HOT 317: Chief Scientist Report
Chief Scientist: Carolina Funkey
R/V *Kilo Moana*
December 18-20, 2019

Cruise ID: KM 19-24
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 and Lance Frymire

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 December 18th 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 December 19th – December 21st.
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 December 21st.
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 December 21st 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 December 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 the CTD cast, both the old and the new Hyperpro were to be cast each did one yo-yo and one profile. Then a hand net tow was to be cast for the Stanford group. 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 December 20th. Another free-drifting array (Gas Array) was to be deployed for 24 hours for incubation experiments on December 20th. The Gas Array was to be recovered on December 21st.

A plankton net was to be towed between 1000-1400, and 2200-0200 for 30 minute intervals on December 19th and 20th at Station ALOHA.

The Hyperpro was to be deployed at noon time on December 18th and 19th. 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 December 21st. 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 December 21st. 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
Macarena Burgos	Scientist	UH	Spain
Tim Burrell	Research Associate	UH/SCOPE	New Zealand
Nina Buzby	Volunteer	SFEI	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
Deepak Krishnamurthy	Graduate Student	Stanford	India
Lucie Knor	Graduate Student	UH	Germany
Adam Larsson	Postdoc	Stanford	USA
Hongquan Li	Graduate Student	Stanford	China
Amanda Loveless	Scientist	UH	USA
Sean Mahaffey	Graduate Student	UH	USA
Mariam Moreno	Undergrad Student	UH	USA
Fernando Pacheco	Research Associate	UH	Brazil
Manu Prakash	Scientist	Stanford	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
Blake Watkins	Marine Engineer	UH	USA

3. GENERAL SUMMARY

All operations were completed at Station Kahe. Upon arrival to Station ALOHA we accessed the weather forecast and decided to cancel the deployment of the WireWalker and the sediment trap array due to the predicted high winds (>30 knots) on the recovery day of December 21st.

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

Four net tows for the core HOT zooplankton collection were completed successfully; two during the day and two during the night. In addition, 4 hand net tows (50 um mesh net) were collected for the ancillary group from Stanford.

Hyperpro casts were completed at Station Kahe and Station ALOHA. Casts with a newly calibrated Hyperpro system were performed directly after the regular Hyperpro unit to compare the two systems. One yo-yo and one profile was done on each.

The primary production cast was deployed and successfully recovered on December 19th. It was incubated for nearly 14 hours.

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 E at about 15kts and by Friday morning at 0200 the winds were over 30 knots from the NE with swells of 15 ft.

The Dynacon 0.322 winch exhibited level wind sensor problems during the first CTD casts on its way up, the crew managed to fix it and was working for the other casts. However a bad wrapping developed on the drum at about 4000 m during the deep cast, which remained on the drum for the rest of the casts.

The lowered-ADCP gave problems during data downloading, breaking the data into multiple files which had to be downloaded at the end of the CTD work instead of doing it after every cast. This problem will be communicated to E. Firing.

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, enthusiasm, concern, and dedication to our scientific mission. We especially commend the bridge for excellent ship handling during the Primary production array and the CTD casts during windy conditions until operations were canceled.

Technical support during this cruise was good. OTG personnel were available to assist in our work during the cruise. New OTG personnel was good and at asking for help and advice.

5. DAILY REPORT OF ACTIVITIES (HST)

December 18, 2019

- 0915 Depart UH Marine Center
- 1000 Safety Briefing
- 1030 Safety Drills
- 1145 Arrive to Station Kahe
- 1158- 1225 Weight Cast

- 1240- 1325 Hyperpro (both the new and old Hyperpro were deployed each did: one yo-yo and one profile)
- 1335-1355 Net tow for Stanford
- 1407- 1514 Kahe Cast (S1C1)
- 1530 Depart Station Kahe for transit to station ALOHA
- 2302 Arrive to station ALOHA
- 2332- 2344 Net tow for Stanford

December 19, 2019

- 0007-0035 Net tows for HOT 22° 43.6166' N, 158° 01.3696' W
- 0043-0114 Net tows for HOT 22° 43.3210' N, 158° 01.3596' W
- 0153-0306 Primary Production Cast (S2C1)
- 0424-0514 Primary Production Deployment 22° 43.598' N, 158° 01.534' W
- 0555-1013 PO Deep Cast (S2C2)
- 1137-1253 PO Shallow Cast (S2C3)
- 1310-1347 Net tow for HOT 22° 44.8' N, 157° 59.8' W
- 1355-1420 Hyperpro (1 yoyo and 1 profile)
- 1423-1434 Net Tow for Stanford
- 1442-1559 PCPN Cast (S2C4)
- 1728-1847 PPO4 Cast (S2C5)
- 1928-1944 Recovery of Primary Production Array 22° 49.085' N, 158° 00.1483' W
- 1954-2141 BEACH Cast (S2C6)
- 2154- 2208 Net tow for Stanford
- 2214-2241 Net tow for HOT 22° 49.2' N, 157° 59.8' W
- 2252- 0021 HPLC Cast (S2C7)

December 20, 2019

- 0154 Start of PSi Cast (S2C8)
- 0221 Aborted PSi Cast due to winds > 30 knots and heavy swells
- 0230 Decided to abort all operations until daylight
- 0630 Captain decided to abort the rest of the HOT operations due to bad weather forecast until Sunday (winds 30-40 knots swells of 15 feet)
- 0745 Passed by WHOTS mooring to take photographs of the damaged anemometer
- 0800 Begin transiting to Station Kahe
- 1548-1554 Station Kahe Net tow for Stanford
- 1555 Transit to Pier 35
- 1924 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:		
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
Manu Prakash	"Gravity Machine" Testing a microscope for scale free vertical tracking of marine plankton in field conditions	Stanford
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
Angelicque White	SCOPE: C-STAR, IFCB	UH
Virginia Ambrust	SCOPE: Seaflow	UW