

HOT-228: Chief Scientist Report

Chief Scientist: Craig Nosse

R/V Kilo Moana

January 8-10, 2011

Cruise ID: KM 11-01

Departed: January 8, 2011 at 0930 (HST)

Returned: January 10, 2011 at 0900

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

Master of the Vessel: Captain Richard Meyer

OTG Marine Technicians: Ben Colello and Dan Fitzgerald

1. SCIENTIFIC OBJECTIVES

The objective of the cruise was to maintain a time-series of hydrographic and biogeochemical data at the Hawaii Ocean Time-series (HOT) stations. Four stations were to be occupied during the cruise, with twenty (20) CTD casts scheduled. Three (3) arrays (sediment traps, primary productivity and gas) were to be deployed and recovered. Six (6) plankton net tows were to be conducted at Station ALOHA. Optics work was to include using a Hyperpro as well as a package that included a transmissometer, fluorometer and particle size and distribution analyzer. A small Automated Trace Element sampler was to be hand deployed. One (1) Apex-ISUS drifter was to be deployed. A surface debris trawl was to be towed six (6) times for one hour periods.

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

2. GENERAL SUMMARY

The cruise returned to port two (2) days early as complications with two winch systems aboard the ship prevented safe CTD operations. The primary (Caley) winch system had its tension meter fail during a weight test cast. Without a tension reading, the winch operator would not be able to determine if the load on the wire was exceeding minimum or maximum limits; either could result in situations where the wire could part and/or break. In order to maintain personnel and equipment safety, operations were switched to the backup (Dynacon) winch system. The Dynacon winch system experienced two (2) severe kinks in the wire (viewed as a precursor to the wire parting or breaking) during the third CTD cast conducted. Without a solution to prevent the wire from kinking, personnel and equipment safety were being risked by going forward. As no real-time solutions were available to solve the problems with either of the two systems, it was decided to return to port as the core hydrographic and biogeochemical sampling could not be safely completed.

Caley winch complications:

The tension meter for the Caley system was calibrated during loading day, one (1) day prior to sailing. The instrument was giving problematic readings (low response characteristics) and it was theorized that the device had drifted since its last use. Upon arrival to Station Kahe on the first day of the cruise (8 January 2011), a 1000 lb. weight test cast was conducted. During the cast, it was noticed that the tension meter was giving readings that appeared anomalously low. For example, the “in-air” readings before the test weight was placed back on deck was, on average, about 500 lbs. too light. At the completion of the test cast the Director of OTG decided to recalibrate the tension meter.

The calibration was unsuccessful. With 2000 lbs. of tension applied to the winch, the tension meter wildly fluctuated between -1,000 lbs. and 45,000 lbs. and would occasionally show asterisks (***) as a reading. Without a working tension meter, the Captain, OTG Director and Chief Scientist decided (at around 1430) that CTD operations should be switched to the backup (Dynacon) winch system for safety reasons; as the tension could not be monitored, minimum and maximum allowable loads could not be identified and the wire could part or break.

Dynacon winch complications:

The Dynacon winch was rigged for a weight test cast with the ship's A-frame, using the same 1000 lb. weight at Station Kahe. This second weight cast was conducted at 1600 and was completed in about an hour with minor issues. During the deployment, as the A-frame moved forward to deploy the weight over the stern of the ship, the .322 wire started to wrap around what appeared to be a mounting tab for the winch. The deployment was stopped and the ship's engineering department was called. An engineer cut the tab off with a saw. With the tab cut off, the wire no longer touched the winch but ran close to the side of the winch frame; estimated distance was less than one (1) inch, typically not a problem if wire tension is maintained. The tension meter for the Dynacon appeared to be offset high, when the 1000 lb. weight was on the deck with no tension in the wire, the meter showed averaged readings around 150 lbs.

The science party decided to go forward using the Dynacon with some adjusted protocols devised by the Chief Scientist:

- 1) winch operators were to be informed that minimum allowable tensions during casts would be 400 lbs.; tensions lower than 400 lbs. would require slower winch speeds or stopping the winch
- 2) winch operators were to be solely responsible for monitoring tensions as a display could not be setup in the CTD lab
- 3) CTD console operators were to keep radio communications as concise and direct as possible given that the winch operator had to wear ear protection while running the winch
- 4) CTD console operators were instructed how to make real-time estimates from decibars to meters of wire out as the remote depth readout would take time to be moved to the Dynacon from the doghouse

The ship transited to Station ALOHA and the Dynacon was used without incident for the first two CTD casts (both 200 m casts) at Station ALOHA on 09 January. Major complications arose as the CTD came on deck after the third cast at Station ALOHA (a deep cast that went to 4809 m) at around 1130. Two (2) severe kinks at ten (10) and twenty (20) feet above the rosette were discovered as the CTD was being recovered. The Chief Scientist decided to put CTD operations on stand-down until the HOT Principal Investigator could be contacted.

After conferring with the Principal Investigator, the Chief Scientist requested a meeting with the Captain, OTG Director and both Watch Leaders. The Chief Scientist put forth a question from the Principal Investigator as to whether there was any way to conduct safe CTD operations with water collection down to 200 m. It had been concluded (at the time) by all parties that the cause of the kinks in the Dynacon wire was a combination of the ship's stern heaving up and down with very steep angles from the Dynacon winch to the sheave in the A-frame. With the steep angle, slack was being introduced into the wire as the stern heaved up and down. It was noted that slack was introduced into the wire even with the CTD stationary at 5 m of water depth.

Solutions discussed included: adding more weight to the package, slower winch speeds and putting the ship "into the trough" to reduce heaving of the stern. The Captain had just concluded an experiment of

putting the ship in different headings relative to the swell and that did not reduce heave. The possible solution of adding more weight to the package was considered and discounted as adding weight could actually promote more snap tension. The solution of going slower was considered and discounted with the aforementioned observation of slack wire even when the CTD was stationary.

As there was no solution developed at the meeting to conduct safe “shallow water” CTD and water collection operations, it was decided to return to port as the majority of the work scheduled for the cruise could not be completed. Upon return to port, offloading was not immediately conducted as it was hoped that the ship could be outfitted in such a way that the cruise could continue. The Chief Scientist was informed by the Port Operations Manager at 1100 on 10 January that the cruise would not be continuing and offloading was scheduled for 0900 on 11 January.

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

The officers, crew and technicians of R/V *Kilo Moana* were professional and worked hard to overcome the problems that arose during the cruise.

Technical support by way of testing both winch systems prior to sailing could have helped to identify some of the difficulties faced.

4. SCIENCE PERSONNEL

Participant	Title	Affiliation/HOT Group
Susan Curless	Research Associate	UH/BEACH
Lance Fujieki	Computer Specialist	UH/BEACH
Scott Grant	Research Associate	UH.CMORE
Adriana Harlan	Research Associate	UH/BEACH
Dan Sadler	Research Associate	UH/BEACH
Brett Updyke	Research Associate	UH/BEACH
Donn Viviani	Graduate Student	UH/BEACH
Blake Watkins	Marine Engineer	UH/BEACH
Cameron Fumar	Research Associate	UH/PO
Bo Keopaseut	Research Associate	UH/PO
Jefrey Snyder	Marine Technician	UH/PO
Craig Nosse	Research Associate	UH/PO
Rebecca Mabardy	Volunteer	UH/PO
John Bullister	Scientist	NOAA/PMEL
Dave Wisegarver	Technician	NOAA/PMEL
Brandon Carter	Technician	UCSC
Joel Paschal	Citizen Scientist	Sea of Change
Kathryn Nelson	Citizen Scientist	Sea of Change
Ben Colello	Marine Technician	OTG
Dan Fitzgerald	Marine Technician	OTG

5. DAILY REPORT OF ACTIVITIES (HST)

08 January 2011

0900 Departure delayed due to ship traffic in harbor

0905 Safety briefing for Science Party

0935 Depart Snug Harbor
1006 Fire and emergency, abandon ship drills
1220 Arrive Kahe Station
1235 Weight cast #1 (500 m)
1346 Hyperpro Cast
1605 Weight cast #2 (1000 m)
1738 Transit Station ALOHA

09 January 2011

0128 Arrive Station ALOHA
0227 Sediment trap deployed at 22 45.01 N, 158 04.29 W
0243 S2C1 200-m CTD cast
0423 S2C2 200-m CTD cast
0637 Primary Production array deployed at 22 45.0 N, 158 03.2 W
0720 S2C3 4740-m CTD cast
0916 Bottom of deep cast reached at:
22 44.98 N, 158 0.01 W (6 m off bottom)
1140 End S2C3. Two kinks found in CTD wire.
1145 Transit to pump tanks
1210 Observation of WHOTS-7 mooring
1255 Net tow
1330 Net tow
1405 ATE sample
1516 Surface debris trawl
1805 Recover Primary Production array at 22 42.78 N, 158 05.01 W
1856 Recover Sediment traps at 22 42.73 N, 158 06.19 W
1937 Apex-ISUS drifter deployed at 22 42.97N, 158 06.05 W
1947 Transit to Honolulu

10 January 2011

0900 Arrive Snug Harbor

11 January 2011

0900 Offload

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 partially completed due to shortened cruise:

Matt Church (via Donn Viviani, Daniela Bottjer and Dan Sadler)	Ocean perturbation experiment	UH
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Various CMORE PI's	Microbial RNA/DNA collection	UH/CMORE
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Ancillary programs not completed due to shortened cruise:

Charles Keeling	CO ₂ dynamics and intercalibration	SIO
Paul Quay	DI ¹³ C	SIO
Penny Chisholm	Prochlorococcus population dynamics	MIT
Matt Church	Diversity and activities of nitrogen-fixing Microorganisms	UH

Additional programs completed:

Angel White and Katie Watkins-Brandt	Surface seawater collection	OSU
Grieg Steward (via Elisha Wood-Charlson)	Virus removal testing	UH/CMORE
Steve Riser and Ken Johnson (via Blake Watkins)	Apex-ISUS profiling drifter	UW
Sherri Kano (via Scott Grant)	CMMED Culture collection	UH
Joel Paschal and Kathryn Nelson	Citizen scientists and marine debris monitoring	Sea of Change

Additional programs partially completed due to shortened cruise:

Jonathan Zehr (via Brandon Carter)	UCYN-A/Dinoflagellate association	UCSC
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Additional programs not completed due to shortened cruise:

Dave Karl (via Sam Wilson)	Reduced gases in the upper ocean: The cycling of methane, sulfide and nitrous oxide	UH/Moore
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