HOT 333: Chief Scientist Report
Chief Scientist: Karin Björkman
R/V *Kilo Moana*
October 27-November 2, 2021

Cruise ID: KM 21-16
Vessel: R/V *Kilo Moana*, University of Hawaii
Master of the Vessel: Captain Peter Aguinaldo
Chief Scientist: Karin Björkman, University of Hawaii
Marine Technicians: Julianna Diehl, Jeff Koch

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.

- All science party was vaccinated.
- All cruise participants self-isolated according to the HOT Risk Mitigation Plan before the cruise.
- All cruise participants were tested for COVID.

During the cruise all participants:

- wore face masks
- maintained a distance of 6 ft. when possible
- properly disinfected all workspaces often

2.0 SCIENTIFIC OBJECTIVES

The cruise objective was to maintain a collection of hydrographic and biogeochemical data at the Hawaii Ocean Time-series (HOT) stations. In addition, we deployed and recovered Seagliders, and a deep moored sediment trap array.

A copy of the detailed cruise plan is available at:

https://hahana.soest.hawaii.edu/hot/crsplan/HOT_333_Operational_Cruise_plan.pdf

Science operations were planned for 4 stations, in the following order:

1) Station 1, referred to as Station Kahe, is located at 21° 20.6'N, 158° 16.4'W.
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.
3) Station 50, the site of WHOTS-17 Mooring (anchor position 22° 46.002'N 157° 53.958'W).
4) Station 6, referred to as Station Kaena, is located off Kaena Point at 21˚ 50.8’N, 158˚ 21.8’W

3.0. SCIENCE PERSONNEL

Participant	Title	Affiliation	Citizenship
Benedetto Barone	Scientist	UH	ITA
Eleanor Bates	Graduate student	UH	USA
Andy Burger	Scientist	UH	USA
Karin Björkman	Scientist	UH	SWE
Kieran Curran	Scientist	UNH	GBR
Julianna Diehl	Marine Technician	OTG	USA
Mattia Da Fieno	Undergraduate student	UH	USA
Dan Fitzgerald	Research Associate	UH	USA
Corinne Hite	Graduate student	UH	USA
Reece James	Graduate student	UH	USA
Fuyan Li	Post-doc	UH	CHI
Jeff Koch	Marine Technician	OTG	USA
Lucie Knor	Graduate student	UH	DEU
Fernando Pacheco	Research Associate	UH	BRA
Tully Rohrer	Research Associate	UH	USA
Dan Sadler	Research Associate	UH	USA
Fernando Santiago-Mandujano	Research Associate	UH	USA
Eric Shimabukuro	Graduate student	UH	USA
Carlo Van Dijken	Undergraduate student	UH	USA
Blake Watkins	Marine Engineer	UH	USA

4.0. GENERAL SUMMARY

Equipment loading was conducted on October 27th, followed by a same day departure at 1410 (HST). At Station Kahe, the Hawboldt LARS system passed the prescribed operational checks and weight cast. The CTD cast had to be aborted as there were problems with the communications with the package. The cast was then cancelled and the ship proceeded to Station ALOHA.

Upon arrival at Station ALOHA, the sediment trap array-1 and IRSC traps were deployed W of center station, as the currents were expected to carry them towards the SW. A CTD cast was conducted to collect water for ancillary investigators. A Seaglider (513) equipped with a microstructure sensor package was deployed on the 28th October and recovered on the 1st of November. Two other Seagliders (# 511, #626) were recovered after months long missions on the 28th of October. The following night (October 29th) the sediment trap-2 array was deployed and the Primary Production array was deployed at dawn and recovered at dusk the same day. The Gas-array was deployed on October 30th and recovered in the morning of the 31st.

At Station ALOHA, two near bottom CTD casts, fifteen 1000 m, and three shallower depth CTD casts were completed. One 5-cycle yoyo CTD cast to 200 m was completed near the WHOTS mooring (Station 50). Kaena (station 6) was occupied on the last day with a near bottom cast to 2460 m.

Six net tows for the core HOT zooplankton collection were completed: three during the day and three at night.

Hyperpro operations were twice during the cruise, one at Station ALOHA during the primary production experiment and one at Station 50. Each operation was to consist of 2 deep casts to 185 m,

and a 5 cycle Yo-Yo cast to 20 m. However, the cast at Station ALOHA was cut short after one profile and one yo-yo due to too much interest shown by Oceanic Whitetip sharks.

Eight trace-metal Go-Flo casts were completed.

The deep moored traps were recovered successfully.

The 300 kHz ADCP, underway fluorometer, transmissometer, thermosalinograph and the ship's meteorological suite ran without interruption during the cruise. The 38 kHz ADCP is still not working correctly due a failed cable. This is anticipated to be correct during dry dock in 2022.

Winds during the cruise were 5-15 knots from the NE initially and dropped to 3-10 knots from the NW swinging to SW by the end of the cruise.

Due to the loss of the two HOT rosettes earlier this year we used the OTG package for this cruise including the CTD. The rosette received 24, all new bottles for this cruise. We experienced many casts when multiple bottles did not close. This was partly due to the new bottles being used with end caps and lanyards from the old bottles. It was also due to sticking latches on the OTG carousel for some positions. Most of the initial problems were resolved towards the end of the cruise. The PO-group's carousel was tested at Station 6 and all bottles closed without issue.

The PO-group's CTD failed at station Kahe and the OTG back-up was installed and used for the entirety of this cruise. Trouble shooting of the PO CTD late in the cruise identified the problems and these will be resolved by HOT 334.

We had issues with the belly pack communications with the LARS system resulting in a delay and cancellation of one CTD cast. This was resolved and there was no loss of samples collected as these could be shifted to a later cast.

We also had problems with the hoist/pulley system for the CTD cart that started slipping when under the heavy load of a full rosette. At the end the sled and package had to hand crank into and out of the wet lab bay.

Finally, we had an unusual amount of shark sightings during this cruise.

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.

Captain Peter Aguinaldo and the ship's crew showed flexibility, concern, and dedication to our scientific mission. Ship handling was very good during all operations which were many more than during a typical HOT cruise.

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

Special thanks to OTG Senior Technician Julianna Diehl for having the OTG rosette updated with new bottles and the CTD components in operational condition to serve as the primary for this cruise.

6.0. DAILY REPORT OF ACTIVITIES (HST)

Wednesday 27th, October 2021

1410 Departed Pier 35
1445 Safety briefing followed by fire and abandon ship drills
1700 Arrived at Kahe
1720 Weight cast. End 1755
1900 Trace Metal Go-Flo cast. End 1914
1923 CTD deployed for S1C1. Multiple electronics errors with CTD led to cancelling the cast
1945 Transit to Station ALOHA

Thursday 28th, October, 2021

0320 Arrived at Station ALOHA
0404 Begin IRSC trap deployment. End 0430. 22˚44.1722N, 158˚01.0345W
0501 Begin Sed Trap-1 deployment. End 0556. 22˚46.4272N, 157˚59.5W
0629 Begin S2C1
0806 Begin deployment of Seaglider 513. End 0810. 22˚41.9572N, 158˚03.0276W
0847 Seaglider 511 recovery. 22˚42.1645N, 15802.7988
0931 Seaglider 626 recovery. 22˚39.7655N, 158˚06.1157
1417 S2C2
1541 TM-Go-Flo cast 2
1912 S2C3 High resolution cast 1 – fluorescence not in display, S2C3 did not collect samples.
1959 S2C4 High resolution cast 1. Bottles 15,16, 18 did not close. Cast not sampled.
2208 Net tow
2240 Net tow

Friday 29th October, 2021

0015 Start sediment traps-2 deployment
0051 Sed traps-2 array released. 22˚43.5126’ N, 157˚58.9206’W
0300 Start S2C5 -Primary Production cast. Bottles 16, 18, 24 did not close. Cast sampled outside as crane locking pin would not disengage making it impossible to move package into bay.
0444 Begin Primary Production array deployment. Spar buoy caught under ship. Spar recovered and beacon reattached.
0509 Primary Production array released. 22˚44.9375’N, 158˚ 59.9918’W
0510 Transit to center
0541 Begin S2C6 PO-Deep-1 cast
0736 Winch stopped to check level wind. 0738 cast resumed. Level wind rehomed twice more during cast.
0930 End PO Deep-1. Bottles 2, 18 did not close.
0951 TM-Go-Flo cast 3.
1219 Begin S2C7 PO Shallow after delay due to winch belly pack malfunctions. Bottles 4, 9, 18, 24 did not close. Bottle 2 likely mistrip.
1354 HyperPro yo-yo and profile cast.
1428 HyperPro casts cut short when sharks appeared to be attracted to instrument.
1507 S2C8 PC/PN. Bottles 4, 15, 16 did not close.
1633 Transit to pump tanks
PPO4 cast cancelled to make up time. Samples moved to S2C10.

1840 Primary Production array recovered. 22˚41.956'N, 157˚59.480'W
1915 TM Go-Flo cast 4
1952 S2C9 BEACH cast. Bottles 15, 16 did not close. Bottle 2 likely mistrip.
2207 Net tow
2305 S210 PPO4 cast. Bottles 15, 16, 18, 24 did not close.

Saturday October 30th, 2021

0159 S2C11 Gas-array cast. Bottles 3, 4, 16, 18, 24 did not close.
0422-0445 Gas-array deployment. 22˚41.1912'N, 158˚02.7310'W
0515 S2C12 open cast. All bottles closed after moving lanyards to left of each bottle.
0616 Transit to pump tanks
0805 S2C13 – High Resolution cast 1. Bottle 18 did not close.
0925-0940 TM Go-Flo cast 5
1106 S2C14 PSi
1227 Net tow
1257 Net tow
1402 S2C15 ATP
1513 Transit to pump tanks
1656 S2C16 open. Bottle 18 did not close. Extra bottles tripped to avoid.
1825-1847 TM Go-Flo cast 6
1958 S2C17 HPLC. Bottle 18 did not close. Extra bottles tripped to avoid.
2309 S2C18 PO Deep cast 2 – start

Sunday 31st October, 2021

0215 End of PO Deep cast 2
0259-0451 Optics cast
0627-0647 Gas-array recovery. 22˚35.272'N, 158˚05.536'W
0750-0806 Sediment trap-2 recovery. 22˚30.3669'N, 158˚07.5467'W
0816 Transit to WHOTS mooring
1106 S50C1
1220 HyperPro
1308-1406 VPR tow
1505 Transducer in water for Deep moored trap recovery
1525 Release confirmed
1640 Start recovery Deep moored traps. 22˚50.885'N, 157˚54.891'W
1800 Recovery completed. Two traps and acoustic releases onboard.
1805 Transit to Station ALOHA
2000-2029 TM Go-Flo cast 7
2127 S2C19 – High Resolution cast 3 to 300 m. Approximately 0.5 miles of sg 513. Bottle 18 did not close. Extra bottle tripped to avoid.

Monday 1st November, 2021

0200 S2C20 open (Kieran Curran, Rachel Foster)
0313 Optics cast
0435-0547 VPR tow
0515-0816 CTD testing of 'fish'.
0818-0829 TM Go-Flo cast #8
0830 Transit to sg513

0947-1003	Recovery of Seaglider #513. 22˚41.3595'N, 158˚00.6729'W
1044	Net tow
1051-1206	VPR tow
1210	Transit to sediment trap 1
1347-1408	Sediment trap 1 recovery. 22˚28.8416'N, 158˚10.7693'W
1546-1613	IRSC trap recovery. 22˚23.7776'N, 158˚24.6368'W
1620	Transit to Kaena station. OTG carousel swapped out for PO's for testing at Stn 6
1937-2130	S6C1
2130	Transit to Pier 35

Tuesday 2nd *November, 2021*

0745	Arrived at Pier 35

HOT program sub-components:

Investigator	Project	Institution
Angelicque White	Core Biogeochemistry	UH
Dave Karl	SCOPE-biogeochemistry	UH
John Dore	Biogeochemistry QA/QC	MSU
James Potemra	Hydrography	UH
Mike Landry	Zooplankton dynamics	SIO
Ricardo Letelier	Optical measurements	OSU

Ancillary programs:

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
Paul Quay	$DI^{13}C$	UW
Dan Repeta	SCOPE: DOM collection	WHOI
Angelicque White	SCOPE: C-STAR, UVP, IFCB	UH
Nicholas Hawco Eleanor Bates	Quantifying Iron Turnover in the Upper Ocean via Time-series Measurements at Station ALOHA	UH
Sonya Dyhrman	Physiological ecology of diatom diazotroph associations using metatranscriptome samples.	LDEO
Debbie Lindell	Seasonal Virus Sampling	Technion
Robert Letcher Kieran Curran	Transparent exopolymer and phytoplankton vertical migration as sources for preformed nitrate anomalies in the subtropical North Pacific Ocean	UNH