

HOT-221: Chief Scientist Report

Chief Scientist: Paul Lethaby

R/V Ka'Imakai-O-Kanaloa

May 17th – 21st, 2010

Cruise ID: **KOK-1011**

Departed: May 17, 2010 at 0800 (HST)

Returned: May 21, 2010 at 0830 (HST)

Vessel: ***R/V Ka'Imakai-O-Kanaloa***

Operator: University of Hawaii

Master of the Vessel: Captain Ross Barnes

Chief Scientist: Paul Lethaby

OTG Electronics/Deck Operations Technicians: Jenny White and Ben Colello

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. Four 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 was to be occupied on the first day of the cruise for about 3 hours.
- 2) Station 2, referred to as Station ALOHA (A Long Term Oligotrophic Habitat Assessment) 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 was to be occupied during the 2nd, 3rd, and 4th days of the cruise.
- 3) Station 52, is the site of the WHOTS-6 Mooring, located at 22° 39.99'N, 157° 56.96'W will be occupied on the 4th day of the cruise for about two hours.
- 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 the 4th day of the cruise for approximately 3 hours.

Upon arrival to Station Kahe a 500 lb. weight-test cast to 500 m, one CTD cast to 1000 m, and a Hyperpro cast were to be conducted at this location on the afternoon of the first day. 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 these operations were satisfactorily completed, the ship was to proceed to Station ALOHA.

Upon arrival at Station ALOHA, the free-drifting sediment trap array was to be deployed. The sediment trap array was to stay in the water for about 52 hours. This was to be followed by one shallow CTD cast to 200 m, one 1000 m CTD cast (to collect water for the Primary Production Array), and then another 200 m CTD cast to collect water for an ocean acidification incubation experiment. These casts were to be followed by the deployment of the free-drifting Primary Productivity Array to incubate insitu 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 on May 20th.

Another free-drifting array (Gas Array) was to be deployed for 24 hours for incubation experiments on May 19th. The Gas Array was to be recovered on May 20th.

A plankton net was to be towed between 1000 – 1400 and 2200 – 0200 for 30 min intervals on May 18th and May 19th at Station ALOHA.

A Hyperpro profiling instrument was to be deployed for half-hour periods near noon time on May 17th, 19th, and 20th.

A package including a Wet Labs AC9, a Chelsea Fast Repetition Rate Fluorometer (FRRf), a SeaBird Seacat, and a LISST particle size and distribution analyzer was to be used to profile the upper 200 m at Station ALOHA around noon time on May 19th and in the early morning and around noon on May 20th.

An automated trace element sampler (ATE) was to be deployed to a depth of 10 m for 30 minutes in the afternoon of May 18th.

After the 36 hour burst period of CTD work at Station ALOHA was accomplished, the ship was to transit to recover the floating Sediment Trap array and the Gas Array on May 20th.

After recovering the arrays, the ship was to transit to Station 52 to conduct a 200 m CTD yo-yo cast

The ship was to re-position within Station ALOHA to conduct an AC9/FRRf/LISST cast, followed by a Hyperpro cast.

Two ARGO floats were to be deployed at station ALOHA once all other operations were completed.

After the ARGO floats were deployed the ship was to transit to Station 6, referred to as Station Kaena where a near-bottom CTD cast (~2500 m) was to be conducted to collect salinity and chlorophyll samples for calibration. After Station Kaena operations were complete, the ship was to transit back to Snug Harbor.

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

2. SCIENCE PERSONNEL

| Participant | Title | Affiliation |
|------------------|-----------------------------------|-------------|
| Daniela Böttjer | Post-doc Scientist | UH/BEACH |
| Ben Colello | Marine Technician | OTG |
| Susan Curless | Research Associate | UH/BEACH |
| Asako Endo | Volunteer | UH/PO |
| Lance Fujieki | Computer Specialist | UH/BEACH |
| Cameron Fumar | Research Associate | UH/PO |
| Scott Grant | Graduate Student | UH/CMORE |
| Kristin Halbert | Graduate Student | UH |
| Adriana Harlan | Research Associate | UH/BEACH |
| Bo Keopaseut | Research Associate | UH/PO |
| Paul Lethaby | Chief Scientist – Research Assoc. | UH/PO |
| Anill Rick Rupan | Research Engineer | UW |
| Dan Sadler | Research Associate | UH/BEACH |
| Chris Schvarcz | Graduate Student | UH |
| Jefrey Snyder | Marine Technician | UH/PO |
| Kathryn Stanaway | Research Associate | UH/BEACH |
| Don Viviani | Graduate Student | UH/CMORE |
| Blake Watkins | Marine Engineer | UH/BEACH |
| Jenny White | Marine Technician | OTG |

3. GENERAL SUMMARY

Operations during the cruise were conducted as planned without any major delays. Almost all objectives for HOT-221 were successfully completed. The ATE sampler failed to open while in the water despite functioning correctly in the lab. Two attempts were made but no sample was collected.

There was a small delay putting the CTD in the water for cast 6 due to a hot water pipe breaking in the 01 companionway resulting in minor flooding of the rear staterooms. The ship also experienced loss of power and propulsion during the transit from Station ALOHA to Station Kaena which delayed the start of the Kaena CTD by about one hour.

One 1000 m CTD cast was conducted at Station Kahe. Thirteen 1000 m CTD casts, two 200 m, and two deep casts were conducted at Station ALOHA. A 200 m yo-yo CTD cast was conducted for one hour near the WHOTS mooring (Station 52). One near-bottom CTD cast was conducted at Station Kaena.

The array of floating sediment traps, the gas array, and the primary production array were deployed and recovered successfully. All arrays drifted to the south south-west, with the sediment trap and gas array being recovered approximately 11 miles and 7 miles, respectively from the center of ALOHA.

Nine net tows were successfully completed; three were conducted during the day, and six at night.

The Hyperpro was deployed three times around noon.

The optical package ACS/AC9/FRRf/LISST was deployed three times during the cruise.

The ATE sampler was deployed twice and upon recovery was found to have failed to open both times.

Two ARGO floats were deployed successfully before leaving Station ALOHA. The floats were hand deployed from the rear quarter. Once the ship had slowed down the floats were lowered to the sea surface using a slip line which was then released as the ship moved forward slowly.

The ADCP, thermosalinograph, fluorometer, and the ship's meteorological system ran without interruption throughout the cruise.

Winds were from the east between 10 – 20 knots Seas were 4 – 5 ft from the east with 6 ft swell from the east increasing to 8 – 10 ft during the last day.

We arrived at Snug Harbor for off-loading on May 21st, at 0830 (HST).

Added operations:

A hand held surface net tow was conducted on May 20th.

4. R/V KA'IMAKAI-O-KANALOA, OFFICERS AND CREW, TECHNICAL SUPPORT

The R/V Ka'Imikai-O-Kanaloa continues to maintain excellent ship support for our work. The Captain and ship's crew were most helpful and accommodating throughout the cruise. Throughout our cruise, the entire crew showed enthusiasm, concern, and dedication to our scientific mission.

Technical support during this cruise was excellent. OTG personnel were available at any time to assist in our work and helped keep operations running smoothly.

5. DAILY REPORT OF ACTIVITIES (HST)

16 May, 2010: Loading Day

The lab vans, winches, and scientific equipment were loaded this day.

17 May, 2010

0800 Departed from Snug harbor
0845 Abandon ship and fire drills, followed by safety briefing and science meeting
1100 Arrive at Station KAHE
1210 500 m weight cast
1145 Hyperpro cast
1220 Station 1 cast 1 (1000 m)
1335 Transit to station ALOHA
2350 Arrive at station ALOHA

18 May, 2010

0025 Sediment trap array deployed (22 44.48'N 158 01.00'W)
0043 Station 2 cast 1 (200 m)
0144 Station 2 cast 2 (1000 m)
0355 Station 2 cast 3 (200 m)
0450 Primary production array deployed (22 44.91'N 158 00.27'W)
0515 Station 2 cast 4 (deep cast)
1000 Net tow
1120 Station 2 cast 5 (1000 m) - Start of 36-hr CTD burst period
1230 Net tow
1300 ATE sampler deployed – failed to get a sample
1400 CTD Cast delayed due to ship emergency. Hot water pipe broke in the 01 companionway.
1420 Station 2 cast 6 (1000 m)
1659 Station 2 cast 7 (1000 m)
1925 Primary production array recovered (22 41.815'N 158 01.358'W) 3.1NM SSW of ALOHA
2002 Station 2 cast 8 (1000 m)
2200 Net tow
2240 Net tow (K. Halbert)

2314 Station 2 cast 9 (1000 m)

19 May, 2010

0040 Net tow
0120 Net tow (K. Halbert)
0200 Station 2 cast 10 (1000 m)
0420 Deploy gas array (22 44.94'N 158 00.64'W)
0500 Station 2 cast 11 (1000 m)
0800 Station 2 cast 12 (1000 m)
0910 ATE sampler deployed (2nd attempt) – failed to get sample
1000 Net tow
1100 Station 2 cast 13 (1000 m)
1200 Hyperpro cast
1245 AC9/FRRf/LISST optics cast
1400 Station 2 cast 14 (1000 m)
1659 Station 2 cast 15 (1000 m)
2004 Station 2 cast 16 (1000 m)
2130 Net tow (K. Halbert)
2200 Net tow
2258 Station 2 cast 17 (deep cast) - End of 36-hr CTD burst period

20 May, 2010

0300 AC9/FRRf/LISST optics cast
0400 Transit to recover sediment trap
0630 Recovered Sediment trap array (22 35.07'N 158 06.24'W) 11.5 NM SSW of ALOHA
0730 Recovered Gas array (22 39.64'N 158 04.45'W) 7.4 NM SSW of ALOHA
0915 Station 52 Cast 1 (1-hr 200 m yo-yo cast)
1030 Hand held surface net tow
1105 AC9/FRRf/LISST optics cast
1200 Hyperpro cast
1315 Deployed ARGO float #1 (22 40.74'N 157 58.45'W)
1339 Deployed ARGO float #2 (22 40.84'N 157 58.20'W)
1715 Ship generators went offline with loss of propulsion.
2249 Station 6 cast 1 (2400 m)

21 May, 2010

0040 Transit to Snug Harbor
0830 Arrive at Snug Harbor for offload.

HOT program sub-components

| Investigator | Project | Institution |
|---------------------|----------------------|--------------------|
| Matt Church | Core Biogeochemistry | UH |
| Roger Lukas | Hydrography | UH |
| Mike Landry | Zooplankton dynamics | SIO |
| Ricardo Letelier | Optical measurements | OSU |

Ancillary programs:

| | | |
|--------------------|--|----------|
| Charles Keeling | CO ₂ dynamics and intercalibration | SIO |
| Paul Quay | DI ¹³ C | UW |
| Penny Chisholm | Prochlorococcus population dynamics | MIT |
| Matt Church | Diversity and activities of nitrogen-fixing microorganisms | UH |
| Various CMORE PI's | Microbial RNA/DNA collection | UH/CMORE |

Additional programs:

| | | |
|---|--|----------|
| Dave Karl (via Sam Wilson) | Reduced gases in the upper ocean: The cycling of methane, sulfide and nitrous oxide | UH/CMORE |
| Grieg Steward (via Chris Schvarcz) | Comparison of virus concentrating methods in oligotrophic waters from station ALOHA. | UH/CMORE |
| Matt Church (via Donn Viviani, Daniela Böttjer, and Dan Sadler) | Carbon dioxide ocean perturbation experiment. | UH |
| Brandon Carter | MEGAMER Facility probe development | UCSC |
| Erica Goetze (via Kristin Halbert) | Large-scale population genetic structure of oceanic zooplankton | UH |
| Donn Viviani | Oceanic diazotroph community structure and activities in a high carbon dioxide world | UH |
| Steve Riser/Rick Rupan | ARGO floats | UW |