

# HOT 316: Chief Scientist Report

Chief Scientist: Dan Sadler

R/V *Oceanus*

Cruise ID: **OC1910A**

Departed: October 16, 2019 at 0750 (HST)

Returned: October 20, 2019 at 0738 (HST)

Vessel: **R/V *Oceanus***

Master of the Vessel: Captain Jeremy Fox

Marine Technicians: Patrick A'Hearn

## 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 and 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 October 16<sup>th</sup> 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 October 16<sup>th</sup> – 19<sup>th</sup>.
- 3) Station 52, the site of WHOTS-16 Mooring (anchor position 22° 40.010 'N 157° 56.962'W) was to be occupied for about one hour on October 19<sup>th</sup>.
- 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 October 19<sup>th</sup> 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 October 16<sup>th</sup>. 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 the CTD cast, the ship was to proceed to Station ALOHA.

Upon arrival to Station ALOHA, the WireWalker and the free-drifting sediment trap array were to be deployed. These two arrays were to stay in the water for about 54 hours. This was to be followed by followed by a 200 m CTD cast to collect water for the Primary Productivity Array in preparation for a pre-dawn deployment and 12 hour *in situ* incubation. Seaglider SG512 was to be deployed and the ship repositioned to the center of the station circle for a full-depth (~4740 m) CTD cast. Next would be a series of 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 October 18<sup>th</sup>.

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 October 18<sup>th</sup>.

A plankton net was to be towed three times between 1000-1400, and three times between 2200-0200 for 30 minute intervals on October 17<sup>th</sup> and 18<sup>th</sup> at Station ALOHA.

The Hyperpro was to be deployed for a half-hour period near ~1400 on October 16<sup>th</sup>, 17<sup>th</sup> and 19<sup>th</sup>.

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 October 19<sup>th</sup>.

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 October 19<sup>th</sup>.

After recovering the arrays, the ship was to transit to Station 52 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-15 ADCP data. Once operations at Station 52 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.

## 2. SCIENCE PERSONNEL

<b>Participant</b>	<b>Title</b>	<b>Affiliation</b>	<b>Citizenship</b>
Brandon Brenes	Undergraduate Student	UH	USA
Tim Burrell	Research Associate	UH	New Zealand
Dan Sadler – Chief Scientist	Research Associate	UH	USA
Dan Fitzgerald	Research Associate	UH	USA
Carolina Funkey	Research Associate	UH	USA
Lucie Knor	Graduate Student	UH	Germany
Tully Rohrer	Research Associate	UH	USA
Fernando Santiago-Mandujano	Research Associate	UH	USA
Eric Grabowski	Research Associate	UH	USA
Ryan Tabata	Research Associate	UH	USA
Blake Watkins	Marine Engineer	UH	USA
Fernando Pacheco	Research Associate	UH	Brazil
Patrick A'Hearn	Marine Technician	OSU	USA

## 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 north.

One 1000 m CTD cast was completed at Station Kahe. Two near bottom CTD casts, eleven 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 52). A near bottom CTD cast was completed at Station Kaena.

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

Hyperpro casts were completed at Station Kahe and Station ALOHA. The first Hyperpro cast at Station ALOHA was moved from October 17<sup>th</sup> to October 18<sup>th</sup> due to the revised schedule.

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

The large diameter of the HOT rosette caused tight clearances while deploying from the side squirt boom. One Bullister bottle was lost and several others were pushed downward during deployment of S2C2 while bringing the package to the surface from 10m. The wire angle tended under the ship causing contact with the CTD/rosette. The cast continued and the bottle was replaced after the cast. After the cast, a meeting with the captain produced revised deployment guidelines to prevent further contact. The time spent replacing the bottle and repositioning the other bottles was regained by cancelling one 1000m CTD open cast.

Wire tension was closely monitored during all CTD casts to ensure compliance with UNOLS Appendix A safety requirements. The first deep cast, S2C2 was terminated 30 m from the bottom to remain within the operating envelope. The second deep cast, S2C15, saw lower tensions due to less swell induced wire loading than the first deep cast and successfully reached maximum cast depth.

The O<sup>18</sup> primary production experiment was cancelled due to rough sampling conditions.

Seaglider SG512 was deployed near Station ALOHA.

The LADCP recorded data during all the casts, except during the first deep cast.

Winds during the cruise were from the South at 15-20 kts. Seas were 6-8 ft.

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

The R/V *Oceanus* and crew provided excellent support for the cruise. The ship was clean and well maintained. The ship kept on schedule for all stations and operations. Ship handling during over-the-side work and deployment and recovery of arrays was outstanding. They were also able to provide a smooth ride for rosette sampling in challenging conditions.

Technical support from the marine technician was also excellent. With a 24/7 schedule, the single technician managed to be around for all necessary operations, plus some.

#### 5. DAILY REPORT OF ACTIVITIES (HST)

16 October 2019

0630 Ship drills  
0750 Underway  
1038 Arrive St Kahe  
1050 Weight cast to 500m  
1116 End cast  
1135 Begin Hyperpro cast

1215 End cast  
1238 Begin S1C1 CT's cast to 1000m  
1353 End cast  
1405 Transit to St ALOHA  
1410 Stopped to finish sampling ahead of rain squall resumed transit  
2216 Arrive at edge of St. ALOHA circle  
2318 Wirewalker deployed at 22° 39.286' N, 158° 01.843' W

17 October 2019

0006 Sediment traps deployed at 22° 40.041' N, 158° 00.952' W  
0200 Begin S2C1 CTD cast to 200m. Secondary fluorescence peak at 130 db  
0226 End cast  
0505 PP array deployed at 22° 43.322' N, 158° 04.802' W  
0538 Seaglider deployed at 22° 43.322' N, 158° 04.162' W  
0643 S2C2 CTD near bottom CTD cast. CTD hit bottom of ship on deployment  
0829 Cast terminated 30 m from bottom because tension over 3000 lb limit  
1026 End of cast. Bottle 20 lost from frame. Other bottles downward  
1312 Begin S2C3 CTD cast to 1000m  
1423 End cast  
1537 Begin S2C4 CTD cast to 1000m. Dropped one cast to get back on schedule.  
1643 End cast  
1814 PP array re covered at 22° 44.785' N, 158° 03.568' W  
1950 Begin S2C5 ctd cast to 1000m  
2104 End of cast  
2235 Net tow at 22° 46.702' N, 157° 58.576' W  
2318 Begin S2C6 ctd cast to 1000m

18 October 2019

0015 End cast  
0156 Begin S2C7 ctd cast to 1000m  
0248 End cast  
0435 Gas array deployed at 22° 45.985' N, 157° 55.649' W  
0502 Start S2C8 ctd cast to 1000m  
0627 End cast  
0800 Begin S2C9 ctd cast to 1000 m  
0904 End cast  
1058 Begin S2C10 ctd cast to 1000 m

1203 End cast  
1235 Net tow  
1301 Net tow  
1338 Hyperpro cast  
1407 End Hyperpro cast  
1417 Squall on station  
1420 Begin S2C11 ctd cast to 1000 m  
1513 End cast  
1658 Begin S2C12 ctd cast to 1000 m  
1803 End cast. Conductivity sensor replaced due to bad reading. Possibly damaged during heavy landing on deck

1955 Begin s2c13 ctd cast to 1000 m  
2053 End of cast  
2121 Transit of pump tanks. Unexpected as holding tanks filled faster than anticipated.  
2255 Net tow  
2354 Begin S2C14 near bottom ctd cast

19 October 2019

0134 Reached target depth of 4801 m. 7 m off bottom  
0312 End of cast  
0329 Start optics cast  
0623 Recovered gas array at 22° 52.345' N, 157° 53.971' W.  
0746 Recovered sediment trap at 22° 49.495' N, 157° 57.417' W.  
0826 Recovered wire walker at 22° 47.767' N. 157° 58.381' W.  
1133 Hyperpro cast  
1221 Begin S52C1 ctd cast to 200 m  
1326 End of cast. 5 cycles  
1455 Transit to St. Kaena  
2001 Arrive St. Kaena  
2013 Begin S6C1 near bottom CTD cast  
2211 End of cast  
2253 Transit to Honolulu Harbor

20 October 2019

0700 "H" sea buoy  
0738 Arrive Pier 35

**HOT program sub-components:**

<b>Investigator</b>	<b>Project</b>	<b>Institution</b>
Dave Karl	Core Biogeochemistry	UH
Angelique White	Core Biogeochemistry	UH
John Dore	Biogeochemistry QA/QC	MSU
James Potemra	Hydrography	UH
Mike Landry	Zooplankton dynamics	SIO

Ricardo Letelier	Optical measurements	OSU
<b>Ancillary programs:</b>		
Andrew Dickson	CO <sub>2</sub> dynamics and intercalibration	SIO
Paul Quay	DI <sup>13</sup> C	UW
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
Ed DeLong	SCOPE: DNA and Viral DNA collection, Single cell genomic flow cytometry sample collection	UH
Dan Repeta	SCOPE: DOM collection	WHOI
Sara Ferrón-Smith	Seasonal variability in productivity and respiration in the North Pacific Subtropical Gyre	UH
Grieg Steward	Three dimensional model system of mixotrophic Phytoplankton, its prey and a giant virus infecting them	UH
Rachel Kelly	Nickel drawdown incubation experiments	USC