

HOT-277: Chief Scientist Report

Chief Scientist: R. Walter Deppe

R/V Ka'Imikai-O-Kanaloa

12-16 October, 2015

Cruise ID: **KOK 15-15**

Departed: 12 October at 0753 (HST)

Returned: 16 October at 0740

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 October 12th 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 was to be occupied during October 13th to 15th.
- 3) Station 52, the site of WHOTS-12 Mooring (anchor position 22° 40.061' N, 157° 56.9654' W) was to be occupied on October 15th 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 October 15th for approximately 2 hours.

Upon arrival to Station Kahe a 400 lb. weight-test cast to 1000 m, one CTD cast to 1000 m, and a Hyperpro cast were to be conducted on the afternoon of October 12th. The single CTD cast was to be conducted to collect a continuous profile 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. As the ship departed Station Kahe, two SLDMB floats were to be deployed to map an eddy feature located off the west side of Oahu.

Surface water samples were to be collected from the underway seawater system during transits between Honolulu and Station ALOHA and to be processed. A filtration system for plastic debris collection was also to be connected to an outlet of the underway seawater system to sample in continuous throughout the cruise.

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 53 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, 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 October 14th.

Another free-drifting array (Gas Array) was to be deployed for 24 hours for incubation experiments on October 14th. The Gas Array was to be recovered on October 15th.

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A plankton net was to be towed between 1000-1400, and 2200-0200 for 30 minute intervals on October 13th and 14th at Station ALOHA.

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 at Station ALOHA and three tows were to be conducted along a transect from Station ALOHA to Station Kaena on the return transit.

The Hyperpro (a profiling unit with one up-looking and one down-looking hyperspectral radiometer, a WET Labs ECO-BB2F triplet, temperature and conductivity sensors), was to be deployed on October 12th, 13th, and 15th.

A trace metal free sample was to be collected by the ATE sampler on October 14th at Station ALOHA.

After the 36 hour burst period of CTD work at Station ALOHA was accomplished, the ship was to transit to recover the floating Gas Array and the Sediment Trap Array on the morning of October 15th.

After recovering the arrays, the ship was to transit to Station ALOHA to Station 52 to conduct a one-hour 200 m CTD yo-yo cast (final cycle to 500-m to collect water) and was to recover seaglider #512 and deploy an APEX float.

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. As the ship reached the latitude of Station Kahe, two more SLDMB floats were to be deployed.

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

2. SCIENCE PERSONNEL

Participant	Title	Affiliation
Susan Curless	Research Associate	UH
Lance Fujieki	Research Associate	UH
Dan Sadler	Research Associate	UH
Brenner Wai	Research Associate	UH
Alex Nelson	Research Associate	UH
Blake Watkins	Marine Engineer	UH
Brie Maillot	Technician	UH
Eric Shimabukuro	Research Associate	UH
Tara Clemente	Research Associate	UH
Greyson Adams	Research Associate	UH
Jim Burkitt	Research Associate	UH
Jefrey Snyder	Marine Technician	UH
Fernando Santiago-Mandujano	Research Associate	UH
Daniel McCoy	Research Associate	UH
R. Walter Deppe	Research Associate	UH
Sarah-Jeanne Royer	Post-Doc	UH
Markus Lindh	Post-Doc	UH
Chandler Bruttig	Undergraduate Student	UH

Caleb Hsu
Trevor Young
Steve Tottori

Undergraduate Student
Marine Technician
Marine Technician

UH
OTG
OTG

3. GENERAL SUMMARY

Operations during the cruise were conducted as planned. There were two issues with the provided equipment that should be addressed before our next cruise on this ship: 1) The bottom depth information from the Knudsen system seems to be skewed low compared to past observations, likely as a result of inaccurate sound speed velocity inputs in the system. 2) The CTD squirt boom was moving slowly during CTD deployment and recoveries, indicating a possible problem with the hydraulic system.

One 1000 m CTD cast was completed at Station Kahe. Two near bottom CTD casts and thirteen 1000 m CTD casts were conducted at Station ALOHA. The secondary conductivity sensor malfunctioned during the first deep cast (S2C2) and the following cast (S2C3). The sensor was replaced before S2C4 and the replacement functioned correctly for all remaining casts. One yo-yo CTD cast was completed near the WHOTS mooring (Station 52) with five cycles completed (four to 200 m, one to 500 m to collect water from that depth). One near bottom cast was completed at Station Kaena.

The Sediment Traps, Primary Production Array, and Gas Array were all deployed and recovered successfully. The Gas Array was modified due to potential contamination of the ^{15}N enriched seawater stemming from freezing of the $^{15}\text{N}_2$ seawater stocks. Only one bottle was attached at each depth.

Six net tows were completed successfully; three during the day, and three during the night.

The ATE was successfully deployed on October 14th.

On October 15th, at Station ALOHA, the APEX float was deployed without incident and seaglider #512 was successfully recovered.

The Hyperpro casts (three cycles each) were successfully conducted three times during the cruise. The first two were conducted around the scheduled time slot on October 12th and 13th. On October 15th, the final hyperpro cast was conducted earlier than scheduled because the port main engine was not functioning correctly, making transit speeds ~6 kts instead of ~9 kts, requiring an earlier start to the return transit from Station ALOHA to Station Kaena. The engine was fixed during transit, restoring the ship to full speed, and allowing operations at Station Kaena to be conducted on schedule.

Six manta trawl tows were completed successfully, three at Station ALOHA, and three on the transit from Station ALOHA to Station Kaena.

Four SLDMB drifters were deployed according to plan, two on October 12th after leaving Station Kahe, and two on October 16th during the return transit at the same latitude.

The underway thermosalinograph system, the underway fluorometer, and the ADCP functioned correctly during the cruise. The underway seawater samples were collected as planned and the underway seawater plastic filtration system functioned properly.

The ship's anemometer ran without interruption during the cruise.

Winds were from the northeast between about 10 and 15 kts, with moderate seas. A north swell was present throughout the cruise starting at 3-4 ft, then increasing to 7-8 ft, and relaxing to 5 ft on the last day.

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 Don Jack and the ship's crew showed flexibility, enthusiasm, concern, and dedication to our scientific mission. A special thanks goes out to the chief engineer, who was able to fix the engine problem in time for work at Station Kaena to be conducted as scheduled.

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

5. DAILY REPORT OF ACTIVITIES (HST)

October 12, 2015

0753- Depart Snug Harbor
0830- Fire and safety drill
0900- Safety meeting with Captain
1100- Arrive Station Kahe
1104- Weight cast to 500 m
1133- Recover weight
1150- Hyperpro
1242- S1C1 1000 m cast
1351- End of cast
1355- Transit ALOHA
1402- SLDMP drifter (SN 43174) deployed @ 21° 20.883'N, 158° 16.702'W
1407- SLDMP drifter (SN 43309) deployed @ 21° 21.177'N, 158° 16.822'W

October 13, 2015

0010- Arrive Station ALOHA
0013- Sediment Trap Deployment begins
0034- Sediment Trap Deployment @ 22° 44.977'N, 158° 3.509'W
0151- S2C1 1000 m cast
0255- End of cast
0400- Primary Production Array Deployment begins
0420- PP Array released @ 22° 45.05'N, 158° 1.10'W
0458- S2C2 Near bottom CTD
0641- @ 5m off the bottom @ 22° 45.004'N, 158° 0.0'W
0836- End of cast
1025- Manta Trawl
1052- Manta Trawl net recovered
1055- S2C3 1000 m CTD
1210- End of cast
1239- Net Tow
1311- End of tow
1330- Hyperpro
1415- End of Hyperpro
1430- S2C4 1000 m CTD
1533- End of cast
1535- Transit to pump tanks
1707- S2C5 1000 m CTD
1814- End of cast
1917- Primary Productivity Array recovered @ 22° 44.225'N, 158° 2.256'W
1947- S2C6 1000 m CTD

2055- End of cast
2105- Manta Trawl
2128- Manta Trawl net recovered
2157- Net Tow
2224- End of tow
2228- Net Tow
2250- End of tow
2259- S2C7 1000 m CTD

October 14, 2015

0004- End of cast
0153- S2C8 1000 m CTD
0252- End of cast
0408- Gas Array Deployment begins @ 22° 44.938'N, 158° 1.231'W
0425- Gas Array released
0459- S2C9 1000 m CTD
0601- End of cast
0750- S2C10 1000m CTD
0853- End of cast
1000- Net Tow
1030- End of tow
1045- ATE sampling
1105- End ATE sampling
1108- S2C11 1000m CTD
1201- End of cast
1210- Net Tow
1237- End of tow
1352- S2C12 1000 m CTD
1456- End of cast
1500- Transit to pump tanks
1640- Manta Trawl
1701- Manta Trawl net recovered
1707- S2C13 1000 m CTD
1809- End of cast
1959- S2C14 1000 m CTD
2103- End of cast
2201- Net Tow
2227- End Net Tow
2259- S2C15 CTD to near-bottom

October 15, 2015

0043- CTD 8 m off bottom @ 22° 45.004'N, 157° 59.994'W
0217- End of cast
0440- Gas Array recovered @ 22° 44.49'N, 158° 5.96'W
0500- Transit to Sediment Traps
0622- Sediment Traps recovered @ 22° 38.982'N, 158° 7.718'W
0640- Transit to WHOTS mooring
0902 - Start S52C1 CTD yo-yo cast (4 cycles to 200 m, final to 500 m)
1015- End of cast
1020- Transit to APEX float deployment site
1036- APEX float deployed @ 22° 38.759'N, 157° 59.277'W
1145- Recover seaglider @ 22° 38.45'N, 158° 3.63'W
1218- Hyperpro
1255- Begin transit to Station Kaena at ~6 kts (due to engine trouble)

1429- Manta Trawl
 1449- Manta Trawl net recovered
 1639- Manta Trawl
 1657- Manta Trawl net recovered
 1820- Engine problems fixed, continue to Station Kaena at ~9 kts (normal speed)
 1838- Manta Trawl
 1858- Manta Trawl net recovered
 2045- Arrive at Station Kaena
 2049- S6C1 CTD to near-bottom
 2156- CTD 9 m off bottom @ 21° 50.803'N, 158° 21.885'W
 2252- End cast
 2257- Transit to Snug

October 16, 2015

0238- SLDMP drifter (SN 43414) deployed @ 21° 21.00'N, 158° 13.5'W
 0243- SLDMP drifter (SN 43252) deployed @ 21° 20.8'N, 158° 13.3'W
 0740- Arrive at Snug

6. 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 inter-calibration	SIO
Paul Quay	DI ¹³ C	SIO
Matt Church	SCOPE: Diversity and activities of nitrogen-fixing microorganisms	UH
Sam Wilson	SCOPE: Reduced gases in the upper ocean: The cycling of methane, sulfide and nitrous oxide	UH
Erica Goetze	Temporal stability of copepod populations at Station ALOHA	UH
Sara Ferron-Smith	SCOPE: Determination of net community production from the diurnal variability of O ₂ /Argon ratios	UH
Ed DeLong	SCOPE: DNA collection	UH

Angel White	SCOPE: Diazotroph microscopy sampling	OSU
Virginia Armbrust	SCOPE: Seaflow Underway Flow Cytometer	UW
Sarah-Jeanne Royer & Jessica Byrant	SCOPE: Plastic debris from Honolulu harbor to ALOHA station and its release of carbon gases	UH
Sarah-Jeanne Royer & Sara Ferron-Smith	SCOPE: O ₂ /Ar measurements in dark bottle incubations	UH
Markus Lindh	SCOPE: Spatio-temporal investigation of surface bacterioplankton communities	UH
Victoria Futch	SLDMB float deployment	UH
Dana Swift	ARGO/PAL2 Apex profiling drifter deployment	UW
Dave Karl	SCOPE: Sea Glider Recovery	UH
Benedetto Barone	SCOPE: Evaluation of eukaryotic phytoplankton size	UH
Alex Nelson	HOT: Samples for reference and instrument calibration	UH
Roman Battisti	SCOPE: DOC leaching	UH
Lydia Baker	CMORE: Surface seawater for culturing	UH
Tim Burrell	SCOPE: Incubation experiments with phosphate addition	UH
Abby Bate	SCOPE: Filtered sea water for medium for Trichodesmium	UH