HOT-288: Chief Scientist Report

Chief Scientist: Fernando Santiago-Mandujano

R/V *Sikuliaq*

25-29 November, 2016

Cruise ID: **SKQ201615**S
Departed: 25 November at 0900 (HST)
Returned: 29 November at 0750
Vessel: **R/V *Sikuliaq***, University of Alaska Fairbanks
Master of the Vessel: Captain Diego Mello
Marine Technicians: Bern McKiernan and Steven Hartz

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 November 25th 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 November 26th to 28th.
3) Station 50, the site of WHOTS-13 Mooring (anchor position 22° 47.24' N, 157° 54.45' W) was to be occupied on November 28th 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 November 28th for approximately 2 hours.

Upon arrival to Station Kahe a 1300 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 November 25th. 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.

Upon arrival to the edge of Station ALOHA, a Seaglider was to be deployed. After this, the ship was to proceed to the center of Station ALOHA, where 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 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, and by the deployment of an optical profiler float. 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 November 27th.

Another free-drifting array (Gas Array) was to be deployed for 24 hours for incubation experiments on November 27th. The Gas Array was to be recovered on November 28th.

A plankton net was to be towed 3 times between 1000-1400, and 3 times between 2200-0200 for 30 minute intervals on November 26th and 27th at Station ALOHA.

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 November 25th, 26th, and 28th.

An optics package including a Wet Labs AC-S, a SeaBird Seacat, and a LISST particle size and distribution analyzer was to be used to profile the upper 200 m at Station ALOHA twice on November 28th, once in the early morning, and once starting at 1000.

A trace metal free sample was to be collected by the ATE sampler on November 27th 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 November 28th.

After recovering the arrays, the ship was to transit to Station ALOHA to conduct optics profiles, and to Station 50 to conduct a one-hour 200 m CTD yo-yo cast.

If weather conditions and time allowed, a small boat operation was to be conducted to repair a failing anemometer on the WHOTS buoy.

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, fluorometer, and the ship's meteorological instruments.

2. SCIENCE PERSONNEL

Participant	**Title**	**Affiliation**
Susan Curless	Research Associate	UH
Dan Sadler	Research Associate	UH
Brenner Wai	Research Associate	UH
Alexa Nelson	Research Associate	UH
Timothy Burrell	Research Associate	UH
Blake Watkins	Marine Engineer	UH
Thomas Lankiewicz	Scientist	University of Maryland
Anne Thompson	Scientist	Portland State University
Kathleen Kouba	Research Assistant	Portland State University
Tara Clemente	Research Associate	UH/SCOPE
Greyson Adams	Research Associate	UH/SCOPE
Eric Shimabukuro	Research Associate	UH /SCOPE
Ryan Tabata	Research Associate	UH/SCOPE
Jefrey Snyder	Marine Technician	UH
Fernando Santiago-Mandujano	Research Associate	UH
Kellen Rosburg	Research Associate	UH
Robert (Walt) Deppe	Research Associate	UH
Angelicque White	Scientist	OSU
Katie Watkins-Brandt	Scientist	OSU
Mark Haught	Scientist	UW

Sara Ferron-Smith	Scientist	UH
Gerianne Terlouw	Graduate Student	UH
Stephanie Matthews	Volunteer	UH
Garret Hebert	Undergrad Student	UH
Bern McKiernan	Marine Technician	Sikuliaq
Steven Hartz	Marine Technician	Sikuliaq

3. GENERAL SUMMARY

Weather conditions during the cruise were rough, with persistent 25-30 kt winds and 8-12 ft seas on November 26th and 27th at Station ALOHA, decreasing slightly on November 28th. Conditions did not allow for a safe deployment/recovery of the sediment traps, primary production array, gas array, optical profiler float and Seaglider; they also precluded small boat operations to repair the WHOTS buoy anemometer. On the other hand, CTD operations were conducted without any problems, the CTD recovery/deployment system on the ship allowed for safe deployment/recovery, and all water sampling was conducted as planned. There were minor problems with the CTD winch level winding during some up-casts, causing the winch to slow or stop when the wire was wrapping near the winch drum cheeks, also some bad wraps were fixed at the bottom of the second deep cast.

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 cast was completed at Station Kaena.

Four net tows were completed successfully; two during the day, and two during the night.

The Hyperpro was deployed on November 25th and 28th.

The optical package ACS/LISST was deployed one time in the early morning of November 28th. It was decided (A. White) that a second morning profile was not needed.

The ATE was deployed on November 28th but it did not function correctly and a sample was not collected.

The underway thermosalinograph systems, the underway fluorometer, and the ADCP worked correctly during the cruise.

The ship's meteorological instruments ran without interruption during the cruise.

4. R/V *Sikuliaq* OFFICERS AND CREW, TECHNICAL SUPPORT

The R/V *Sikuliaq* provided excellent support for our work. Captain Diego Mello and the ship's crew showed flexibility, enthusiasm, concern, and dedication to our scientific mission. We commend the bridge crew for their effective handling of the ship during back deck operations.

Technical support during this cruise was excellent. Bern McKiernan and Steven Hartz were available at all times to assist in our work during the setting up of our instrumentation and lab equipment, and during the cruise. Communications with Steven Hartz, Ethan Roth and the U Alaska Marine Center contributed for an effective cruise planning.

We thank Captain Mello, Murray Stein (U. Alaska Seward Marine Center), Doug Baird (Port Captain), and the UH Marine Center for their flexibility and efforts to allow us loading our equipment on November 23rd, instead of having to load on Thanksgiving Day.

5. DAILY REPORT OF ACTIVITIES (HST)

November 25, 2106

0900 - All aboard. Depart from Pier 35
1000 - Safety briefing, Science meeting
1100 - Fire and Abandon ship drills
1255 - Arrived at Kahe Station
1300 - Weight cast to 1000 m with 1300 lb weight.
1346 - End of weight cast
1413 – Start Hyperpro cast
1455 - End of hyperpro cast
1500 - Start S1C1 CTD cast to 1000 m.
1619 - End of cast
1624 - Transit to ALOHA Station. Rough ride due to persistent 30 kt winds

November 26, 2106

0023 - Arrived at the edge of the ALOHA circle, postponed Seaglider deployment
0120 - Arrived to ALOHA Station. Cancelling sediment traps, primary productivity cast and primary productivity array deployment, as well as optical profiler float deployment due to rough conditions.
0358 - Start S2C1 CTD deep cast
0547 - 8 m off the bottom, 22 44.958'N, 158 0.022'W
Several stops during up-cast to check for possible CTD wire damage and bad wraps on drum (no damage found)
0853 - End of cast
1103 - Start S2C2 CTD cast to 1000 m
1239 - End of cast
1353 - Start S2C3 CTD cast to 1000 m
1506 - End of cast
1515 - Transit to pump ship's tanks
1700 - Start S2C4 CTD cast to 1000 m
1805 - End of cast
1950 - Start S2C5 CTD cast to 1000 m
2109 - End of cast
2200 - Start net tow
2230 - End net tow
2234 - Start net tow
2302 - End net tow. Net metal frame slightly bent due to rough seas.
2306 - Start S2C6 CTD cast to 1000 m

November 27, 2016

0020 - End cast
0156 - Start S2C7 CTD cast to 1000 m
0303 - End of cast
0330 - Transit to pump ship's tanks
0458 - Start S2C8 CTD cast to 1000 m
0559 - End of cast
0754 - Start S2C9 CTD cast to 1000 m
0902 - End of cast

1055 - Start S2C10 CTD cast to 1000 m
1209 - End cast
1351 - Start S2C11 CTD cast to 1000 m.
1501 - End of cast
1652 - Start S2C12 CTD cast to 1000 m
1806 - End of cast
1815 - Transit to pump ship's tanks
1952 - Start S2C13 CTD cast to 1000 m
2103 - End of cast
2313 - Start S2C14 CTD cast to near-bottom

November 28, 2106

0054 - CTD at 11 m off the bottom 22 44.762'N, 158 0.503'W. Corrected bad wraps on the CTD drum.
0312 - End of cast
0351 - Start Optics cast
0434 - End of cast
0438 - Start Optics cast
0520 - End of cast
0753 - Start s50C1 CTD yo-yo cast to 200 m, near the WHOTS-14 mooring, 5 cycles completed
0916 - End of cast
1127 - Start net tow
1159 - End net tow
1202 - Start net tow
1222 - End net tow
1227 - Deploy ATE
1307 - End ATE. ATE didn't close properly, sample not taken
1329 - Start hyperpro cast
1405 - End of cast
1410 - Transit to Kaena Station
1942 – Start S6C1, CTD cast to near-bottom
2148 – End of cast
2220 – Transit to Pier 35

November 29, 2016

0750 - Arrive Pier 35, full offload.

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
Sara Ferron-Smith	SCOPE: Determination of net community production from the diurnal variability of O2/Argon ratios	UH
Sara Ferron-Smith	Testing membrane inlet mass spectrometer for underway measurements of O2/Ar	UH
Ed DeLong	SCOPE: DNA collection	UH
Dave Caron	SCOPE: DNA collection	USC
Dan Repeta	SCOPE: DNA collection	WHOI
Angelicque White Katie Watkins-Brandt	SCOPE: Diazotroph microscopy sampling	OSU
Angelicque White Katie Watkins-Brandt Mark Haught	Measurements of oxygen and carbon based productivity from surface flow-through measurements	OSU
Tim Burrell	Water column respiration experiments	UH
Anne Thompson	Prochlorococcus ecotypes	Portland State University
Mark Haught	Diurnal Primary Production	UW
Tom Lankiewicz	Growth efficiency in the mesopelagic at Station ALOHA	University of Maryland
Erica Goetze	Temporal stability of copepod populations at Station ALOHA	UH
Rhea Foreman	Direct determination of dissolved Organic Nitrogen	UH
Kyle Edwards	Effects of viruses on phytoplankton trait evolution	UH