

HOT 309: Chief Scientist Report

Chief Scientist: Dan Sadler

R/V *Kilo Moana*

Cruise ID: **KM 19-01**

Departed: January 14, 2019 at 0852 (HST)

Returned: January 18, 2019 at 0738 (HST)

Vessel: **R/V *Kilo Moana***

Master of the Vessel: Captain David Martin

OTG Marine Technicians: Julianna Diehl, 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. Three stations were to be occupied and during the cruise along with the recovery of the deep moored traps, events were to occur 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 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 January 14th – 17th.
- 3) Station 50, the site of WHOTS-15 Mooring (anchor position 22° 46.045'N 157° 53.888'W) was to be occupied for about one hour on January 17th.
- 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 about 2 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 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, a 1000 m CTD cast for preparation of the Primary Productivity Array was to be conducted followed by deployment of the WireWalker and the free-drifting sediment trap array. These two arrays were to stay in the water for about 54 hours. This was to be followed by the deployment of the free-drifting Primary Productivity Array to incubate *in situ* for 12 hours. A full-depth (~4740 m) CTD cast was to be conducted after the deployment of the Primary Production Array centered over Station ALOHA, 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.

The lowered-ADCP was to collect current measurements on down- and up-cast. The 600 kHz LADCP, operating in single ping, was to record measurements internally at a rate of 4 kHz and data was to be downloaded after each cast via RS422 connection.

The free-drifting Gas array was to be deployed for 24 hours for incubation experiments on January 16th.

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

The Hyperpro was to be deployed for a half-hour period near ~1400 on January 14th, 15th, and 17th.

An optics package including a package consisting of a SeaBird Seacat with temperature, conductivity, fluorometer and pressure sensors, 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 on January 17th.

After the optics package and 36 hour burst period of CTD work at Station ALOHA was accomplished, the ship was to transit to recover the Gas array, the WireWalker and the Sediment Trap array on the morning of January 17th.

After recovering the arrays, , the ship was to transit to Station 50 to conduct a one-hour 200 m CTD yo-yo cast. The ship was to remain 0.25 nm, downwind and down current from Station 52, after completion of the CTD yo-yo to gather one hour of shipboard ADCP for comparison to WHOTS-14 ADCP data. Once operations at Station 50 were complete, the ship was to re-position within Station ALOHA to conduct a Hyperpro cast.

The ship was to proceed to Station 6 (Kaena) and perform a near bottom CTD cast then transit back to Honolulu Harbor, Pier 35.

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

Atmospheric aerosol samples were to be collected at various times using a kite.

2. SCIENCE PERSONNEL

Participant	Title	Affiliation	Citizenship
Katherine Ackerman	UH Undergraduate	UH/Atmospheric Sci	USA
Kendra Babcock	Research Associate	UH	USA
Karin Björkman	Scientist	UH	Sweden
Macarena Burgos	Scientist	UCádiz	Spain
Tim Burrell	Research Associate	UH	New Zealand
Dan Fitzgerald	Research Associate	UH	USA
Carolina Funkey	Research Associate	UH	USA
Tully Rohrer	Research Associate	UH/SCOPE	USA
Amanda Millin	Volunteer	Malama Loko Ea Foundation	USA
Courtney Morgan	UH Undergraduate	UH	USA
Alyssa Renteria	UH Undergraduate	UH	USA
Dan Sadler– Chief Scientist	Research Associate	UH	USA
Andres Salazar	Graduate Student	UH	Chile
Fernando Santiago-Mandujano	Research Associate	UH	USA
Jefrey Snyder	Marine Technician	UH	USA
Ryan Tabata	Research Associate	UH	USA
Chung Taing	Graduate Student	UH/Atmospheric Sci	Cambodia
Blake Watkins	Marine Engineer	UH	USA
Julianna Diehl	Marine Technician	OTG	USA
Jeff Koch	Marine Technician	OTG	

3. GENERAL SUMMARY

All operations were completed at Station Kahe. Upon arrival at Station ALOHA, the WireWalker, sediment traps and primary production array were deployed and drifted northward.

One 1000 m CTD cast was completed at Station Kahe. Two near bottom CTD casts, twelve 1000 m CTD casts, and one 200m CTD cast were conducted at Station ALOHA. One 5 cycle yoyo CTD cast to 200 m was completed near the WHOTS mooring (Station 50). A near bottom CTD cast was completed at Station Kaena.

Five net tows for the core HOT zooplankton collection were completed successfully; Two during the day and three during the night. The gas array was deployed and recovered.

Due to strong winds (>35 knots), the CTD cast at Station 50 (WHOTS) was delayed until 1830. The CTD cast at Station Kaena was cancelled due to the delay at Station 50.

Hyperpro casts were completed at Station Kahe and Station ALOHA. Casts with a new Hyperpro system were performed directly after the regular Hyperpro unit to compare the two systems.

The ADCP, underway fluorometer, thermosalinograph, transmissometer and the ship's meteorological suite ran without interruption during the cruise.

Atmospheric aerosol samples were collected using a kite. Six sampling sessions were completed.

Winds during the cruise were mostly light from the South for the first 3 days with speeds of 0-10 kts. Winds picked up to 35 knots on January 17 as a front approached and swung to the North. The seas were 2-6 ft. with a large ground swell that induced large tension variations during CTD casts.

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

The R/V *Kilo Moana* and crew provided excellent support for the cruise. We especially commend the bridge for excellent ship handling during the array recoveries in difficult conditions. We also thank engineering for the repairs required before sailing.

Technical support during this cruise was very good. OTG personnel were available to assist in our work during the cruise. They were flexible in accommodating the atmospheric sampling and pro-active in suggesting ways to improve the science safety drills.

5. DAILY REPORT OF ACTIVITIES (HST)

January 14, 2019

0852 Cast off lines and departed UH Marine Center
0930 Safety Briefing
1002 Abandon Ship Drill
1145 Arrive Station Kahe
1149 Begin Weight Cast
1228 End cast
1245 Begin Hyperpro. YoYo and 2 deep casts on old instrument, 2 deep cast on new instrument
1350 End Hyperpro cast
1412 Begin S1C1 CTD cast to 1000m
1420 Meeting on bridge to discuss kite deployment for aerosol sampling
1551 End cast
1605 Depart Station Kahe for transit to ALOHA
1611 Began kite air sampling

1845 End kite sampling
2036 Deployed kite
2111 Retrieved kite
2333 Arrived St. ALOHA - 3 miles west of center
2348 Begin Wirewalker deployment 22° 45.0587'N, 158° 03.2336'W

January 15, 2019

0007 Finished deployment at 22° 45.0501'N, 158° 03.2346'W
0009 Transit to sediment trap deployment site, 2 miles west of center
0030 Begin sediment trap deployment
0108 Sediment traps released at 22° 44.9803'N, 158° 02.0892'W
0211 Begin S2C2 CTD cast to 200m for PP array. Slow descent due to low tension from swells
0245 End cast
0420 Begin PP array deployment at 22° 45.9768'N, 158° 01.0931'W
0441 PP array released at 22° 44.9373'N, 158° 01.0739'W
0531 Begin S2C2 near bottom CTD cast
1001 End cast
1006 Transit to pump tanks
1105 Deployed kite
1141 Retrieved kite
1202 Begin S2C3 CTD cast to 1000m
1326 End cast
1345 Start Hyperpro cast. 2 Hyperpro units
1454 End Hyperpro
1514 Begin S2C4 CTD cast to 1000m
1638 End Cast
1723 Begin S2C5 CTD cast to 1000m - slow downcast due to tension fluctuations
1855 End caast
1900 Transit to PP array
1925 Begin PP array recovery at 22° 46.5395' N, 158° 00.9576' W
1950 Recovery complete
2050 Begin S2C6 CTD cast to 1000m
2229 End cast
2242 Net tow at 22° 44.9840' N, 157° 59.9496' W
2322 Net tow at 22° 44.3787' N, 158° 00.1831' W
2348 Net tows complete
2357 Begin S2C7

January 16, 2019

0124 End cast
0130 Transit to pump tanks
0229 Begin S2C8 CTD cast to 1000 m
0341 End cast
0436 Begin Gas Array deployment
0457 Gas Array released at 22° 42.9615' N, 158° 02.1993' W
0523 Begin S2C9 CTD cast to 1000m
0634 End cast
0804 Begin S2C10 CTD cast to 1000m
0911 End cast
0920 Transit to pump tanks

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1046 POS-MB crashed, so NAV data for shipboard ADCP may be affected
1055 Begin S2C11 CTD cast to 1000m
1110 Shipboard ADCP back up and running, may have 25 min gap
1159 End cast
1200 POS-MV crashed again, ADCP data disrupted
1215 Net tow at 22° 45.1897' N, 158° 04.5667' W
1230 ADCP back with NAV data
1250 Net tow at 22° 45.3013' N, 158° 04.2508' W
1400 Begin S2C12 CTD to 1000m
1510 End cast
1526 Kite launched
1612 Network time servers reset by OTG
1630 Kite recovered
1703 Begin S2C13 CTD cast to 1000m
1810 End cast
1815 Transit to pump tanks
2010 Begin S2C14 CTD cast to 1000m
2128 End cast
2200 Net tow at 22° 44.8162' N, 158° 00.1465' W
2300 Begin S2C15 near bottom CTD cast

January 17, 2019

0038 Winch stopped due to level wind issues
0051 10 m from bottom. Cold event occurring. Pot Temp at 4803m was 1.085 C
0256 End cast
0312 Begin optics cast at 22° 44.9870' N, 157° 59.9799' W
0441 End optics cast
0613 Begin Gas Array recovery at 22° 47.8848' N, 157° 59.2613' W
0636 End recovery
0730 Begin Sediment Trap recovery at 22° 53.968' N, 157° 58.803' W
0800 Finish recovery
0845 Begin Wirewalker recovery at 22° 55.679' N, 157° 59.590' W
0907 Finish recovery
1035 Arrive WHOTS mooring. Cast postponed due to 30 knot winds.
1215 Hyperpro cast with unit #1 at 22° 45.997' N, 157° 53.920' W
1243 Hyperpro cast with unit #2 at 22° 45.870' N, 157° 53.864' W
1320 End Hyperpro casts
1325 Front passing through, gusts to 35 knots. Standing by for conditions to improve
1410 Raining on station
1610 Launched kite
1735 Recovered kite
1813 Begin S50C1 CTD yoyo cast, 5 cycles to 200m
1939 End cast
1953 Begin transit to Honolulu, no Kahe station.

January 18, 2019

0735 Arrive Pier 35

HOT program sub-components:

Investigator	Project	Institution
Dave Karl	Core Biogeochemistry	UH
John Dore	Biogeochemistry QA/QC	MSU
James Potemera	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
Matthew McCarthy Tom Guilderson	Sediment trap samples to look at amino acid-based paleo proxies to examine propagation of exported production into coral polyps and skeletons.	UCSC
Matt Church	Diversity and activities of nitrogen-fixing microorganisms	UM/FLBS
Sam Wilson	Reduced gases in the upper ocean: The cycling of methane, sulfide and nitrous oxide.	UH
Sara Ferrón-Smith	Determination of gross primary production from the euphotic zone in situ, using the drifting primary production array	UH
Dave Caron	SCOPE: Protistan biodiversity, trophic activities, culturing	USC
Ed DeLong	SCOPE: DNA and Viral DNA collection, Single cell genomic flow cytometry sample collection	UH
Dan Repeta	SCOPE: DOM collection	WHOI
Angelique White	SCOPE: C-STAR, IFCB and LISST to record nano-plankton special diversity	OSU
Grieg Steward	Three dimensional model system of mixotrophic Phytoplankton, its prey and a giant virus infecting them	UH
Dave Karl	Mixing Experiment	UH
Karin Bjorkman &	Comparison of 14C-assimilation and gross O ₂	UH

Sara Ferrón-Smith

production, and effects on respiration at different
light intensities.

Alison Nugent

Katherine Ackerman

Chung Taing

Comprehensive Study of Open Ocean Sea Salt Aerosols UH