HOT 319: Chief Scientist Report

Chief Scientist: Dan Sadler

R/V *Kilo Moana*

January 29-February 2, 2020

Cruise ID: KM 20-3
Vessel: R/V *Kilo Moana*, University of Hawaii
Master of the Vessel: Captain David Martin
Chief Scientist: Dan Sadler, University of Hawaii
Marine Technicians: Trevor Young, Jeff Koch and Alexander 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 29th 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 29th – February 1st.
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 February 1st.
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 February 1st 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 29th. 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. A trace metal free rosette CTD cast to 75m was to be performed. 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 31st. Another free-drifting array (Gas Array) was to be deployed for 24 hours for incubation experiments on January 31st. The Gas Array was to be recovered on February 1st. A plankton net was to be towed between 1000-1400, and 2200-0200 for 30 minute intervals on January 30th and 31st at Station ALOHA.

The Hyperpro was to be deployed at noon time on January 29th, 30th and February 1st. 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 February 1st. 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 February 1st. 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 followed by a Trace Metal Free CTD cast to 500m.

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	SWE
Brandon Brenes	Undergraduate Student	UH	USA
Macarena Burgos	Postdoc	UH	ESP
Tim Burrell	Research Associate	UH/SCOPE	NZL
Mathieu Caffin	Post Doc	UH	FRA
Tara Clemente	Research Associate	UH/SCOPE	USA
Haley Chasin	Undergraduate Student	UH	USA
Kieran Curran	Postdoc	UNH	GBR
Dan Fitzgerald	Research Associate	UH	USA
Carolina Funkey	Research Associate	UH	USA
Lucie Knor	Graduate Student	UH	GDR
Jeff Koch	Technician	OTG	USA
Robert Letscher	Scientist	UNH	USA
Fernando Pacheco	Research Associate	UH	BRA
Tully Rohrer	Research Associate	UH/SCOPE	USA
Dan Sadler-Chief Sci	Research Associate	UH	USA
Alex Sidelev	Marine Technician	OTG	USA
Paul Spooren	Graduate Student	UH	GDR
Ryan Tabata	Research Associate	UH/SCOPE	USA
Jessica Tritsch	Undergraduate Student	UH	USA
Blake Watkins	Marine Engineer	UH	USA
Trevor Young	Technician	OTG	USA

3. GENERAL SUMMARY

All operations were completed at Station Kahe.

Operations at Station ALOHA were impacted by large ground swells and a weather front to the north. The large swells kept the ship heaving and rocking, generating large tension spikes during CTD casts.

Winch speeds were reduced to compensate, resulting in longer cast times. The motion also produced several kinks in the 0.322 CTD cable. CTD operations were switched to the 0.681 wire after S2C11. The 0.681 wire provided a larger safety margin and resisted further kinks.

Anticipating degenerating conditions from the approaching weather front, Seaglider 512 was recovered on Thursday along with the primary production array. The Wirewalker and sediment traps were recovered a day early on Friday afternoon and the gas array Friday after dark in 25 to 30 knot winds. The gas array samples were moved to a deck incubator overnight to complete the 24 hour experiment.

One 1000 m CTD cast and one 75m trace metal free cast were completed at Station Kahe. Two near bottom CTD casts, twelve 1000 m CTD casts, and one 500m trace metal free cast were conducted at Station ALOHA.

Two nightime and three daytime net tows were completed.

Hyperpro casts were completed instrument 0120 at Station Kahe and Station ALOHA. One yo-yo and two profiles at each station. A second cast at Station ALOHA was cancelled due to high winds and seas.

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

The secondary conductivity sensor kept showing greater-than-ideal differences from the primary sensor. Several replacement sensors were swapped in during the cruise but the problem persisted. It's looking like it might be a cabling issue. Sensors are being sent back to Sea-bird for analysis and recalibration, and new cables, and probably a newer CTD, will be used for the next HOT cruise.

Initially, the winds at Station ALOHA were from the south at 5-10 knots. They increased to 25-30 knots from the north on Friday, January 31st and backed off late Saturday afternoon to 10 to 15 knots. Several ground swells were present ranging from 6 -12 ft.

Kaena station was cancelled in order to remain at Station ALOHA for the trace metal free CTD cast. The trace metal line was used on the SeaMac winch for the 500m cast because the trace metal winch struggled to lift the rosette upon recovery at Station Kahe.

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, concern, and dedication to our scientific mission. We commend the bridge for keeping the ship in position for all deployments and recoveries. The combination of several large swells and strong winds created challenging conditions.

OTG personnel were very accommodating and flexible as our schedule adapted to the changing weather conditions. They were extremely thorough and cautious during deployments and recoveries of the CTD.

5. DAILY REPORT OF ACTIVITIES (HST)

Wednesday, January 29,2020

- 0855 Ship turned to load Van 24 on starboard side
- 0920 Departed Pier 35
- 1000 Safety briefing and ship orientation meeting
- 2045-2100 Fire and abandon ship drills
- 1210-1248 Weight cast to test 0.322 winch and wire
- 1304-1344 Hyperpro cast. 1x5 cycle yo-yo and 2x 180m cast
- 1401-1535 S2C1 CTD cast to 1000m
- 1557-1617 CTD cast using trace metal free rosette and trace metal winch
- 1629 Transit to Station ALOHA

Thursday, January 30, 2020

- 0023-0043 Sediment traps deployed at 22° 42.066'N, 157° 59.981'W
- 0102-0121 Wirewalker deployed at 22° 42.999'N, 157° 59.984'W
- 0201-0317 S2C1 CTD cast to 1000m, Primary Production Cast
- 0430-0450 Primary production array deployed at 22° 44.791'N, 158° 02.021'W
- 0535-1012 S2C2 near bottom CTD, PO Deep Cast
- 1128-1304 S2C3 CTD cast to 1000m, PO Shallow Cast
- 1319-2347 Net tow at 22° 44.930'N, 157° 59.906'W
- 1353-1423 Hyperpro cast at 22° 42.504'N, 157° 59.458'W, 1 x 5 cycle yo-yo and 2 profiles to 180m
- 1446-1615 S2C4 CTD cast to 1000m for Particulate Carbon/Nitrogen
- 1620 Transit to recover Seaglider 512
- 1751-1814 Recovered Seaglider 512 at 22° 39.849'N, 158° 06.059'W
- 1816 Transit to recover Primary Production Array
- 1859-1917 Recovered PP array at 22° 46.393'N, 158° 05.490'W
- 1946-2104 S2C5 CTD cast to 1000m, Particulate Phosphorous Cast
- 2220-0005 S2C6 CTD cast to 1000m, BEACH Cast

Friday, January 31, 2020

- 0015 Net Tow #1
- 0050 Net Tow #2
- 0120 Transit to pump tanks
- 0211-0342 S2C7 CTD cast to 1000M, Gas Array Cast
- 0451-0506 Gas Array deployed at 22° 47.912'N, 158° 04.517'W
- 0528-0653 S2C8 CTD cast to 1000m, Open Cast
- 0803-0932 S2C9 CTD cast to 1000m, Open Cast
- 0940 Transit to pump tanks
- 1038-1224 S2C10 CTD cast to 1000m, PSi Cast
- 1245-1330 Net Tow at 22° 44.866'N, 158° 04.819'W
- 1335-1354 Net Tow at 22° 44.503'N, 158° 04.527'W
- 1434-1447 Recovered Wirewalker at 22° 48.501'N, 158° 03.885'W - rain squall

- 1449 Transit to recover Sediment Trap Array
- 1518-1536 Recovered Sediment Trap Array 22° 48.483'N, 158° 03.066'W
- 1540 Transit to pump tanks
- 1707-1830 S2C11 CTD cast to 1000, Open Cast
- 1835 Transit to Gas Array - Winds sustained over 25 knots
- 1933-2003 Recovered Gas Array 22° 48.597'N, 158° 08.275'W
- 2048-2217 S2C12 CTD cast to 1000m, HPLC Cast
- 2327 Begin S2C3 near bottom CTD cast, Deep Cast #2

Saturday, February 1, 2020

- 0346 End of cast
- 0400 Optics cast cancelled due to heavy weather
- 0610-0757 S52C1 CTD cast to 200m, 5 cycle yo-yo
- 0904-1045 S2C14 CTD cast to 1000m, ATP Cast
- 1100 Hyperpro cast cancelled due to heavy weather.
    - Trace metal CTD cast postponed due to weather.
- 1130 KM Crew and OTG rinsed and greased 0.322 wire for storage.
- 1817-1910 Trace Metal Cast to 500m on the SeaMac winch
- 1915 Transit to Honolulu Harbor

Sunday, February 2, 2020

- 0804 First line at Pier 35.
- 0805-0843 Unloaded 0.322 winch and Van #24 from starboard side.
- 0911 Secured at Pier 35, port side to.
- 0915 Post cruise meeting in KM conference room.

End of HOT-319

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
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
Anitra Ingalls	Metabolomics and macromolecules	UW
Paul Quay	$DI^{13}C$	UW
Dan Repeta	SCOPE: DOM collection	WHOI
Angelique White	SCOPE: C-STAR, IFCB	UH
Sam Wilson	Reduced gases in the upper ocean: The cycling of methane, sulfide and nitrous oxide.	UH
Robert Letscher	Transparent exopolymer and phytoplankton vertical migration as sources for preformed nitrate anomalies in the subtropical N. Pacific Ocean	UNH
Andrew Burger	Large volume water collection for genomics	UH