

HOT-268: Chief Scientist Report

Chief Scientist: Susan Curless
R/V Kilo Moana
December 15-19, 2014

Cruise ID: **KM14-28**

Departed: December 15, 2014 at 0900 (HST)

Returned: December 19, 2014 at 0808 (HST)

Vessel: *R/V Kilo Moana*, University of Hawaii

Master of the Vessel: Captain Jay Chavez

Chief Scientist: Susan Curless, University of Hawaii

OTG Marine Technicians: Justin Smith and Trevor Young

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 December 15th 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 December 16th, 17th, and 18th.
- 3) Station 50, the site of WHOTS-11 Mooring (anchor position 22° 45.981'N 157° 53.964'W) was to be occupied on December 18th 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 December 18th for approximately 3 hours.

Upon arrival to Station Kahe, a ~1300 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 December 15th. 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 the deployment of the Repeta Diaphragm Pump for bulk water collection and then 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 insitu 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 December 17th.

Another free-drifting array (Gas Array) was to be deployed for 24 hours for incubation experiments on December 17th. The Gas Array was to be recovered on December 18th.

A plankton net was to be towed between 1000-1400, and 2200-0200 for 30 minute intervals on December 16th and 17th at Station ALOHA.

A trace metal free sample was to be collected by the ATE sampler on December 17th.

The Hyperpro was to be deployed around the 1400-1430 time slots on December 15th, 16th and 18th. This time slot allows for a better matchup with both the AQUA and S-NPP satellites.

An optics package including a Wet Labs AC9, a SeaBird Seacat, 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 December 18th.

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 December 18th.

After recovering both arrays, the ship was to transit back to Station ALOHA to conduct an optics cast. Once the optics profile 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 transit back into the ALOHA circle for a Hyperpro cast.

Once operations 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.

The following instruments were to collect data throughout the cruise: shipboard ADCP, thermosalinograph, underway fluorometer, $p\text{CO}_2$ system, and the meteorological package.

2. SCIENCE PERSONNEL

Participant	Title	Affiliation
Susan Curless	Research Associate	UH
Dan Sadler	Research Associate	UH
Lance Fujieki	Research Associate	UH
Alexa Nelson	Research Associate	UH
Brenner Wai	Research Associate	UH
Brie Maillot	Technician	UH
Eric Shimabukuro	Research Associate	UH/SCOPE
Tara Clemente	Research Associate	UH/SCOPE
Blake Watkins	Marine Engineer	UH
Jackie Meuller	Graduate Student	UH
Ken Doggett	Research Associate	UH/CMORE
Ger van den Eng	Scientist	MarCy
Prosper Zigah	Postdoctoral Researcher	WHOI
Randie Bundy	Graduate Student	UCSD
Jefrey Snyder	Marine Technician	UH
Joseph Gum	Research Associate	UH
Daniel McCoy	Research Associate	UH
Robert (Walt) Deppe	Research Associate	UH
Natalie Farinholt	Technician	UH
Tyler Kueffner	Volunteer	
Justin Smith	Marine Technician	OTG
Trevor Young	Marine Technician	OTG

3. GENERAL SUMMARY

Operations during the cruise ran mostly as planned but were impacted by two events that made working off a modified schedule necessary. After recovering the CTD package from the deep cast, communication with the CTD was lost. The time spent trouble shooting and fixing this problem put operations behind schedule. While trying to recover from the timing set-back, slack was introduced into the trawl winch when it was accidentally operated without proof of tension. This incident took about 45 minutes to fix, and it was clear that we were no longer going to be able to make up for time lost. One 1000 m CTD cast in the 36 hour period was cancelled and water needs were redistributed to other casts.

The .681 wire, trawl winch and A-frame were used for CTD operations. 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 three cycles completed. One near bottom cast was completed at Station Kaena.

A damaged section of .681 wire was found during the first deep CTD cast at Station ALOHA and it was documented with photos. During the second deep cast, the damaged section of wire was inspected again and photographed while between the storage drum and traction unit. Based on the wire condition, it was decided to not allow the damaged section of wire to enter the winch traction unit, which made the second deep cast 'bottom' only 4655 m wire out.

The Sediment Traps, Primary Production Array, and Gas Array were all deployed and recovered successfully. All arrays drifted to the west of their deployment sites.

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

The ATE operated successfully and one trace metal free sample was collected.

The Hyperpro casts (three cycles each) were successfully conducted three times around the scheduled 1400-1430 time slots on December 15th, 16th, and 18th.

The optical package (ACS/Sea Bird Seacat/LISST) was deployed two times during the cruise, once around noon and once in the early morning on December 18th.

The fluorometer, ADCP, thermosalinograph, $p\text{CO}_2$ system, and the ship's meteorological suite ran without interruption during the cruise.

The winds were from the east at 20-25kts, with moderate seas. An easterly swell of 7-10 ft was present throughout the cruise, diminishing slightly during the last day on station.

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

The R/V *Kilo Moana* provided good ship support for our work. Captain Jay Chavez and the ship's crew showed enthusiasm, concern, and dedication to our scientific mission.

Technical support during this cruise was also good. The OTG personnel were available at any time to assist in our work during the cruise.

5. DAILY REPORT OF ACTIVITIES (HST)

December 15th, 2014

0900- Depart Snug Harbor
1000- Safety meeting with the Captain
1020- Fire and Abandon Ship Drills
1155- Weight cast to 500 m
1227- End of cast
1240- Hyperpro
1319- Recovered Hyperpro
1329- S1C1 1000 m CTD
1505- End of cast
1525- Transit Station ALOHA
2332- Arrive Station ALOHA, 3 miles west of the center
2342- Deployment of the Sediment Traps 22°44.992'N 158°3.012'W

December 16th, 2014

0035- Repeta Pump
0135- Pump Recovered
0147- S2C1 1000 m CTD cast
0157- Large swings of package during deployment due to winch operator error
0311- End of cast
0415- Deployment of the PP array 22°45.07'N 158°01.13'W
0420- ISUS removed from CTD
0454- S2C2 near bottom CTD
0653- 9m off the bottom, approach made with pinger, altimeter not working
0700- Bad section of wire noticed on outer wire wrap at 4800 m (pictures taken)
0711- Cast continued
0914- End of cast, deck box error and communication with CTD lost while package out of water during recovery
0920- Transit to pump Ship's tanks
1030- Repeta Pump
1100- Recovered pump
1206- Net tow
1235- End of tow, net recovered
1305- S2C2 1000 m CTD
1434 - End of cast
1445- Hyperpro
1523- S2C4 1000 m CTD -Delay in cast deployment due to winch operator taking in slack prior to confirming proof of tension
1612- Cast deployed
1715- End of cast
1725- Transit to PP Array
1826- PP Array Recovery 22°46.835'N 158°4.952'W
1838- End of cast
1845- Transit to Pump Tanks
1949- S2C5 1000 m CTD
2005- End of cast
2115- Repeta Pump
2205- Pump recovered
2210- Net Tow
2237- End of tow
2239- Net tow
2207- End of tow
2308- S2C6 1000 m CTD

December 17th, 2014

0032- End of cast
0041- Transit to pump Ship's tanks
0200- S2C7 1000 m CTD
0318- End of cast
0405- Gas Array Deployment 22°45.003'N 158°1.107'W
0455- S2C8 1000 m CTD
0616- End of cast
0630- Repeta Pump
0701- Pump Recovered
0755- S2C9 1000 m CTD
0913- End of cast
0918- Transit to Pump Ship's tanks
1010- Net tow
1033- End of tow
1045- ATE
1113- ATE recovered
1117- S2C10 1000 m CTD
1227- End of cast
1244- Net Tow
1315- End of tow
1400- S2C11 1000 m CTD
1515- End of cast
1524- Repeta Pump
1630- Pump recovered
1653- S2C12 1000 m CTD
1808- End of cast
1814- Transit to pump ship's tanks
1943- S2C13 1000 m CTD
2103- End of cast
2112- Repeta Pump
2138- Pump recovered
2157- Net tow
2132- End net tow
2249- S2C14 near bottom CTD
-stopped at 4740 m to inspect and take photos of damaged wire section suspended between drums. Decision made to not descend any further, bottom bottle fired.

December 18, 2014

0235- End of cast
0300- Optics cast
0350- Recovered
0355- Optics cast
0445- Recovered
0453- Transit to Gas Array
0625- Gas Array Recovery 22°46.754'N 158°9.954'W
0642- Recovery complete
0645- Transit Sediment Traps
0748- Recovery of Sediment Traps 22°49.039'N 158°17.010'W
0805- Recovery complete
0807- Transit towards WHOTS
0959- Optics cast
1050- Recovered
1055- Optics cast
1145- Recovered
1224- S50C1 200 m yo-yo cast

1347- End of cast, 3 cycles complete
1400- Hyperpro
1437- End of hyperpro
1530- Transit Kaena
2047- S6C1 near bottom CTD
2255- End of cast
2300- Transit Snug Harbor

December 19, 2014

0808- Arrive Snug Harbor, full offload.

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 intercalibration	SIO
Paul Quay	DI ¹³ C	UW
Matt Church & Ricardo Letelier	Diversity and activities of nitrogen-fixing microorganisms	UH
Sam Wilson	Reduced gases in the upper ocean: The cycling of methane, sulfide and nitrous oxide	UH
Christopher Schvarcz	Viral Dynamics at Station ALOHA	UH
Erica Goetze	Temporal stability of copepod populations at Station ALOHA	UH
Sara Ferrón-Smith	Determination of net community production from the diurnal variability of O ₂ /Argon ratios	UH
Ger van den Engh & Ken Doggett	Prochlorococcus Ecotype Fluorescence and Scatter	UH/MarCy
Daniela del Valle	Method development testing the use of ¹⁸ O-H ₂ O to measure GPP	UH
Rebecca Briggs	LNSW and nutrient profile collection for method development	UH
SCOPE	Sample collection for DNA analysis	UH