HOT 305: Chief Scientist Report

Chief Scientist: Tara M. Clemente
R/V *Kilo Moana*
September 9-13, 2018

Cruise ID: **KM18-15**
Departed: September 09, 2018 at 0850 (HST)
Returned: September 13, 2018 at 0845 (HST)
Vessel: **R/V *Kilo Moana***
Master of the Vessel: 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. Three stations will be occupied and during the cruise along with the recovery of the deep moored traps, 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 10th 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 will be occupied September 11th – 13th.
3) Station 52, the site of WHOTS-14 Mooring (anchor position 22° 40.01'N 157° 57.09'W) will be occupied on for about one hour on September 13th.
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 13th for about 2 hours.

Upon arrival to Station Kahe a ~1300 lb. weight-test cast to 500 m, one CTD cast to 1000 m, one hand held net tow for the Caron lab and a Hyperpro cast were to be conducted on the afternoon of September 10th. 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. This was to be followed by a 200 m CTD cast for preparation of the Primary Productivity Array. This cast 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 12th.

The lowered-ADCP was to collect current measurements on down- and up-cast. The LADCP, operating in single ping at 4 Hz, was to record measurements internally 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 12th.

A plankton net was to be towed three times between 1000-1400, and three times between 2200-0200 for 30 minute intervals on September 11th and 12th at Station ALOHA.

A plankton net for the Caron Lab was to be towed four times a day for 15-30 minute intervals on September 11th and 12th at Station ALOHA.

The Hyperpro was to be deployed for a half-hour period near ~1400 on September 10th, 11th, and 13th.

An optical package including a SeaBird Seacat with temperature, conductivity, and pressure sensors, a Wetlabs ECO triplet measuring g backscatter, chlorophyll fluorescence, and CDOM fluorescence 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 13th.

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 September 13th.

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-14 ADCP data. Once operations at Station 52 were complete, the ship was to re-position within Station ALOHA to conduct a Hyperpro cast.

Once operations at Station ALOHA were complete, 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.

2. SCIENCE PERSONNEL

Participant	Title	Affiliation	Citizenship
Kendra Babcock	Research Associate	UH	USA
Macarena Burgos	Scientist	UCádiz	Spain
Tim Burrell	Research Associate	UH/SCOPE	New Zealand
Evan Clement	Undergraduate Student	UH	USA
Tara Clemente – Chief Scientist	Research Associate	UH/SCOPE	USA
Carolina Funkey	Research Associate	UH	USA
Alyssa Mincer	Undergraduate Student	UH	USA
Svetlana Natarov	Research Assistant	UH	USA
Dan Sadler	Research Associate	UH	USA
Fernando Santiago-Mandujano	Research Associate	UH	USA
Eric Shimabukuro	Research Associate	UH/SCOPE	USA
Jefrey Snyder	Marine Technician	UH	USA
Ryan Tabata	Research Associate	UH/SCOPE	USA
Ksenia Trifonova	Research Assistant	UH	Germany
Blake Watkins	Marine Engineer	UH	USA
Angelicque White	Scientist	UH/SCOPE	USA
Julianna Diehl	Marine Technician	OTG	USA
Jeff Koch	Marine Technician	OTG	USA

3. GENERAL SUMMARY

Operations at Station ALOHA were conducted with a modified and shortened schedule (Figure 1.). Due to the potential impact of Tropical Storm Olivia our departure was moved ahead one day to Sunday September 9th, 2018 at 0800 to maximize the good weather window. The modified and shortened schedule had us returning to port on Wednesday September 12th, 2018 at 0800.

Departure from Pier 35 on Sunday September 9th, 2018 was delayed by 45 minutes. Operations at Station Kahe were completed late, but successfully with the exception of the HyperPro which was cancelled. Upon arriving at Station ALOHA the sediment traps were successfully deployed and an optics cast was conducted. We then conducted a CTD cast for the primary production in situ incubation array and successfully deployed the primary production array. The deep cast was conducted successfully and we began with CTD casts following the modified schedule.

Both arrays moved ENE in direction. The primary production array was recovered successfully on the evening of September 10th under calm conditions with winds 7-10kts from the NE and 3 ft seas. The Sediment Trap array was recovered on the morning of September 11th 2 1030 under increased winds and seas (15-20 kts, 6-8ft, respectively)

As predicted the winds and seas at Station ALOHA steadily increased late Tuesday evening (September 11th) into Wednesday (September 12th). After discussions with the captain it was decided to stop operations at 1900 on September 11th, following the modified schedule. However, instead of steaming home towards the storm it was decided and steam north approximately 120 miles to avoid the potential effects of tropical storm Olivia. Before departing Station ALOHA the ship transited to Station 52 and we conduct a one-hour 200 m CTD yo-yo cast and deployed the APEX float. On the morning of September 12th, we headed south to Honolulu Harbor, with arrival at Pier 35 scheduled for September 13th, at 0900.

Due to expected weather conditions from Tropical Storm Olivia HOT-305's schedule was amended as follows:

- Departure was moved up one day earlier to 0800 on September 9th, 2018.
- Deployment of the Wirewalker was cancelled.
- Deployment of the sediment trap array was conducted on Sunday September 9th at 2230 and recovered early, ~ 34 hours later on Tuesday September 11th at 1000.
- Deployment of the Gas Array was cancelled.
- Dave Caron's group of 5 persons delayed participation until HOT 306 in October; therefore all the Caron net tows were cancelled.
- S2C15, the second near bottom (4800m) CTD cast was cancelled.
- The 36-hr of continuous CTDs was not completed (only 28 hours were completed).
- The HyperPro cast at Station 52, WHOTS was cancelled.
- S2C6, Station Kaena was cancelled.
- Approximately 1.5 science days were lost due to weather. Arrival into Honolulu Harbor was on Thursday September 13th, at 0845.

One 1000 m CTD cast was completed at Station Kahe. One 200 m CTD, one near bottom CTD casts and twelve 1000 m CTD casts were conducted at Station ALOHA. One 200 m yo-yo CTD cast was completed near the WHOTS mooring (Station 52) with five cycles completed.

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

The ADCP, underway fluorometer, thermosalinograph, transmissometer, pCO2 and the ship's meteorological suite ran without interruption during the cruise.

We arrived at Pier 35 for off-loading on September 13th, at 0845 (HST).

Figure 1.

Ship: R/V *Kilo Moana* HOT 305 Modified Schedule Date: September 9-12, 2018

TIME	Sun. 9/9	Mon. 9/10	Tues. 9/11	Wed. 9/12	Thurs. 9/13
0000			Transit to pump tanks		
0100					
0200		S2C1 PP	S2C7 PUR		
0300					
0400		Deploy PP Array			
0500		S2C2 PO-1	S2C9 Open		
0600					
0700					
0800	All Sci. Aboard		S2C10 PSi	Arrive Pier 35	
0900	Depart Pier 35		Transit to pump tanks Recover Sed Traps		
1000	Arrive Kahe (10:30) Weight Cast				
1100	S1C1 Kahe	S2C3 PO-2	S2C11 Open		
1200	Transit ALOHA	Net Tow	Net Tow Net Tow		
1300		HyperPro			
1400		S2C4 PC/PN	S2C12 ATP		
1500		Transit to pump tanks			
1600					
1700		S2C5 PPO4	Station 52 WHOTS		
1800		Recover PP array	Deploy APEX Float		
1900			Trainsit to Pier 35		
2000		S2C6 BEACH			
2100	Arrive ALOHA Deploy Sed Trap				
2200	Net Tow	Net Tow Net Tow			
2300	Optics	S2C14 HPLC			

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.

Technical support during this cruise was very good. OTG personnel were available to assist in our work during the cruise.

There was some confusion as to which CTD wire was going to be used, we were originally told the 0.681, but found out on loading day that we had to use the 0.322. After discussions with the Captain, Anita Lopez and Jefrey Snyder about our UNOLS Appendix A safety concerns, it was decided to use the 0.322 cable and terminate the 0.681 cable to be used in rough seas or as a backup if needed. We are still waiting for appropriate Appendix A safety calculations and guidelines for use with our CTD package.

5. DAILY REPORT OF ACTIVITIES (HST)

September 9, 2018
0850 Depart Pier 35
0920 Safety Briefing and Science Meeting
0945 Fire and Abandon Ship Drills
1015 Secured from Drills
1140 Arrive Station Kahe
1145 Weight cast to 500m
1213 End of weight cast
1310 S1C1 1000m CTD cast
1427 S1C1 End
1430 Transit to Station ALOHA
2225 Arrive at Station ALOHA, 2nm east of center
2319 Start Sediment Trap array deployment, 2nm east of center
2335 Sediment Trap array released: 22°44.96 N, 157°57.82 W

September 10, 2018
0008 Start Optics Cast
0131 End Optics Cast
0202 S2C1 200m CTD cast
0237 S2C1 End
0407 Start Primary Production array deployment, 2nm north of center
0427 Primary Production array released: 22°47.24 N, 157°59.83 W
0432 Transit to Station ALOHA, Center
0500 Arrive at Station ALOHA, Center
0512 S2C2 near bottom CTD
0707 S2C2 bottom depth 4806db, 7m off bottom
0915 S2C2 End
1103 S2C3 1000m CTD
1236 S2C3 End
1253 Net tow
1321 Net tow end
1334 Start HyperPro
1414 End HyperPro
1417 S2C4 1000m CTD

1705 S2C5 1000m CTD
1813 End S2C5
1815 Transit to recover PP array
1845 Begin PP array recovery: 22°49.175 N, 157°35.378 W
1910 PP array recovered, transit back to ALOHA
2009 S2C6 1000m CTD
2121 End S2C6
2203 Net tow
2230 Net tow end
2235 Net tow
2302 Net tow end
2319 S2C7 1000m CTD

September 11, 2018
0010 End S2C7
0023 Transit to pump tanks
0203 S2C8 1000m CTD
0310 End S2C8
0513 S2C9 1000m CTD
0620 End S2C9
0750 S2C10 1000m CTD
0907End S2C10
0915 Transit to Sediment Trap Array
1005 Begin Sediment Trap array: 22°49.605 N, 157°46.587 W
1035 Sediment Trap array recovered, transit back to ALOHA
1139 S2C11 1000m CTD
1303 End S2C11
1317 Net tow
1340 Net tow end
1345 Net tow
1410Net tow end
1432 S2C12 1000m CTD
1550 End S2C12
1615 Transit to Station 52, WHOTS mooring
1747 Begin S52C1 CTD 200m, 5 cycle yo-yo
1848 End S52C1
1921 Deploy APEX Float
1934 Transit north to avoid Tropical Storm Olivia

September 12, 2018
0730 Transit South to Honolulu

September 13, 2018
0845 Arrive Pier 35
1000 Post-Cruise Meeting

HOT program sub-components:

Investigator	Project	Institution
Dave Karl	Core Biogeochemistry	UH
John Dore	Biogeochemistry QA/QC	MSU
Roger Lukas	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
Dave Caron	SCOPE: Eukaryote DNA	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