HOT 315: Chief Scientist Report
Chief Scientist: Tara M. Clemente
R/V *Kilo Moana*
September 3-7, 2019

Cruise ID: KM 19-17
Departed: September 3, 2019 at 08:45
Returned: September 7, 2019 at 07:51
Vessel: R/V *Kilo Moana*, University of Hawaii
Master of the Vessel: Captain David Martin
OTG Marine Technicians: Jeff Koch and Julianna Diehl

1. SCIENTIFIC OBJECTIVES

The objective of the cruise is to maintain a collection of hydrographic and biogeochemical data at the Hawaii Ocean Time-series (HOT) stations. Four stations will be occupied and during the cruise and events will 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 will be occupied on September 3rd for about 3-4 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 will be occupied September 4-6th.
3) Station 50, the site of WHOTS-15 Mooring (anchor position 22° 46.045'N 157° 53.888'W) will be occupied for about 3-4 hours on September 6th.
4) Station 6, referred to as Station Kaena, is located off Kaena Point at 21° 50.8'N, 158° 21.8'W and will be occupied on September 6th 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 September 3rd. 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 WireWalker was to be deployed followed by the free-drifting sediment trap array. These two arrays were to stay in the water for about 54 hours. Following these deployments, a 200m CTD cast for preparation of the Primary Productivity Array was to be conducted. 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 September 6th.

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 September 5th.

A plankton net was to be towed three times between 1000-1400, and three times between 2200-0200 for 30 minute intervals on September 4th and 5th at Station ALOHA.

The Hyperpro was to be deployed for a half-hour period near ~1400 on September 3rd, 4th and 6th.

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 September 6th.

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 Sediment Trap array and the WireWalker on the morning of September 6th.

After recovering the arrays, the ship was to transit to Station 50 to conduct a Hyperpro cast and one-hour 200 m CTD yo-yo cast. The ship was to remain 0.25 nm, downwind and down current from Station 50, 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 50 were complete, the ship was to transit to Station 6 (Kaena).

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, pCO2 the meteorological package, SeaFlow, Inline C-Star Transmissomter and Imaging FlowCytobot (IFCB).

2. SCIENCE PERSONNEL

Participant	**Title**	**Affiliation**	**Citizenship**
Brandon Brenes	Undergraduate Student	UH	USA
Karin Björkman	Scientist	UH	Sweden
Macarena Burgos	Scientist	UH	Spain
Tim Burrell	Research Associate	UH/SCOPE	New Zealand
Mathieu Caffin	Scientist	UH	France
Tara Clemente – Chief Scientist	Research Associate	UH/SCOPE	USA
Julianna Diehl	Marine Technician	OTG	USA
Dan Fitzgerald	Research Associate	UH	USA
Lance Fujieki	Research Associate	UH	USA
Jeff Koch	Marine Technician	OTG	USA
Lucie Knor	Graduate Student	UH	Germany
Andrew Mendenhall	UnderGrad/Volunteer	UH	USA
Tully Rohrer	Research Associate	UH/SCOPE	USA
Dan Sadler	Research Associate	UH	USA
Fernando Santiago-Mandujano	Research Associate	UH	USA
Ryan Tabata	Research Associate	UH/SCOPE	USA
Jessica Tritsch	UnderGrad/Volunteer	UH	USA
Blake Watkins	Marine Engineer	UH	USA
Eleanor Yuan	UnderGrad/Volunteer	UH	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 Southwest.

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.

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

Hyperpro casts were completed at Station Kahe and Station ALOHA.

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

Winds at the beginning of the cruise were from the SSW at 5-10kts and clocked around to the NE strengthening to 15-20kts throughout the cruise. The currents were heading to the SW and the Seas were 2-6 ft.

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

The R/V *Kilo Moana* continues to maintain very good ship support for our work. Captain David Martin and the ship's crew showed flexibility, enthusiasm, concern, and dedication to our scientific mission. We especially commend the bridge for excellent ship handling during the array recoveries and deployments.

Technical support during this cruise was good. OTG personnel were available to assist in our work during the cruise. They were flexible and accommodating. We especially enjoyed the improved science safety drills.

5. DAILY REPORT OF ACTIVITIES (HST)

September 3rd, 2019

O845 Cast off lines and departed UH Marine Center
0925 Safety Briefing, Lab Safety Tour, Fire and Abandon Ship drills
1035 Secure from drills
1100 Daily Meeting with Captain and Chief Engineer.
1130 Arrive Station Kahe.
1139 Begin Weight
1210 End weight cast
1219 Begin Hyperpro. YoYo and 2 deep cast.
1303 End Hyperpro cast
1403 Begin S1C1 CTD cast to 1000m.
1510 End Cast
1520 Depart Station Kahe for transit to ALOHA.
2345 Arrive at Station ALOHA

September 4th, 2019

0000 Start Wire Walker deployment, NW of center
0009 Wire Walker released: 22°48.002 N, 158°01.063 W
0032 Start Sediment Trap array deployment
0052 Sediment Trap array released: 22°47.928 N, 158°02.185 W
0202 Start S2C1 200m CTD
0238 S2C1 End
0403 Start Primary Production array deployment
0423 Primary Production array released: 22°48.811 N, 158°02.209 W
0509 S2C2 near bottom CTD, NOTE: Cast performed at ACO site ~1/4 mile SW of ALOHA center (22°44.285 N, 158°00.405 W)
0656 S2C2 bottom depth, 5m off bottom
0900 S2C2 End
1051 S2C3 1000m CTD
1201 S2C3 End
1218 Begin Net tow
1243 End Net tow
1258 Start HyperPro
1332 End HyperPro
1404 S2C4 1000m CTD
1503 S2C4 End
1509 Transit to pump tanks
1656 S2C5 1000m CTD
1804 End S2C5
1810 Transit to recover PP array
1930 Begin PP array recovery: 22°40.38 N, 158°06.48 W
1948 PP array recovered
2011 S2C6 1000m CTD
2128 End S2C6
2201 Net tow
2229 Net tow end
2234 Net tow
2302 Net tow end
2313 S2C7 1000m CTD

September 5th, 2019

0026 End S2C7
0030 Transit to pump tanks
0155 S2C8 1000m CTD
0257 End S2C8
0300 Transit to deploy Gas Array
0420 Start Gas Array deployment
0436 Gas Array released: 22°44.85 N, 158°02.07 W
0504 S2C9 1000m CTD
0609 End S2C9
0800 S2C10 1000m CTD
0855 End S2C10
0900 Transit to pump tanks
1055 S2C11 1000m CTD
1155 End S2C11

1216 Net tow
1240 Net tow end
1246 Net tow
1313 Net tow end
1401 S2C12 1000m CTD
1507 End S2C12
1523 Start Hand Net Tow
1530 Recover hand Net Tow
1705 S2C13 1000m CTD
1811 End S2C13
1818 Transit to pump tanks
1946 S2C14 1000m CTD
2101 End S2C14
2159 Start Net tow
2230 End Net tow
2301 S2C15 near bottom CTD

September 6, 2019

0100 S2C15 8m off bottom; 22°44.39 N, 158°0.37 W
0250 End S2C15
0308 Deploy Optics package
0443 Optics package recovered
0447 Transit to recover Gas Array, ~16 miles
0629 Begin Gas Array Recover: 22°31.62 N, 158°11.85 W
0642 Gas Array Recovered
0643 Transit to the Sediment Trap Array, ~9.5 miles SW
0751 Begin Sediment Trap Recovery: 22°24.43 N, 158°18.77 W
0807 Sediment Trap Array Recovered
0810 Transit to Wire Walker Array
0845 Begin Wire Walker Recovery
0857 Wire Walker Recovered: 22°24.82 N, 158°15.73 W
0859 Transit to Station 50, WHOTS buoy
1209 Arrive Station 50
1233 Begin HyperPro
1308 End HyperPro
1326 S50C1 200m Yo-Yo, 1000m CTD
1427 End S50C1, 5 cycles complete
1530 Transit to Station Kaena
2037 S6C1 2500m CTD
2250 End S6C1
2305 Transit to Honolulu Harbor, Pier 35

September 7, 2019
0751 Arrive Pier 35
0930 Post Cruise Meeting

HOT program sub-components:

Investigator	Project	Institution
Angelique White	Core Biogeochemistry	UH
Dave Karl	Core Biogeochemistry	UH
John Dore	Biogeochemistry QA/QC	MSU
James Potemra	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	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	UH
Dan Repeta	SCOPE: DOM collection	WHOI
Angelique White	SCOPE: C-STAR, IFCB	UH
Virginia Ambrust	SCOPE: Seaflow	UW
Mathiew Caffin	Isotopic Constraints on the Contribution of N2 fixation to New and Export Production in the NPSG	UH
Allison Coe	Collection of unfiltered seawater to isolate some new phages to investigate PICI elements	MIT
Christopher Schvarcz	Collection of filtered seawater, which will later be used to make media for maintaining cultures of open ocean phytoplankton and their viruses.	UH
Susan Becker	Collection of seawater to continue/expand the freeze/thaw Experiments for the updated GO-SHIP nutrient manual.	UCSD/Scripps