HOT 321: Chief Scientist Report
Chief Scientist: Carolina Funkey
R/V *Kilo Moana*
August 6-11, 2020

Cruise ID: KM 20-09
Vessel: R/V *Kilo Moana*, University of Hawaii
Master of the Vessel: Captain Joey Daigle
Chief Scientist: Carolina Funkey, University of Hawaii
Marine Technicians: Lance Frymire, Trevor Young

1.0 COVID-19 PREVENTION

Due to the current COVID-19 pandemic extra precautions were set in place before and during the cruise to prevent the spread of COVID-19 onboard. UNOLS has provided guidelines which were followed on this cruise. A few of the guidelines are found below. The extensive list can be found in the Pandemic Response Plan.

- Sailing with a minimum science party, one scientist per stateroom (11 scientist).
- All cruise participants will self-isolate according to the HOT Risk Mitigation Plan before the cruise (July 22nd – August 4th).
- All cruise participants will be tested for COVID-19 three days before the cruise (August 3rd).

During the cruise all participants:

- wore face masks
- maintained a distance of 6 ft. when possible
- properly disinfected of all workspaces often
- remain in their staterooms as much as possible during non-work hours

2.0 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 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 will be occupied on August 6th 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 August 7th – 10th.
3) Station 52, the site of WHOTS-16 Mooring (anchor position 22° 40.01'N 157° 56.96'W) will be occupied for about 3-4 hours on August 10th.
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 August 10th 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 August 6th. 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. The HyperPro was to be deployed for one yo-yo and two profiles.

Upon arrival to Station ALOHA, the WireWalker was to be deployed, followed by the deployment of the free-drifting sediment trap array. These two arrays were to stay out at sea for about 72 hours, which is one day longer than a normal cruise. This was to be followed by a 1000 m CTD cast for the preparation of the Primary Productivity Array. The deployment of the free-drifting Primary Productivity Array was to be incubated in situ from dawn to dusk. A 1000 m CTD cast was to be conducted afterwards for SCOPE DNA samples.

Plankton net were to be towed between 1000-1400, and 2200-0200 for 30-minute intervals on August 7th, 8th and 9th at Station ALOHA. Handheld plankton net (50 μm mesh) were to be towed for 15-30 minutes, moving at ~0.5 knots. These tows were done around noon and midnight on August 7th, 8th and 9th h.

The HyperPro was to be deployed around noon time on August 7th and 10th. An optical 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 August 8th.

A full-depth (~4740 m) CTD cast was to be conducted after the Optics Cast, 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 August 9th.

The gas array was to be deployed for 24 hours for incubation experiments on August 9th, which was to be recovered on August 10th.

Following the gas array recover the WireWalker and the free-floating sediment trap were to be recovered.

At Station 52 (WHOTS-16 mooring) a one-hour 200 m CTD yo-yo cast was to be conducted.

An additional 1000 m CTD cast was to be deployed for size fractionated particulate material.

Once the above operations were to be completed, the ship was to transit to Station Kaena to conduct a near-bottom CTD cast. After all operations were to be completed, the ship was to transit back to Honolulu Harbor, Pier 35.

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

The following instruments was to be collected data throughout the cruise: shipboard ADCP, thermosalinograph, LISST, transmissometer, pCO2 the meteorological package, Inline C-Star Transmissometer and Imaging FlowCytobot (IFCB).

In addition, two McLane pumps were to be tested for large volume collection of particulate material on different pore size filters and were to be assessed for total mass collected. The two pumps were to be connected to the underway system and run for as long as possible.

3.0. SCIENCE PERSONNEL

Participant	Title	Affiliation	Citizenship
Karin Björkman	Scientist	UH	SWE
Brandon Brenes	Research Assistant	UH	USA
Tim Burrell	Research Associate	UH/SCOPE	NZL
Dan Fitzgerald	Research Associate	UH	USA
Lance Frymire	Marine Technician	OTG	USA
Carolina Funkey-Chief Sci	Research Associate	UH	USA
Lucie Knor	Graduate Student	UH	DEU
Fernando Pacheco	Research Associate	UH	BRA
Tully Rohrer	Research Associate	UH/SCOPE	USA
Ryan Tabata	Research Associate	UH/SCOPE	USA
Blake Watkins	Marine Engineer	UH	USA
Angelicque White	PI	UH	USA
Trevor Young	Marine Technician	OTG	USA

4.0. GENERAL SUMMARY

All operations were completed at Station Kahe. Upon arrival at Station ALOHA, the WireWalker, sediment traps were deployed and drifted North and were recovered on the last day. The primary production array was deployed at dawn, drifting North and recovered at dusk on the 7th. Unfortunately, the bottles were put in reverse order and therefore the data is unusable.

One 1000 m CTD cast was completed at Station Kahe. At Station ALOHA, two near bottom CTD casts, fourteen 1000 m CTD casts, and two shallower casts varying from 25 -400-meter depths CTD casts. 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.

Six net tows for the core HOT zooplankton collection were completed successfully; three during the day and three during the night. An additional six handheld net tows were completed three at noon and three at midnight.

The gas array was deployed and drifted North and recovered successfully.

HyperPro casts were completed at Station Kahe and Station ALOHA.

The ADCP, underway fluorometer, transmissometer and the ship's meteorological suite ran without interruption during the cruise. The data from the thermosalinograph still had a few issues due to the pressure flow system causing the data to be segmented.

For the majority of the cruise the winds were from the East at 15-23 kts. The Seas were 6-9ft.

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

The R/V *Kilo Moana* continues to maintain very good ship support for our work. The LARS system is working well even though a few minor issues that we had on the previous cruise remains such as: docking head not mounting over the bridle, excessive cable lube, and payout meter discrepancies, but none of these issues impeded our work.

In the IMET lab the pressure flow system is still experiencing intermittent and reduced flow rates, which impacted the quality of the thermosalinograph data. This issue has been discussed with OTG and they believe they can get it fixed for the next HOT cruise.

Captain Joey Daigle and the ship's crew showed flexibility, concern, and dedication to our scientific mission.

Technical support during this cruise was great. OTG personnel were available to assist in our work during the cruise. They were flexible and accommodating.

6.0. DAILY REPORT OF ACTIVITIES (HST)

August 6, 2020

- 0657: Departure from the Marine Center
- 0815: Abandon Ship drills
- 0930: Arrive to Station Kahe
- 0940-1020: Weight Cast
- 1042-1128: HyperPro (2 profiles and 1 yoyo)
- 1215-1322: Kahe Cast (S1C1 to 1000m)
- 1330: Depart to Station ALOHA
- 2115: Arrive to Station ALOHA
- 2228-2242: Deployed the WireWalker: 22°40.4276’ N, 158°02.0975’ W
- 2309-2346: Deployed the Sediment Traps (2 crosses): 22°40.4462’ N, 158°01.0748’ W

August 7, 2020

- 0203-0257: Primary Production Cast (S2C1 to 1000m)
- 0423-0450: Deployed the Primary Production Array: 22°44.1662’ N, 158°02.4701’ W
- 0830- 0932: SCOPE DNA Cast (S2C2 to 1000m)
- 1200-1233: Net Tow (x1)
- 1238- 1308: Hand Net Tow (x1)
- 1313-1350: HyperPro (1 yoyo, 2 profiles)
- 1357-1433: Ancillary Science Cast (S2C3 to 300m)
- 1910-1927: Recovery of the Primary Production Array: 22°47.3457’ N, 158°01.9693’ W
- 2209-2310: Net Tow (x2)
- 2320-2343: Hand Net Tow
- 2351-0128: Optics Cast

August 8, 2020

- 0401-0742: Deep Cast (PO-1) (S2C4 to 4800m)
- 1058-1220: Shallow Cast (PO-2) (S2C5 to 1000m)
- 1231-1255: Net Tow (x1)
- 1316-1330: Hand Net Tow (x1)
- 1411: PC/PN Cast (S2C6 to 1000m)
- 1700-1755: PPO4 Cast (S2C7 to 1000m)
- 1957-2101: Beach Cast (S2C8 to 1000m)
- 2200-2227: Net Tow (x1)
- 2238: Hand Net Tow (x1)
- 2310-2403: SCOPE DNA Cast (S2C9 to 1000m)

August 9, 2020

- 0214- 0307: Gas Array Cast (S2C10 to 1000m)
- 0412-0427: Deployment of the Gas Array
- 0454-0559: MC DNA Cast (S2C11 to 1000m)

- 0754-0900: PSi Cast (S2C12 to 1000m)
- 1054-1201: High Resolution Cast (S2C13 to 1000m)
- 1215-1243: Net Tow (x1)
- 1248-1305: Hand Net Tow (x1)
- 1354-1503: ATP and SCOPE DNA Cast (S2C14 to 1000m)
- 1700-1751: Ancillary Science Cast (S2C15 to 1000m)
- 2005-22105: HPLC Cast (S2C16 to 1000m)
- 2214-2235: Hand Net Tow (x1)
- 0034-0207: Deep Cast #2 (S2C17 to 4800m)

August 10, 2020

- 0405-0426: Recovery of the Gas Array: 22°50.0814’ N, 158°02.7805’ W
- 0445-0504: Recovery of the WireWalker: 22°50.7206’ N, 158°01.9244’ W
- 0539-0556: Recovery of the Sediment Traps: 22°51.5807’ N, 157°59.4049’ W
- 0958-1100: WHOTS Cast (S52C1 to 200 m)
- 1157-1231: HyperPro (1 yoyo, 2 profiles)
- 1258-1325: Size fractionated particulate material Cast (S2C18 to 400m)
- 1330: Transit to Kaena
- 1850: Arrive to Kaena
- 1916-2127: Kaena Station Cast (S6C1 to 2500)
- 2130: Transit to Honolulu

August 11, 2020

- 0741: Arrive to Pier 35

HOT program sub-components:

Investigator	Project	Institution
Angelicque White	Core Biogeochemistry	UH
Dave Karl	SCOPE-biogeochemistry and particle flux	UH
John Dore	Biogeochemistry QA/QC	MSU
James Potemra	Hydrography	UH
Mike Landry	Zooplankton dynamics	SIO
Ricardo Letelier	Optical measurements	OSU
Ancillary programs:		
Virginia Ambrust	SCOPE: Seaflow	UW
Karin Björkman (Karl)	Deep sea ATP sampling	UH
Matt Church	Diversity and activities of nitrogen-fixing microorganisms	UM/FLBS
Ed DeLong	SCOPE: DNA and Viral DNA collection	UH
Andrew Dickson	CO_2 dynamics and intercalibration	SIO
Robert Letcher	Transparent exopolymer and phytoplankton vertical migration as sources for preformed nitrate anomalies in the subtropical N. Pacific Ocean	UNH
Paul Quay	$DI^{13}C$	UW
Dan Repeta	SCOPE: DOM collection	WHOI
Angelicque White	SCOPE: C-STAR, IFCB, UVP	UH
John Zehr	Samples for unicellular cyanobacterium	UCSC