HOT-259: Chief Scientist Report

Chief Scientist: Susan Curless
R/V *Kilo Moana*
January 14-18, 2014

Cruise ID: **KM14-02**
Departed: January 14, 2014 at 0859 (HST)
Returned: January 18, 2014 at 0930 (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: 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 January 14th 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 January 15th, 16th, and 17th.
3) Station 52, the site of WHOTS-10 Mooring (anchor position 22° 40.12'N 157° 57.01'W) was to be occupied on January 17th 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 January 17th for approximately 3 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 January 14th. 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 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 January 16th.

Another free-drifting array (Gas Array) was to be deployed for 24 hours for incubation experiments on January 16th. The Gas Array was to be recovered on January 17th.

A plankton net was to be towed between 1000-1400, and 2200-0200 for 30 minute intervals on January 15th and 16th at Station ALOHA.

The Hyperpro was to be deployed around the 1400-1430 time slot on January 14th, 15th and 17th. This time slot allows for a better matchup with both the AQUA and S-NPP satellites.

A package including a Wet Labs AC9, a Chelsea Fast Repetition Rate Fluorometer (FRRf), 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 January 17th.

A trace metal free sample was to be collected by the ATE sampler on January 16th.

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 January 17th.

After recovering both arrays, the ship was to transit back to Station ALOHA to conduct an ACS/AC9/FRRf/LISST cast. Once the AC9/FRRf profile was complete, the ship was to transit to Station 52 to conduct a one-hour 200 m CTD yo-yo cast. Once operations at Station 52 were complete, the ship was to transit back into the ALOHA circle for a Hyperpro cast and the deployment of an APEX float.

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, pCO_2 system, and the meteorological package.

2. SCIENCE PERSONNEL

Participant	**Title**	**Affiliation**
Susan Curless	Research Associate	UH
Dan Sadler	Research Associate	UH
Stuart Goldberg	Postdoctoral Researcher	UH
Brett Updyke	Research Associate	UH
Adriana Harlan	Research Associate	UH
Lance Fujieki	Research Associate	UH
Brenner Wai	Technician	UH
Blake Watkins	Marine Engineer	UH
Christopher Schvarcz	Graduate Student	UH
Jefrey Snyder	Marine Technician	UH
Fernando Santiago-Mandujano	Research Associate	UH
Cammy Fumar	Research Associate	UH
Daniel McCoy	Research Associate	UH
Jacob Taylor	Undergraduate Student	UH
Alexander Nelson	Undergraduate Student	WCC
Claire Mueller	Undergraduate Intern	Erskine College
Trevor Young	Marine Technician	OTG
Jeff Koch	Marine Technician	OTG

3. GENERAL SUMMARY

Operations during the cruise ran mostly as planned but were complicated by the use of the new wire run configuration of the 0.322 Caley winch wire to deploy the CTD through the A-frame.
At Station Kahe, time during the 1000 m weight cast was used to fine tune the repairs to the level wind of the Caley winch and observe the heave compensation operation of the winch with the new 0.322 wire

run. The order of planned science operations after the weight cast at Kahe were reversed so the Hyperpro water time sync with satellite pass over was not missed.

Operations at Station ALOHA were conducted as planned with minor delays experienced due to belly pack control issues, sea state, and time spent spooling out and stowing the 0.322 wire between CTD operations and other deck operations.
-The planned 1000 m CTD cast to collect water for the Primary Productivity Array was shortened to 200 m to compensate for time spent trouble shooting belly pack winch control issues prior to the cast deployment.
-CTD operations during the 36-hour burst period (casts 9 and 10) were delayed after the 0.322 wire was crushed in the A-frame pads during the deployment of the Gas Array and needed to be re-terminated.
-During the second deep cast at Station ALOHA the Caley winch had two free-spooling events and the emergency stop had to be activated to stop the winch. After the winch controls were re-set by OTG the cast continued but the heave compensation was not responding to the sea state and was therefore shut off. The cast continued at slow speeds without heave compensation engaged and the CTD was successfully recovered.
-The unresponsiveness of the heave compensation on the winch to the sea state suggested problems with the MRU. Unfortunately, there was not a spare MRU on board that was in calibration. To continue CTD operations safely, it was decided by the Chief Scientist and Captain to use the 0.681 wire and Dynacon trawl winch for CTD casts at Station 52 WHOTS and Station 6 Kaena.

One 1000 m CTD cast was completed at Station Kahe. Two near bottom CTD casts, one 200 m 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 52) with two cycles completed. One near bottom cast was completed at Station Kaena.

The Sediment Traps, Primary Production Array, and Gas Array were all 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 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 slot on January 14th, 15th and 17th.

The optical package ACS/AC9/FRRf/LISST was deployed two times during the cruise, once around noon and once in the early morning on January 17th.

The Caley winch control system display monitor in Lab 1 was not working during the cruise.

The fluorometer, ADCP, thermosalinograph, and the ship's meteorological suite ran without interruption during the cruise.
The port and starboard anemometers showed agreement in wind speeds however the Ultrasonic anemometer showed speeds ~10 kt higher than the other two anemometers. It was also noted that the RM Young rain gauge showed glitches throughout the cruise.
The pCO_2 system was operational during the cruise after extensive repairs to the system took place prior to departure. During the cruise it was noted that increasing the water pressure of the system feed water would be better for instrument performance. Data review will be helpful in efforts of fine tuning this equipment.

Winds at the beginning of the cruise were ~20 kts from the southwest, and then shifted and decreased to ~10-15 kts from the northwest. The winds continued to shift and decrease even further to ~0-2 kts from the north on the last day of the cruise. There was a large ground swell from the northwest present at Station ALOHA that started off at 8 ft and gradually increased to 10-12 ft during the cruise.

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)

January 14, 2014
0859- Depart Snug Harbor
0940- Safety Briefing with Captain
1030- Fire and abandon ship drill
1100- Secure from all drills
1150- Arrive Station Kahe
1200- Weight cast to 1000 m
1205- All stop engineers working on level wind
1215- Resume downcast
1320- End of weight cast
1330- Hyperpro
1415- End of cast
1443- S1C1 1000 m CTD cast
1616- End of cast
1625- Transit to Station ALOHA

January 15, 2014
0015- Arrive ALOHA
0038- Deploy Sediment traps 22° 44.996'N 158° 4.322'W
0155- S2C1 1000 m CTD
0217- Due to belly pack communication issues and time constraints on getting the cast on board to process for deployment on the PP array, cast was decreased to 200 m
0300- Emergency stop activated by winch, not by a person. Cause of e-stop unknown, OTG re-set winch control system to deactivate e-stop.
0308- CTD cast continued
0315- S2C1 end
0425- PP array deployed 22° 45.000'N 158° 2.157'W
0445- End of deployment
0524- S2C2 near bottom CTD cast
0714- At 4810 dbar
0918- End of cast
0930- Transit to pump ship's tanks
1008- Net Tow
1037- End of net tow
1040- Transit to Station ALOHA
1108- S2C3 1000 m CTD
1251- S2C3 end of cast
1335- Hyperpro
1430- End of Hyperpro
1440-S2C4 1000 m CTD

1604- End of cast
1642- S2C5 1000 m CTD
1758- End of cast
1838- Recovery of the Primary Production Array 22° 44.623'N 158° 2.723'W
1900- Transit of pump ship's tanks
1959- S2C6 1000 m CTD
2138- End of cast
2140- Transit towards the center of Station
2200- Net tow
2226- End of first net tow
2229- Begin second Net Tow
2255- End of net tow
2302- S2C7 1000 m CTD

January 16, 2014
0017- End of cast
0152- S2C8 1000 m CTD
0329- End of cast
0400- Gas Array Deployment 22° 43.642'N 158° 1.776'W
0421- End of deployment
0450- While trying to establish communication with CTD prior to deployment without success, the wire was inspected and a section of the wire was found to have been crushed by the A-frame pads during the array deployment. The wire was re-terminated.
0500- Transit to pump ship's tanks
0645- S2C9 1000 m CTD
0741- End of cast
0814- S2C10 1000 m CTD
0930- End of cast
1000- Net Tow
1030- End of net tow
1035- ATE
1105- End of ATE, sample collected successfully
1108- S2C11 1000 m CTD
1120- End of cast
1250- Net Tow
1310- Second Net tow
1315- Rain on station
1354- S2C12 1000 m CTD
1537- End of cast
1552- Transit to pump ship's tanks
1656- S2C13 1000 m CTD
1818- End of cast
1832- Transit to pump ship's tanks
1953- S2C14 1000 m CTD
2127- End of cast
2159- Net tow
2232- End of net tow
2256- S2C15 near bottom CTD

January 17, 2014
0044- All stop at 4728 dbar on the downcast. Winch free spooled and AB activated emergency stop.
0050- Cast resumed after winch control was re-booted.
0101- 10 m off bottom 22° 44.990'N 158° 0.007'W
0116- Heave comp not responding to swell conditions at 4000 m on upcast. Heave comp turned off, cast continued.
0246- End of cast

0305- AC9/FRRF
0500- End of AC9, transit to Gas Array
0641- Gas Array recovery begins 22° 40.059'N 158° 2.939'W
0700- Several attempts made to recover array
0715- Hook on array, hauling in
0735- Gas array on board
0740- Transit to sediment traps
0819- Sediment Trap Array Recovery 22° 41.285'N 158° 7.135'W
0855- Sediment Trap Array on board
0900- Transit to pump Ship's tanks
1000- AC9/FRRF
1115- End of AC9
1130- Termination of .681 wire for further CTD operations.
1330- Hyperpro
1425- End of Hyperpro
1430- Re-position for Station 52
1503- On station, S52C1 200 m yo-yo
1615- End of cast
1625- APEX float deployed 22° 38.5’N 157° 57.2’W
1640- Transit to Station Kaena
2129- Arrive Station Kaena
2132- S6C1 near bottom CTD
2341- End of cast
2350- Transit Snug Harbor

January 18, 2014
0809- First line starboard side to for ROV generator loading
0830- Last line off starboard side for flip ship maneuver
0900- First line port side
0930- Gangway down for 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
Stu Goldberg	Nutrient and DOC cycling experiment	UH
Sara Ferrón-Smith	Determination of net community production from the diurnal variability of O2/Argon ratios and water collection for CH4 production experiments	UH
Scott Turn	Evaluation of Second Generation Biofuels	HNEI/UH
Dana Swift, Steve Riser Ken Johnson	APEX pH float development	UW