HOT-229: Chief Scientist Report

Chief Scientist: Craig Nosse

R/V *Kilo Moana*

January 27-30, 2011

Cruise ID: **KM 11-02A**
Departed: January 27, 2011 at 0900 (HST)
Returned: January 30, 2011 at 1430
Vessel: **R/V *Kilo Moana***
Master of the Vessel: Captain Gray Drewry
OTG Marine Technicians: Dan Fitzgerald and Vic Polidoro

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. Three 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 the first day of the cruise 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 the 2nd, 3rd, and 4th days of the cruise.
3) Station 50, the site of WHOTS-7 Mooring, approximate position 22° 46.0052'N 157° 53.9897'W, was to be occupied on the 4th day of the cruise for about one hour.

Station 6, referred to as Station Kaena, which has been occupied regularly during recent HOT cruises, would not be occupied during this cruise so that we could return to port on the afternoon of 30 January and allow the following cruise aboard *Kilo Moana* more time to load.

Upon arrival to Station Kahe a 1000 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 January 27th. 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 50 hours. The sediment trap deployment was to be followed by two shallow CTD casts to 200 m (the second cast was to collect water for the Gas Array). The two CTD casts were to be followed by an ACS/AC9/FRRf cast (see below for details). After the ACS/AC9/FRRf cast, the free-drifting Gas Array was to be deployed to incubate insitu for about 25 hours. A full-depth (~4740 m) CTD cast was to be conducted after deployment of the Gas Array, followed by 1000 m CTD casts at strict 3 hour intervals for at least 36 hours for continuous and discrete data collection.

Another free-drifting array (Primary Productivity Array) was to be deployed for 12 hours for incubation experiments on January 29th.

A plankton net was to be towed between 1000-1400, and 2200-0200 for 30 minute intervals on January 28th and 29th at Station ALOHA.

The Hyperpro was to be deployed for a half-hour period near noon time on January 27th and 29th.

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 of January 28th and around noon time on January 29th.

On January 28th, the Automated Trace Element Sampler (ATE) was to be hand deployed off the back deck to a depth of 10 m. The ATE was to be recovered after 30 minutes in the water.

After the 36 hour burst period of CTD work at Station ALOHA was accomplished, the ship was to transit to Station 50 to conduct a one-hour 200 m CTD yo-yo cast as well as surface and subsurface instrument intercomparisons.

Once Station 50 operations were complete, the ship was to transit to recover the floating Sediment Trap Array in the early morning of January 30th.

After recovering the array, the ship was to transit back to Snug Harbor.

The following instruments were to collect data throughout the cruise: shipboard ADCP, thermosalinograph, underway fluorometer, meteorological package and a pCO2 system.

2. SCIENCE PERSONNEL

Participant	Title	Affiliation/HOT Group
Susan Curless	Research Associate	UH/BEACH
Lance Fujieki	Computer Specialist	UH/BEACH
Adriana Harlan	Research Associate	UH/BEACH
Dan Sadler	Research Associate	UH/BEACH
Brett Updyke	Research Associate	UH/BEACH
Donn Viviani	Graduate Student	UH/BEACH
Scott Grant	Graduate Student	UH/CMORE
Blake Watkins	Marine Engineer	UH/BEACH
Cameron Fumar	Research Assoicate	UH/PO
Bo Keopaseut	Research Associate	UH/PO
Jefrey Snyder	Marine Technician	UH/PO
Craig Nosse	Research Associate	UH/PO
Dan Fitzgerald	Marine Technician	OTG
Vic Polidoro	Marine Technician	OTG

3. GENERAL SUMMARY

Operations during the cruise were conducted mostly as planned. One 1000 m CTD cast was completed at Station Kahe. One near bottom CTD cast, thirteen 1000 m and two 200 m CTD casts were conducted at Station AOHA. One 200 m yo-yo CTD cast was completed near the WHOTS mooring (Station 50) but only four of the six planned cycles were completed (see Section 4.0 for details).

The floating sediment trap array, primary production array, and gas array were all deployed and recovered successfully. All three arrays drifted to the southeast of the center of ALOHA.

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

The Hyperpro was deployed two times near noon. The deployment at Station ALOHA returned full downcast data but was interrupted at the start of the upcast as the Hyperpro cable got caught in the ship's propeller (see Section 4.0 for details).

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

The ADCP, thermosalinograph, fluorometer, pCO2 and meteorological system ran without interruption during the cruise.

Winds were from the east throughout the cruise at about 15 knots. Seas were about 6-8 feet.

We arrived at Snug Harbor for off-loading on January 30th, at 1430 (HST).

Science objectives not met due to science equipment failures:
- The Automated Trace Element Sampler (ATE) did not function properly during bench testing. It was not deployed.

4. INCIDENTS AFFECTING SCIENCE OPERATIONS

Two incidents occurred during the cruise affecting science operations:

a) WHOTS (Station 50) Yo-Yo CTD cast – Ship's Propulsion Failure

The ship lost propulsion at about 0100 (HST) on January 30th; during the upcast of the second yo-yo cycle. The Captain notified the OTG Technician on watch (Dan Fitzgerald) to hold the CTD at 5 meters below the surface at the conclusion of the upcast. While the CTD operation was halted, the ship's engineers worked to bring the ship's propulsion system back online. The port engine was quickly made available. By using the port engine and the bow thruster together, the 2nd mate on the bridge was able to maintain the ship's heading and position.

The Captain elected to keep the CTD in the water at 5 meters below the surface while the engineers continued to work to bring the starboard engine back online. The decision to keep the CTD at the surface was made to minimize further complications to the problem at hand. Propulsion was fully restored after about 45 minutes (at about 0145). The Chief Scientist decided to continue the yo-yo cycles, but reduced the planned 6 cycles to only 4 cycles due to time constraints as the sediment traps still needed to be recovered before departing for an on time arrival into Honolulu.

b) Hyperpro Cable Caught in Starboard Propeller

The Hyperpro cable got caught in the ship's starboard propeller at about 1230 (HST) on January 29th; at the completion of the instrument's downcast. Deployment strategy for the Hyperpro involves "streaming" the instrument away from the stern of the ship as it free-falls during the downcast. At the conclusion of the downcast it appeared that the streaming was not successful as the Hyperpro cable was tending inboard of the stern towards the starboard side. This inboard/starboard movement was not noticed during the downcast and may have happened as slack worked out of the cable when the cable was no longer being payed out.

The OTG Technician on watch (Vic Polidoro) asked the bridge to "bump" the ship ahead to try and stream the Hyperpro away from the stern. At this point, either the Hyperpro cable had already wrapped around the propeller or the forward spinning of the starboard propeller drew the cable into it. The cable went very taut and out of the grasp of Lance Fujieki who was tending it. Dan Sadler disconnected the cable from its acquisition computer and prepared to secure it to the deck. Dan noted that the instrument was still transmitting data (indicating the instrument was still attached) when he disconnected the cable.

The Captain was alerted that the Hyperpro cable had most likely wrapped around the propeller. He came on watch and decided to slowly turn the starboard propeller in both directions to try and free the cable. These attempts were not successful. Vic then suggested moving the ship forward at about 2 knots with the port engine so that a grapnel could be tossed across the Hyperpro cable in attempts to recover the instrument. This effort was successful and the instrument was brought on deck.

With no ability to free the Hyperpro cable from the starboard propeller, the cable was cut at about 1345. It was estimated that about 25 meters of cable either drifted free or was still wrapped around the propeller. The Captain requested the UH Marine Center to have a diver available to inspect the propeller upon return to Honolulu.

As this incident occurred at the completion of the downcast of the Hyperpro cast, data were still obtained and early analysis of the data appeared normal.

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

The Captain and ship's crew showed continued commitment to our scientific mission. This cruise was not on the schedule for R/V *Kilo Moana* until less than a week before sailing. The UH Marine Center, Captain and ship's crew made a very concerted effort to afford us the opportunity to accomplish our objectives.

Technical support was efficient. OTG personnel were available at any time to assist in our work and helped to maintain our schedule.

6. DAILY REPORT OF ACTIVITIES (HST)

27 January 2011

0900 Depart Snug Harbor
0955 30 minute delay in channel due to ship traffic
1030 Safety meeting
1056 Emergency drills
1235 Arrive Kahe Station
1255 Weight cast to 500 m
1337 Hyperpro cast
1435 S1C1 1000-m CTD cast
1610 Transit to ALOHA
2310 Arrive ALOHA
2336 Sediment traps deployed at 22 40.06 N, 157 59.97 W

28 January 2011

0000 S2C1 200-m CTD cast
0114 S2C2 200-m CTD cast
0210 ACS/AC9/FRRF
0349 Gas array deployed at 22 42.45 N, 158 01.98 W
0426 S2C3 4740-m CTD cast
0615 Reached bottom of deep cast, 4805 dbar, 6 m from bottom
0830 Transit to pump tanks
1005 Net tow
1058 S2C4 1000-m CTD cast
1238 Net tow
1354 S2C5 1000-m CTD cast
1511 Transit to pump tanks
1657 S2C6 1000-m CTD cast
1954 S2C7 1000-m CTD cast
2203 Net tow
2257 S2C8 1000-m CTD cast

29 January 2011

0015 Transit to pump tanks
0115 Net tow

0200 S2C9 1000-m CTD cast
0415 Recovered gas array at 22 38.90 N, 157 57.08 W
0509 S2C10 1000-m CTD cast
0640 Primary Productivity array deployed at 22 40.99 N, 157 59.95 W
0755 S2C11 1000-m CTD cast
1004 Net tow
1056 S2C12 1000-m CTD cast
1217 Start Hyperpro cast
1235 Hyperpro cable caught in starboard propeller
1345 Hyperpro on board, cable cut
1409 ACS/AC9/FRRF
1455 S2C13 1000-m CTD cast
1710 S2C14 1000-m CTD cast
1920 Primary Productivity Array recovered at 22 39.04 N, 157 58.4 W
1953 S2C15 1000-m CTD cast
2200 Net tow
2258 S2C16 1000-m CTD cast

30 January 2011

0025 S50C1 200-m CTD yo-yo profiles
0058 Start of 3rd yo-yo cycle delayed due to propulsion failure
0143 3rd cycle resumed after propulsion fully restored
0215 Transit to sediment traps
0330 Sediment traps recovered at 22 37.13 N, 157 52.06 W
0400 Transit to Honolulu
1430 Arrive Snug Harbor

HOT program sub-components:

Investigator	**Project**	**Institution**
Matt Church	Core Biogeochemistry	UH
Roger Lukas	Hydrography	UH
Mike Landry	Zooplankton dynamics	SIO
Ricardo Letelier	Optical measurements	OSU
Ancillary programs:		
Charles Keeling	CO_2 dynamics and intercalibration	SIO
Paul Quay	$DI^{13}C$	SIO
Penny Chisholm	Prochlorococcus population dynamics	MIT
Various CMORE PI's	Microbial RNA/DNA collection	UH/CMORE
Additional programs:		
Dave Karl (via Sam Wilson)	Reduced gases in the upper ocean: The cycling of methane, sulfide and nitrous oxide	UH/Moore
Dave Karl (via Tara Clemente)	ATP method comparison	UH
Ed Laws (via Scott Grant)	N^{15} incubation experiment	
Matt Church (via Shimi Rii)	Method testing of DNA extraction for picoeukaryotes	UH

Matt Church (via Donn Viviani)	Bacterial production and EOC at Station ALOHA	UH
Daniela del Valle	DMSP uptake experiment	UH/CMORE