

# HOT-299: Chief Scientist Report

Chief Scientist: Andrew C. King

**R/V *Kilo Moana***

16-19 January, 2018

Cruise ID: **KM 18-02**

Departed: 16 January at 0900 (HST)

Returned: 19 January at 0745

Vessel: **R/V *Kilo Moana***

Master of the Vessel: Captain Greg Steele

OTG Marine Technicians: Jeff Koch, Julianna Diehl

## 1. SCIENTIFIC OBJECTIVES

The objective of the cruise was to maintain a collection of hydrographic and biogeochemical data at the Hawaii Ocean Time-series (HOT) stations. Three stations were to 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 16<sup>th</sup> for about 2 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 16<sup>th</sup> – 18<sup>th</sup>
- 3) Station 52, the site of WHOTS-14 Mooring (anchor position 22 40.01'N 157 57.09'W) will be occupied on for about one hour on December 19<sup>th</sup>.

Upon arrival to Station Kahe a 1300 lb. weight-test cast to 500 m, and one CTD cast to 1000 m were to be conducted on the afternoon of January 16<sup>th</sup>. The single CTD cast was to be conducted to collect a continuous profile of various physical and chemical parameters. Water samples were to be collected at discrete depths for biogeochemical measurements. After these operations were satisfactorily completed, the ship was to proceed to Station ALOHA.

Upon arrival to Station ALOHA, the free-drifting sediment trap array was to be deployed, followed by the deployment of the WireWalker. These two arrays were to stay in the water for about 52 hours. This was to be followed by a 1000 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 centered over Station ALOHA, 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 18<sup>th</sup>.

The lowered-ADCP was to collect current measurements on down- and up-cast. The LADCP, mounted inside the rosette and operating in single ping mode at 4 Hz, was to record measurements internally during CTD casts. Data was to be downloaded after each cast via RS422 connection. Data collection was to be limited to 1000 meter casts and the second deep cast.

Another free-drifting array (Gas Array) was to be deployed for 24 hours for incubation experiments on January 18<sup>th</sup>. The Gas Array was to be recovered on January 19<sup>th</sup>.

A plankton net was to be towed between 1200-1300, and 2200-2300 for 30 minute intervals on January 17<sup>th</sup> and 18<sup>th</sup> at Station ALOHA.

The Hyperpro (a profiling unit with one up-looking and one down-looking hyperspectral radiometer, a WET Labs ECO-BB2F triplet, temperature and conductivity sensors), usually deployed during HOT cruises, was being serviced and was not available during this cruise.

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 19<sup>th</sup>.

A trace metal free sample was to be collected by the ATE sampler on January 18<sup>th</sup> at Station ALOHA.

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 19<sup>th</sup>.

After recovering the arrays, the ship was to transit to Station 52 to conduct a one-hour 200 m CTD yo-yo cast. The ship was to remain 0.25 nmi downwind and downcurrent from Station 52 after completion of the CTD yo-yo to gather one hour of shipboard ADCP data for comparison to WHOTS-14 ADCP data.

Once operations at Station ALOHA were complete, the ship was to transit to the location of the deep sediment trap anchor at 22°51.971' N, 157°53.167' W. Recovery of the sediment trap was expected to take approximately 3 hours, with return to the surface expected to take an hour.

After deep sediment trap recovery operations were complete, the ship was to transit back to Honolulu Harbor, Pier 35.

The following instruments were to collect data throughout the cruise: shipboard ADCP, thermosalinograph, underway fluorometer, transmissometer, the meteorological package.

## 2. SCIENCE PERSONNEL

<b>Participant</b>	<b>Title</b>	<b>Affiliation/HOT Group</b>
Andrew King – Chief Scientist	Research Associate	UH
Karin Bjorkman	Scientist	UH
Eric Grabowski	Research Associate	UH
Lance Fujieki	Research Associate	UH
Blake Watkins	Marine Engineer	UH
Tim Burrell	Research Associate	UH/SCOPE
Carolina Funkey	Research Associate	UH/SCOPE
Eric Shimabukuro	Research Associate	UH/SCOPE
Kellen Rosburg	Research Associate	UH
Gerarda Terlouw	Post Graduate Trainee	UH
Ryan Tabata	Research Associate	UH
Svetlana Natarov	Research Assistant	UH
Jefrey Snyder	Marine Technician	UH
Morgan Linney	Graduate Student	UH
Lauren Block	Undergrad Student	UH
Tyler Byrne	Visiting Scholar	TAMU
Cuong Tran	Undergrad Student	UH
Julianna Diehl	Marine Technician	OTG
Jeff Koch	Marine Technician	OTG

## 3. GENERAL SUMMARY

Weather predictions for Station ALOHA the week of January 16<sup>th</sup> – 20<sup>th</sup> were unfavorable, predicting high winds (+25 kt) and high swell (+10 ft) by the evening of Wednesday, January 17<sup>th</sup> through Friday, January 19<sup>th</sup>. Ultimately, weather conditions and the forecast were such that the Chief Scientist decided to return one day early, on January 19<sup>th</sup>, since no work could be done.

Although deployment of the sediment trap, primary productivity array, gas array, and WireWalker could have been accomplished in calm seas, recovery would not have been possible in these predicted conditions. HOT-299's schedule was amended as follows:

- Deployment of the sediment trap, Wednesday, January 17<sup>th</sup> 0000, was cancelled
- Deployment of the WireWalker, Wednesday, January 17<sup>th</sup> 0100, was cancelled
- Deployment of the primary productivity array, Wednesday, January 17<sup>th</sup> 0400, re-scheduled to Thursday, January 18<sup>th</sup>, at the same time
- S2C8, GAS cast, was cancelled and re-assigned as a duplicate primary productivity array cast
- Deployment of the gas array, Thursday, January 18<sup>th</sup>, was cancelled.
- Two net tows shifted to Wednesday, January 17<sup>th</sup> 0000.

Observed weather conditions ended up being more severe than predicted, with peak observed winds above 30 kts and peak swell above 15 ft on January 18<sup>th</sup>. After S2C5, Captain Greg Steele suspended all CTD deployments until weather conditions improved.

A persistent modulo error issue with the CTD deck unit presented itself on HOT-299; 1 error in total was tracked. This error occurred at the beginning of the S2C2 cast (PO-1 deep cast) at 30 dbar. The CTD pumps remained running in this instance.

An un-commanded Niskin bottle misfire (bottle #9) was tracked during upcast at approximately 3500 dbar on S2C2. The cause of this misfire is not known; however, it is suspected that they are related to RF interference from hand-held radios.

The R/V *Kilo Moana* suffered a ship power failure at 18:45 HST on January 17<sup>th</sup>. Backup generators switched on and power was fully restored within 15 minutes.

One 1000 m CTD cast was completed at Station Kahe. One near bottom CTD cast and four 1000 m CTD casts were conducted at Station ALOHA before weather conditions required returning to Honolulu Harbor. No other CTD casts were completed this cruise.

The ship's trawl winch and 0.681" wire were used for CTD deployments using the A-frame. Maximum CTD lowering speed was 30 m/min given weather conditions and due to risk of shock-loading the CTD wire.

The Sediment Traps, WireWalker, Primary Production and Gas Arrays were not deployed.

Two net tows for the core HOT zooplankton collection were completed successfully; both were conducted at night.

The optical package was not deployed.

The ATE was not deployed.

The thermosalinograph, fluorometer, and transmissometer were collecting data during the cruise, with minor interruption during the power outage.

The broad band/narrow band Ocean Surveyor ADCP and the Workhorse ADCP were working correctly during the cruise.

The ship's meteorological suite ran with only minor interruption during the cruise due to power outage.

Winds were northeast at 15-20 kts the first day of the cruise with NNE 5 ft swell, NE slight seas. By January 17<sup>th</sup>, winds increased to 20-25 kts from the east with a NNW swell at 6-8 ft. By January 18<sup>th</sup>, winds increased to 25-30 kts from the east with various swell at 8-12 ft; peak winds above 40 kts and swell above 15 ft were observed. By mid-day on January 18<sup>th</sup>, weather predictions were upgraded and it became clear that no science, short of underway data, would be possible until January 20<sup>th</sup>.

ADCP data was gathered 0.25 nm down-current and down-wind from the WHOTS buoy on January 18<sup>th</sup>, after which the R/V *Kilo Moana* returned to Honolulu Harbor.

#### 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 Steele and the ship's crew showed flexibility, enthusiasm, concern, and dedication to our scientific mission.

Technical support during this cruise was very good. OTG personnel were available to assist in our work during the cruise.

## **5. DAILY REPORT OF ACTIVITIES (HST)**

### **January 16th**

0900 Depart from Pier 35

0930 Safety briefing

0950 Science meeting

1000 Emergency and abandon ship drills

1130 Arrive at Station Kahe

1144 Start of weight cast, 500m.

1218 End of weight cast

1311 Start of S1C1

1419 End of S1C1

1421 Transit to Station ALOHA

2157 Arrive @ ALOHA

2200 Schedule adjustments due to developing weather conditions:

- Cancel ST deployment
- Cancel WW deployment
- Cancel GA deployment (and cast)
- Shift PP deployment 24 hrs forward, to 1/19.
- Shift PP cast to S2C8, old GA cast.
- Add 2 net tows @ 1000 1/17/2018

### **January 17th**

0012 Start of net tow #1

0045 Start of net tow #2

0115 End of NT

0150 Begin Station 2 cast 1

0330 End of S2C1

0500 Start of S2C2

0509 Modulo error count 1 @30 db. Pumps remained on

0709 Max pressure 4804 dbar. 22 45.0092 N 158 0.0211 W.

0740 Autonomous firing of bottle 9, possibly due to radio interference w/ deck unit

0915 End S2C2

1105 Start of S2C3

1301 End of S2C3

1427 Start of S2C4

1450 End of S2C4

1658 Start of S2C5

1830 End of S2C5, semi-risky recovery due to ship motion and swell.  
Package safely on deck

1845 Loss of power to the R/V Kilo Moana. Backup generators powered on.

1850 Suspension of all HOT activities until further notice, per Captain Greg Steele.

1958 Per chief mate, direction and speed of currents (1.5 kts north) and wind (+25 kts ELY) present a danger to safe CTD operations. Wind and current must change direction / magnitude before safe CTD operations can resume.

### **January 18<sup>th</sup>**

1736 Weather forecast upgraded, not expected to ease until January 20<sup>th</sup>. Currently, no science data can be conducted short of underway data. Transit to WHOTS for ADCP inter-comparisons. Following 1 hour of data collection, R/V *Kilo Moana* and HOT-299 to return to HNL.

1755 Arrive at Station 52 (WHOTS). Begin ADCP data collection for 1 hour.

1855 End of ADCP data collection. Transit to Sea Buoy.

### **January 19<sup>th</sup>**

0746 Arrive at Pier 35.

## 6. HOT program sub-components:

Investigator	Project	Institution
Dave Karl	Core Biogeochemistry	UH
John Dore	Biogeochemistry QA/QC	MSU
Roger Lukas	Hydrography	UH
Mike Landry	Zooplankton dynamics	SIO
Ricardo Letelier	Optical measurements	OSU

### Ancillary programs:

Angelique White	SCOPE: Diazotroph Microscopy, Underway C-STAR	OSU
Matt Church	Diversity and activities of nitrogen-fixing microorganisms	UM/FLBS
Andrew Dickson	CO <sub>2</sub> dynamics and intercalibration	SIO
Paul Quay	DI <sup>13</sup> C	UW
Dan Repeta	SCOPE: DOM collection	WHOI
Erica Goetze	eDNA collection: Metazoan diversity in the abyssal Pacific	UH
Morgan Linney Sam Wilson	Reduced gases in the upper ocean	UH
Sara Ferrón-Smith Gerianne Turlouw	Determination of gross primary production from the euphotic zone in situ, using the drifting primary production array	UH
Dave Caron	SCOPE: DNA collection	USC
Ed DeLong	SCOPE: DNA and Viral DNA collection	UH