate	UH	USA
Brenner Wai	Research Associate	UH	USA
Blake Watkins	Marine Engineer	UH	USA
Jim Burkitt	Research Associate	UH/SCOPE	USA
Tara Clemente	Research Associate	UH/SCOPE	USA
Eric Shimabukuro	Research Associate	UH/SCOPE	USA
R. Walter Deppe	Research Associate	UH	USA
Fernando Santiago-Mandujano	Research Associate	UH	USA
Kellen Rosburg	Research Associate	UH	USA
Jefrey Snyder	Marine Technician	UH	USA
Alyssa Gellene	Research Specialist	USC/SCOPE	USA
Sarah-Jeanne Royer	Post-doc	UH	Canada
Eint Kyi	Graduate Student	UH	Myanmar
Morgan Linney	Graduate Student	UH	USA
Donn Viviani	Graduate Student	UH	USA
Alyssa Agustin	Graduate Student Volunteer	UH	USA

Trevor Young  
Jeff Koch

Marine Technician  
Marine Technician

OTG  
OTG

USA  
USA

### 3. GENERAL SUMMARY

Operations during the cruise were carried out mostly as planned following some changes to the schedule resulting from a long delay at Station Kahe due to problems with the CTD squirt boom.

At the end of the CTD cast at Station Kahe, when the CTD rosette was removed from the water, the CTD squirt boom would not retract. The rosette was sent back down to 5m below the surface while the engineers troubleshooted the issue. It was determined that the squirt boom hydraulic unit had overheated due to being accidentally left turned on for the entire cast. The engineers replaced this hydraulic unit with a new one, the squirt boom began functioning properly and the rosette was recovered, allowing transit to Station ALOHA to commence. Since the rosette was held at 5m for about 2.5 hours before recovery, a number of the samples from S1C1 might be compromised. There were no further problems with the squirt boom for the remainder of the cruise.

These delays (and slow transit speeds inherent to the R/V *Ka'imikai-O-Kanaloa*) resulted in an arrival at Station ALOHA about 4 hours later than planned and it was determined there was not enough time to deploy all three arrays without eating into the 36-hour CTD burst period. Since the time associated with conducting a CTD cast and preparing water to deploy on the PP array would not be able to be accomplished before sunrise, the PP array and its associated cast were moved to August 10th and **therefore, the Gas Array and its associated cast was replaced by the Primary Productivity cast.** In addition to these changes, the Hyperpro cast scheduled for August 9th was moved to August 10th to coincide with the Primary Productivity array and the mid-day net tow scheduled for August 10th was moved to August 9th in its place. Also, the Manta Trawl scheduled for August 10th was moved to August 11th, mid-day.

One 1000 m CTD cast was completed at Station Kahe. Two near bottom CTD casts and twelve 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, Net Trap, and Primary Production Arrays were 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.

The ATE was deployed but it did not function correctly.

The Hyperpro casts (three cycles each) were successfully conducted three times around the re-scheduled 1230-1430 time slots on August 8th, 10th, and 11th.

Three manta trawl tows were completed successfully at Station ALOHA.

Nine surface net tows were successfully completed during the cruise, three per day on August 9<sup>th</sup>, 10<sup>th</sup>, and 11<sup>th</sup>.

The optical package (AC9/Sea Bird Seacat/ Fluorometer /LISST), was deployed two times during the cruise, once around noon and once in the early morning on August 11th. Both casts were conducted successfully.

The fluorometer and the ship's meteorological suite ran without interruption during the cruise. The ADCP briefly stopped logging at one point during the cruise but the problem was fixed. Also, the Knudsen system used to obtain the bottom depth would not function during the cast at Station Kaena and during some of the casts at Station ALOHA. The -80°C freezer in the Rock Lab was not holding temperature throughout the cruise.

The thermosalinograph functioned well throughout the cruise until it stopped logging ~0030 on August 12<sup>th</sup>, soon after departing Station Kaena. There was no thermosalinograph data recorded for the majority of the final transit from Station Kaena to Honolulu Harbor.

Winds and seas during the cruise were mostly from the East. Wind speeds were ~15-20kts and seas stated out at 2-4 ft but increased to about 5 ft during the cruise. An East swell of ~5-6 ft was present at Station ALOHA starting on August 10th. Surface currents were relatively weak and variable and the arrays drifted relatively slowly in the SSW direction.

We arrived at Pier 35 for off-loading on August 12th, at 0645 (HST).

*The following operations were cancelled after delays at Station Kahe due to problems with the squirt boom (described above) led to a ~4 hour delay in arrival at Station ALOHA:*

1. The Gas Array deployment was cancelled.
2. The CTD cast associated with the Gas Array was cancelled.

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

The R/V Ka'Imikai-O-Kanaloa provided 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 thanks goes out to the Chief Engineer and his team in replacing the squirt boom hydraulic unit with speed and care.

Technical support during this cruise was also good. The OTG personnel were available at any time to assist in our work during the cruise. Thank you to Trevor Young for fixing the communication equipment for the ATE.

Before the next cruise on the R/V Ka'Imikai-O-Kanaloa, the -80°C freezer in the Rock Lab should be defrosted and maintained by OTG. Additionally, the Knudsen system should be assessed by OTG for the problems encountered at Station Kaena.

#### **5. DAILY REPORT OF ACTIVITIES (HST)**

##### **August 8, 2016**

0725- Safety meeting with Captain  
0807- Depart Pier 35  
0830- Fire and safety drill  
0845- Science briefing in galley  
1135- Arrive Station Kahe  
1140- Weight cast to 500 m  
1222- Recover weight  
HOT-286 Chief Scientist Report

1248- Hyperpro  
1330- End Hyperpro  
1339- S1C1 1000 m cast  
1449- End of cast, squirt boom stuck out, package sent back to 5 m below surface  
1715- Package recovered after hydraulic unit for squirt boom replaced with new one  
1720- Transit ALOHA

### **August 9, 2016**

0315- Arrive Station ALOHA circle  
0402- Start Sediment Trap Deployment  
0456- Sediment Trap Deployed @ 22° 44.347'N, 158° 1.022'W  
0530- Start Net Trap Deployment  
0545- Net Trap Deployed @ 22° 46.270'N, 157° 59.912'W  
0608- S2C1 Near bottom CTD  
0750- @ 5m off the bottom @ 22° 45.103'N, 157° 48.576'W  
0940- End of cast  
1030- DC Net tow  
1040- End of DC net tow  
1118- S2C2 1000 m CTD  
1232- End of cast  
1245- Net Tow  
1318- End of tow  
1320- Net Tow  
1350- End of tow  
1357- S2C3 1000 m CTD  
1503- End of cast  
1602- DC Net tow  
1614- End of DC net tow  
1655- S2C4 1000 m CTD  
1808- End of cast  
1810- DC Net tow  
1824- End of DC net tow  
1910- Manta Trawl  
1934- Manta Trawl net recovered  
1957- S2C5 1000 m CTD  
2104- End of cast  
2201- Net Tow  
2229- End of tow  
2232- Net Tow  
2300- End of Tow  
2308- S2C6 1000 m CTD

### **August 10, 2016**

0007- End of cast  
0020- Transit to pump tanks  
0212- S2C7 1000 m CTD  
0314- End of cast  
0405- Primary Production Array Deployment begins  
0429- PP Array released @ 22° 46.673'N, 157° 59.074'W  
0458- S2C8 1000 m CTD  
0606- End of cast  
0713- Net Trap signaled to close @ 22° 44.091'N, 158° 2.124'W  
0752- Net Trap recovery @ 22° 44.042'N, 158° 2.063'W  
0823- S2C9 1000 m CTD  
0921- End of cast  
0932- DC Net tow

0944- End of DC net tow  
1002- Net Tow  
1034- End of tow  
1040- ATE sampling  
1110- End ATE sampling  
1112- S2C10 1000m CTD  
1203- End of cast  
1210- DC Net tow  
1230- End of DC net tow  
1302- Hyperpro  
1400- S2C11 1000m CTD  
1505- End of cast  
1520- Manta Trawl  
1550- Manta Trawl net recovered  
1555- DC Net tow  
1608- End of DC net tow  
1656- S2C12 1000m CTD  
1759- End of cast  
1905- Primary Productivity Array recovery @ 22° 46.58'N, 157° 59.69'W  
2000- S2C13 1000 m CTD  
2059- End of cast  
2205- Net Tow  
2235- End Net Tow  
2253- S2C14 CTD to near-bottom

### **August 11, 2016**

0037- CTD 11 m off bottom @ 22° 44.172'N, 157° 58.872'W  
0221- End of cast  
0315- Deploy optics package  
0503- Optics recovered  
0510- Transit to Sediment Traps  
0640- Sediment Traps recovery @ 22° 40.237'N, 158° 3.748'W  
0716- DC Net tow  
0728- End of DC net tow, transit toward WHOTS mooring  
0842- Manta Trawl  
0914- Manta Trawl net recovered  
0919- DC Net tow  
0932- End of DC net tow  
1018- Deploy optics package  
1158- Optics recovered  
1159- Transit to WHOTS mooring  
1218- Start S50C1 CTD yo-yo cast (5 cycles to 200 m)  
1317- End of cast  
1323- Hyperpro  
1405- DC Net tow  
1416- End of DC net tow  
1418- Transit to Station Kaena  
2133- S6C1 CTD to near-bottom  
2227- CTD 12 m off bottom @ 21° 50.845'N, 158° 21.679'W  
2323- End of cast  
2330- Transit to Pier 35

### **August 12, 2016**

0030- Thermosalinograph stopped logging  
0645- Arrive at Pier 35

**HOT program sub-components:**

<b>Investigator</b>	<b>Project</b>	<b>Institution</b>
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
<b>Ancillary programs:</b>		
Andrew Dickson	CO <sub>2</sub> dynamics and inter-calibration	SIO
Paul Quay	DI <sup>13</sup> C	SIO
Matt Church	SCOPE: Diversity and activities of nitrogen-fixing microorganisms	UH
Sara Ferron-Smith	Determination of net community production from the diurnal variability of oxygen and argon ratios	UH
Sam Wilson	SCOPE: Reduced gases in the upper ocean: The cycling of methane, sulfide and nitrous oxide Samples to verify a long-term trend CH <sub>4</sub>	UH
Virginia Armbrust	SCOPE: Seaflow Underway Flow Cytometer	UW
Dave Caron	SCOPE: DNA collection	USC
Ed DeLong	SCOPE: DNA and Viral DNA collection	UH
Dan Repeta	SCOPE: DOM collection	WHOI
Angelique White	SCOPE: Diazotroph Microscopy	OSU
Eint Kyi	SCOPE: Net Trap Experiments: to study the remineralization of sinking particles by various bacteria.	UH
Oscar Sosa	High molecular weight dissolved organic matter sampling	UH
Sarah-Jeanne Royer	SCOPE: Production of methane and ethylene in sediment traps SCOPE: Plastic debris collection at Station ALOHA	UH

Morgan Linney	SCOPE: Dissolved DNA quantification and characterization	UH
Alyssa Gellene	SCOPE: Protistan biodiversity, trophic activities and biogeochemistry at station ALOHA	USC
Donn Viviani	Conduct small volume experiments examining growth of microbial communities	UH

Ancillary experiments not conducted due to delays and schedule changes:

Sam Wilson	Production of DON via Nitrogen Fixation	UH
------------	---	----