HOT 318: Chief Scientist Report
Chief Scientist: Carolina Funkey
R/V *Kilo Moana*
January 6-9, 2020

Cruise ID: KM 20-1
Vessel: R/V *Kilo Moana*, University of Hawaii
Master of the Vessel: Captain Joey Daigle
Chief Scientist: Carolina Funkey, University of Hawaii
Marine Technicians: Juliana Diehl, Lance Frymire and Alex Sidelev

1.0 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 January 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 January 7th – January 9th.
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 January 8th.
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 January 9th 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 January 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. After the CTD cast, both the old and the new Hyperpro were to be cast each did one yo-yo and one profile. 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 deployment of the free-drifting sediment trap array. These two arrays were to stay in the water for about 52 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, 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 January 8th. Another free-drifting array (Gas Array) was to be deployed for 24 hours for incubation experiments on January 8th. The Gas Array was to be recovered on January 9th. A plankton net was to be towed between 1000-1400, and 2200-0200 for 30 minute intervals on January 7th and 8th at Station ALOHA.

The Hyperpro was to be deployed at noon time on January 6th, 7th and 9th. 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 January 9th. After the 36 hour burst period of CTD

work and the optical cast at Station ALOHA were accomplished, the ship was to transit to recover the floating Gas Array, the Wirewalker, and the Sediment Trap Array on the morning of January 9th. After recovering the arrays, the ship was to transit to Station 52 (WHOTS-16 mooring) to conduct a one-hour 200 m CTD yo-yo cast.

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

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 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
Karin Björkman	Scientist	UH	Sweden
Ximena Boza	Volunteer	Smithsonian	Panama
Brandon Brenes	Undergraduate Student	UH	USA
Tim Burrell	Research Associate	UH/SCOPE	New Zealand
Mathieu Caffin	Post Doc	UH	France
Eric Chan	Scientist	UTRGV	USA
Tara Clemente	Research Associate	UH/SCOPE	USA
Julianna Diehl	Marine Technician	OTG	USA
Dan Fitzgerald	Research Associate	UH	USA
Lance Frymire	Marine Technician	OTG	USA
Carolina Funkey -Chief Sci	Research Associate	UH	USA
Benjamin Granzow	Graduate Student	MIT	USA
Sophia Indebetouw	High School Volunteer		USA
Lucie Knor	Graduate Student	UH	Germany
Kelsey Maloney	Undergrad Student	UH	USA
Courtney Morgan	Undergrad Students	UH	USA
Fernando Pacheco	Research Associate	UH	Brazil
Alexa Quiroz	Undergrad Student	UH	USA
Tully Rohrer	Research Associate	UH/SCOPE	USA
Dan Sadler	Research Associate	UH	USA
Andrés Salazar	Graduate Student	UH	Chile
Alex Sidelev	Marine Technician	OTG	USA
Ryan Tabata	Research Associate	UH/SCOPE	USA
Blake Watkins	Marine Engineer	UH	USA

3. GENERAL SUMMARY

All operations were completed at Station Kahe. Upon arrival to Station ALOHA the winds were already at 27 knots with gust to 30 knots. We decided to cancel the deployment of the WireWalker and the sediment trap. Due to the slight tangle with the 322-wire winch which happened during the

previous cruise (HOT 317), and the strong winds we decided to abort all operation until day light. During the night despite the strong winds the bridge was able to hold position; we deemed it safe to deploy the deep cast in the morning.

One 1000 m CTD cast was completed at Station Kahe. One near bottom CTD casts and nine 1000 m CTD casts were conducted at Station ALOHA.

Due to the strong winds during the duration of the cruise all net tows, the primary production array and the gas array were canceled.

Hyperpro casts were completed at Station Kahe. Casts with a newly calibrated Hyperpro system were performed directly after the new Hyperpro unit to compare the two systems. One yo-yo and one profile was done on each. Due to the strong winds during the duration of the cruise at Station ALOHA the Hyperpro was canceled.

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

The lowered-ADCP gave problems during data downloading on the Kahe cast. We discovered that the dummy plug was not the problem but that it was the low voltage on the battery. A new battery was put in and the ADCP worked on all the other casts.

On the previous cruise, HOT 317, bad wrapping developed on the drum of the 322-winch at about 4000 meters during the deep cast. During the deep cast deployed on HOT 318 the crew was able to fix the tangle on the drum and properly wrap up the rest of the line onto the drum. Due to the high winds and the potential of having more level- wind problems with the 322- line we switched over to the 681-wire after the deep cast on January 7th. The rest of the CTD casts were done with the 681-wire.

The winds at Station ALOHA during that duration of the cruise were fairly consistent ranging from 23-31 knots coming from the NE. The swells had an average height of 10 ft.

The CTD yo-yo at the WHOTS mooring and Kaena station was canceled due to the high spiking wire tension seen on the last CTD cast (S2C10). We transited back to Pier 35 after Station 2 Cast 10 and arrived one day early, on January 9th.

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 Joey Daigle and the ship's crew showed flexibility, concern, and dedication to our scientific mission. We especially commend the bridge for holding position during windy conditions while we deployed all CTD casts successfully.

OTG personnel were very accommodating at trying to get all our water requests during very windy cruise conditions while also being extremely thorough and cautious during deployments and recoveries of the CTD.

5. DAILY REPORT OF ACTIVITIES (HST)

January 6, 2020

- 0845 Depart UH Marine Center
- 1000 Safety Briefing
- 1030 Safety Drills
- 1130 Arrive to Station Kahe
- 1136- 1210 Weight Cast
- 1230- 1330 Hyperpro (both the new and old Hyperpro were deployed each did: one yo-yo and one profile)
- 1354- 1512 Kahe Cast (S1C1)
- 1520 Depart Station Kahe for transit to station ALOHA
- 2305 Arrive to station ALOHA
- 23:20 Operations were postponed until daylight

January 7, 2020

- 0738- 1317 PO Deep Cast (S2C1)
- 1320-1500 Transit out of Station ALOHA for pumping sewage tanks and trash incineration
- 1400 -1545 Switched from 322 to 681- wire
- 1620-1742 PO Shallow Cast (S2C2)
- 1849- 2002 Beach Cast (S2C3)
- 2119-2228 PC/PN Cast (S2C4)
- 2336-2449 PPO4 Cast (S2C5)

January 8, 2020

- 0211-0332 HPLC Cast (S2C6)
- 0437-0341 PSi Cast (S2C7)
- 0644 Pump sewage tanks
- 0803-0917 ATP Cast (S2C8)
- 1034-1210 OPEN Cast (S2C9)
- 1200 WHOTS Mooring ADCP inter-comparison
- 1639-1750 SCOPE Cast (S2C10)
- 1800 Transit back to Pier 35

January 9, 2020

- 0845 Arrive to Pier 35

HOT program sub-components:

Investigator	Project	Institution
Angelicque 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:		
Virginia Ambrust	SCOPE: Seaflow	UW
Eric Chan	Collect water to measure oxygen isotopes to determine water mass source	UTRGV
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
Sara Ferrón-Smith	Determination of gross primary production from the euphotic zone in situ, using the drifting primary production array	UH
Benjamin Granzow	Enzyme kinetic experiments to determine C-P lyase activity	MIT
Anitra Ingalls	Metabolomics and macromolecules	UW
Paul Quay	$DI^{13}C$	UW
Dan Repeta	SCOPE: DOM collection	WHOI
Angelicque White	SCOPE: C-STAR, IFCB	UH
Sam Wilson	Reduced gases in the upper ocean: The cycling of methane, sulfide and nitrous oxide.	UH