HOT 310: Chief Scientist Report

Chief Scientist: Tara M. Clemente
R/V *Kilo Moana*
February 18-22, 2019

Cruise ID: KM 19-03
Departed: February 18, 2019 at 08:42
Returned: February 22, 2019 at 08:20
Vessel: R/V *Kilo Moana*, University of Hawaii
Master of the Vessel: Captain David Martin
OTG Marine Technicians: Jeff Koch and Rob Palomares

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 February 18th 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 February 19th – 21st.
3) Station 50, the site of WHOTS-15 Mooring (anchor position 22° 46.045'N 157° 53.888'W) will be occupied for about one hour on February 21st.
4) Deep Trap Deployment Site (22° 51'N, 157° 54'W) will be occupied on February 21st for approximately 3 hours.

Upon arrival to Station Kahe a ~1300 lb. weight-test cast to 500 m, one Hyperpro cast and one CTD cast to 1000 m cast were to be conducted on the afternoon of February 18th. 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. A net tow for Tom Iwanicki and Geir Johnsen (TI & GJ) was then to be conducted followed by a 1000 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 February 20th.

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 February 20th.

A plankton net was to be towed three times between 1000-1400, and three times between 2200-0200 for 30 minute intervals for Blake Watkins and three additional plankton net tows for TI & GJ were to be conducted between 2200-0200 on February 19th and 20th at Station ALOHA.

The Hyperpro was to be deployed for a half-hour period near ~1400 on February 18th, 19th, and 21st.

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 February 21st.

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 February 21st. After recovering the arrays, the ship was to re-position within Station ALOHA to conduct a Hyperpro cast.

Following the Hyperpro 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 50, 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 transit to the deep trap deployment site.

Once at the deep trap deployment site, three McLane sediment traps were to be deployed at the following depths, ~4750m, ~4200m, ~4000m. Following deployment of the traps acoustic mapping of the location of the anchor was to be conducted. Once mapping of the deep trap anchor was complete we were to begin transiting 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
Kendra Babcock	Research Associate	UH	USA
Karin Björkman	Scientist	UH	Sweden
Macarena Burgos	Scientist	UCádiz	Spain
Tim Burrell	Research Associate	UH/SCOPE	New Zealand
Tara Clemente – Chief Scientist	Research Associate	UH/SCOPE	USA
Mathilde Dugenne	PostDoc	UH/SCOPE	France
Dan Fitzgerald	Research Associate	UH	USA
Carolina Funkey	Research Associate	UH	USA
Tom Iwanicki	Graduate Student	UH	Canadian
Geir Johnsen	Scientist	NTNU/TBS	Norwegian
Alyssa Mincer	Undergraduate Volunteer	UH	USA
Tess Rigler	Undergraduate Volunteer	UH	USA
Tully Rohrer	Research Associate	UH/SCOPE	USA
Dan Sadler	Research Associate	UH	USA
Sienna Santiago	Undergraduate Volunteer	UH	USA
Fernando Santiago-Mandujano	Research Associate	UH	USA
Jefrey Snyder	Marine Technician	UH	USA
Blake Watkins	Marine Engineer	UH	USA
Julianna Diehl	Marine Technician	OTG	USA
Jeff Koch	Marine Technician	OTG	USA
Rob Palomares	Marine Technician	OTG	USA

3. GENERAL SUMMARY

All operations were completed at Station Kahe. Upon arriving at Station ALOHA the sediment traps and the WireWalker were successfully deployed and drifted NW in direction. The primary production CTD cast was cancelled due to the 0.322 wire getting damaged on the drum. The 0.322 wire was re-terminated, and the deep cast was conducted successfully. During the deep cast weather at station ALOHA worsened unexpectedly. Operations at Station ALOHA were suspended by the Captain due to weather conditions outside operational limits. The weather conditions were 35-40kt winds from the ESE, and 12-15 ft seas.

Operations were delayed approximately 8 hours due to weather. During our weather delay the ship conducted speed log calibrations. Science operations resumed with a CTD cast at ~ 1700 on February 19th, 2019 following a modified schedule.

The Gas array was successfully deployed on the morning of February 20th, but the primary production array deployment was cancelled due to weather predicted for the recovery. The weather continued to remain unpredictable throughout the cruise.

During the Gas array deployment we had a near miss incident. I was not present at the time of the incident but the following is a report submitted by Jefrey Snyder who was present and involved:

> "Two people from the science party came dangerously close to severe injury during the Gas Array deployment. This near miss incident happened when the CTD .322 wire became taught between the moving A-frame and the rosette located in the staging bay.
>
> Macarena Burgos was observing the gas array deployment from inside the staging bay when the tightening .322 CTD wire bent down the stainless steel hooks it was resting on and snapped against her safety hard hat. Unaware what had hit her, she let out a loud scream when she was hit.
>
> Jefrey Snyder was also in the staging bay, preparing the rosette for the next CTD cast. While bent over draining water from the bottom bottle cap there was a loud noise above him as the tightening wire scraped across the top caps of the bottles. He then heard a loud scream as the rosette and pallet began moving towards him scrapping across the deck. He quickly stood up and saw the CTD wire taught next to his head and neck area as the A-frame stopped moving due to the warning scream."

Thankfully no one was hurt during the incident and a post-cruise science meeting was conducted to discuss the incident and solutions to increase deck safety.

On February 21st, we successfully conducted the optics cast followed by the recovery of the Sediment Trap array and WireWalker. Following these recoveries we conducted a Hyperpro cast and a one-hour 200 m CTD yo-yo cast at Station 50. We then transited to the trap deployment site where the three McLane Deep Moored Sediment Traps were successfully deployed and the anchor position triangulated. After deployment was complete we headed south to Honolulu Harbor and Pier 35.

Due to unexpected weather conditions and CTD winch issues the schedule was amended as follows:

- S2C1 was cancelled due to wire being damaged in the winch drum, therefore needing re-termination.
- Deployment of the primary production array was cancelled because we did not receive water from S2C1 for incubation experiment.
- Operations were suspended after the first deep cast S2C2 due to unexpected inclement weather and did not resume until the weather calmed down.
- The 36-hr of continuous CTDs was not completed (only 28 hours were completed).

- One Hyperpro cast was cancelled.
- One daytime net tow was cancelled.
- Approximately 8 hours were lost due to weather.

One 1000 m CTD cast was completed at Station Kahe. Two near bottom CTD casts and eleven 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; two during the day, and two during the night. Three net tows for TI & GJ were completed successfully.

The ADCP, underway fluorometer, thermosalinograph, transmissometer, pCO2 and the ship's meteorological suite ran with a few glitches during the cruise. The ADCP WH-300 was lost for several hours, but temporarily repaired. The remote IMET lab had to be restarted twice. The data recording rates for the Fluorometer and Thermosalinograph experienced glitches and were fixed by rebooting the IMET remote.

We arrived at Pier 35 for off-loading on February 22nd, at 0820 (HST).

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)

February 18, 2019
0842 Depart Pier 35
0925 Safety Briefing and Science Meeting
1005 Fire Drill
1010 Lab Safety Drill
1030 Abandon Ship Drill
1042 Secured from Drills
1130 Arrive Station Kahe
1142 Weight cast to 500m
1233 End of weight cast
2304 Arrive at Station ALOHA
2320 Start Wire Walker deployment, 3nm West of center
2329 Wire Walker released: 22°45.017 N, 158°03.222 W
2359 Start Sediment Trap array deployment, 2nm east of center

February 19, 2019
0031 Sediment Trap array released: 22°45.073 N, 158°02.096 W
0046 Net tow (For Geir Johnson and Tom Iwanicki)
0129 Net tow end

0200 Start S2C1- CTD winch making strange noise before deployment
0214 Abort S2C1 – CTD wire needs to be re-terminated, wire damaged in the drum
0415 Re-termination completed, on station for deep cast
0439 S2C1 near bottom CTD
0654 S2C1 bottom depth 4809db, 7m off bottom
0855 S2C1 End
2000 Operations suspended by the Captain due to weather conditions outside limits of operation 35-40 kt winds, 12-15ft seas.
1400 Ship is conducting speed log calibrations while science ops are on weather delay.
1650 S2C2 1000m CTD
1804 S2C2 End
1820 Transit to locate sediment trap array (Argos fixes have been unreliable, and Iridium is not working) - visual confirmation
1954 S2C3 1000m CTD – Problems with the traction winch, 2 bends found on CTD cable
2003 Stop CTD, Engineers look into the winch and wire
2020 CTD wire is tangled on the traction sheaves – crew work on untangling, wire appears undamaged
2110 Restart S2C3 1000m CTD
2252 S2C3 End
2311 Net tow
2338 Net tow end
2340 Net tow

February 20, 2019
0010
0106 Transit to pump tanks
0200 S2C4 1000m CTD
0333 S2C4 End
0442 Start Gas Array deployment
0504 Gas Array Released: 22°41.515 N, 157°58.996 W
0540 S2C5 1000m CTD
0655 S2C5 End
0802 S2C6 1000m CTD
0913 S2C6 End
0920 Transit to pump tanks
1100 S2C7 1000m CTD
1218 S2C7 End
1230 Net tow
1300 Net tow end
1304 Net tow
1330 Net tow end
1340 Begin HyperPro
1417 End HyperPro
1433 S2C8 1000m CTD
1556 S2C8 End
1659 S2C9 1000m CTD
1821 S2C9 End
1830 Transit to pump tanks
1958 S2C10 1000m CTD
2134 S2C10 End
2200 Net Tow
2234 Net tow end
2238 Net tow (For Geir Johnson and Tom Iwanicki)

2323 Net tow end

February 21, 2019
0017 S2C11 near bottom CTD
0242 S2C11 9m off bottom
0426 S2C11 End
0445 Optics Cast 1
0519 Optics Cast 1 End
0525 Optics Cast 2
0600 Optics Cast 2 End
0610 Transit to Gas Array
0720 Begin Gas Array recovery at 22° 35.05’ N, 157° 58.71’ W
0740 End recovery
0745 Transit to Sediment Trap Array
0905 Begin Sediment Trap Array recovery at 22° 44.081’ N, 158° 05.039’ W
0928 End recovery
0932 Transit to WireWalker
1004 Begin WireWalker recovery at 22° 44.669’ N, 158° 06.127’ W
1017 End recovery
1020 Transit to Station 50, WHOTS Mooring
1100 Begin HyperPro
1145 End HyperPro
1305 Begin S50C1 CTD yoyo cast, 5 cycles to 200m
1419 S50C1 End
1420 Holding Station for ADCP Inter-comparison
1500 Transit to Deep Sediment Trap deployment site
1600 Start Deep Sediment Trap Mooring deployment
1640 Top Float in the Water at 22° 50.007’ N, 157° 55.990’ W
1844 Anchor Released at 22° 50.719’ N, 157° 55.068’ W
1900 Survey to triangulate anchor location
2040 End of triangulation survey
2040 Transiting to Honolulu Harbor

February 22, 2019
0820 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
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
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
Chris Schvarcz	Cultivate dominant virus-host systems for eukaryotic phytoplankton at Station ALOHA.	UH
Tom Iwanicki & Geir Johnson	Bioluminescent spectra Kinetics of Calanoid copepods	UH & NTNU/TBS