

KOK1703

Post cruise Chief scientist report

Cruise ID: KOK 1703

Vessel: R/V *Ka'Imikai-O-Kanaloa*, University of Hawaii

Master of the Vessel: Mike Hoshlyk

Chief Scientist: Karin Björkman, University of Hawaii

OTG Marine Technicians: Sonia Brugger, Patrick A'Hearn

1.0 SCIENTIFIC OBJECTIVES

The objective of the cruise is to recover the deep moored sediment traps located at Station ALOHA, collect hydrographic and biogeochemical data at or near the Hawaii Ocean Time-series (HOT) station ALOHA (22.75°N, 158.00°W) and undertake a survey using a towed, underway CTD (uCTD). At Station ALOHA we were to deploy net traps, a primary productivity array and do several net tows in addition to CTD work. Sampling was also to be done at the future Sea Water Air-Conditioning (SWAC) site close to the entrance of Honolulu Harbor on day one. Four to seven stations was to be occupied during the cruise including three SWAC stations, Station ALOHA (Station 2) and three stations during the eddy feature transect (Stations 3-5). An oxygen/pH/temp/sal sensing instrument (SeapHOx) was to be run in continuous mode in an on-deck incubator throughout the cruise.

2.0. SCIENCE PERSONNEL

Participant	Title	Affiliation/Citizenship	
Benedetto Barone (M)	Scientist	UH	Italy
Karin Björkman (F)	Scientist (Chief Sci)	UH	Sweden
Tim Burell (M)	Research associate	UH	New Zealand
Tara Clemente (F)	Research associate	UH	USA
Gabe Foreman (M)	Marine Engineer	UH	USA
Erica Goetze (F)	Scientist	UH	USA
Eint Kyi (F)	Graduate student	UH	Burma
Alexa Nelson (F)	Research associate	UH	USA
Katja Peijnenburg (F)	Scientist		Netherlands
Oscar Sosa (M)	Scientist	UH	USA
Eric Shimabukuro (M)	Research associate	UH	USA
Ryan Tabata (M)	Research associate	UH	USA
Gerianne Terlouw (F)	Post graduate trainee	UH	Netherlands
Blake Watkins (M)	Marine Engineer	UH	USA
Sonia Brugger (F)	OTG	UH	USA
Patrick A'Hearn (M)	OTG	UH	USA

(14 science +2 OTG: 8F+8M)

3.0 GENERAL SUMMARY

Operations went predominantly as planned during this cruise. We left as scheduled at 0800 Monday 6 March 2017. Arrived at the first SWAC station at ~0830 but were delayed here due to missing equipment (fluorometer, pinger) necessary for the CTD operations. The small boat was launched and returned to the UHMC where the items were retrieved. Total delay amounted to approximately 3 hours. After successfully finishing sampling at the three SWAC stations we steamed towards Station ALOHA taking the east route around Oahu.

During the evening the uCTD was tested for the first time.

Arrival to station ALOHA was at 0330 on the 7th, and a zooplankton net tow (0.7 m) was conducted successfully. Subsequent zooplankton net tows were made using a 2 m ring net. A total of 7 tows were completed successfully during this cruise. Two planned tows were cancelled upon request from Drs E. Goetze and K. Peijnenburg.

The free floating net traps were deployed in the morning of the 7th and recovered that same evening (Net trap-1), to be redeployed for a second collection later that evening (Net trap-2). Net trap-2 was recovered successfully on the late afternoon of the 8th.

The deep moored sediment traps (ST-19) were recovered uneventfully on the 7th.

The primary production array was deployed and recovered without problems on the 8th.

The uCTD survey commenced in the evening of the 8th and continued through the 9th transecting a weak eddy system. During the 9th three CTD casts were performed at set locations to try to capture distinct features. The uCTD experienced a problem with its level-wind and will need repairs before further use.

The SeapHOx was operating continuously in an on-deck incubator throughout the cruise and successfully collected data from the uncontaminated seawater supply. Cross calibration pH-samples taken from the incubator and from select CTD casts and analyzed onboard.

This cruise also presented the opportunity to train current SCOPE personnel in various capacities including CTD prepping, CTD console operations, array work, and the uCTD operations.

Arrived back at Pier 35 by 0800 for a full off-load.

Weather was agreeable throughout cruise with predominantly light winds and seas.

4.0 R/V *Ka'Imikai-O-Kanaloa* OFFICERS AND CREW, TECHNICAL SUPPORT

The R/V *Ka'Imikai-O-Kanaloa* continues to provide good ship support for our work. Captain Mike Hoshlyk and the entire ship's crew showed enthusiasm, concern, and dedication to our scientific mission and were flexible in accommodating changes in the schedule.

The OTG personnel were available to assist in our work during the cruise.

5.0 DAILY ACTIVITY REPORT

3/6 0800 Depart Pier 35
0835 Arrive at SWAC-1

Discovered that the CTD-rosette package was missing a fluorometer necessary for all CTD casts and a pinger necessary for the CTD ops at the shallow SWAC station.

0850 small boat deployed
1035 man overboard drill
1215 SWAC-1 CTD cast
1310 SWAC-2 CTD cast
1400 Fire and abandon ship drills, safety briefing
1450 SWAC-3 CTD cast
1545 transit towards Station ALOHA
1940 uCTD test casts
2140 uCTD tests completed

3/7 0330 Arrive at Station ALOHA
0345 Zooplankton Net tow (0.7 m bongo)
0425 Plankton tow completed
0610 Net trap-1 deployment
0745 At Deep moored trap site
0910 Recovery of deep moored traps starts
1020 Recovery completed
1210 CTD S2C1
1310 Zooplankton net tow (2m ring net)
1607 CTD S2C2
1830 Net trap-1 recovery
1930 Net trap-2 deployment
2017 CTD S2C3
2300 Zooplankton net tow (2 m ring net)

3/8 0200 Zooplankton net tow (2 m ring net)
0310 CTD S2C4
0520 PP-array deployment
0640 CTD S2C5 1000 m

- 1045 locating seaglider for inspection
 1140 seaglider located
 1210 CTD S2C6 (calibration cast for seaglider)
 1405 CTD S2C7
 1500 Zooplankton net tow
 1700 Net trap-2 recovery
 1900 PP-array recovery
 1935 uCTD deployment for transect study
 2310 Zooplankton net tow
- 3/9 0145 uCTD redeployed
 0320 Zooplankton net tow
 0425 uCTD redeployed
 0645 CTD S3C1
 0745 uCTD redeployed
 1200 CTD S4C1
 1230 uCTD redeployed
 1610 CTD S5C1
 1710 uCTD redeployed, cleaning – finished 1720
- 3/10 0800 at Pier 35

6.0 PROJECTS:

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|------------------------------------|--------------------------------------------------------------------------------------------------------------|
| Benedetto Barone | Eddy feature survey using underway CTD. |
| Karin Björkman | The effect of INT concentrations on phosphate uptake rate (collaboration S.Ferrón/G. Terlouw). |
| Sara Ferrón | Gross primary production using in situ incubations on the primary production array (via G. Terlouw). |
| Erica Goetze/
Katja Peijnenburg | Collection of zooplankton (see attached summary of project). |
| David Karl | Deep moored sediment traps. |
| Eint Kyi | Net trap experiments: To study remineralization of sinking particles by marine bacteria (Advisor M. Church). |
| Alex Nelson | Eddy feature sampling for ammonium oxidation experiments (PI M. Church). |
| Dan Sadler | SeapHOx testing and cross calibration with underway and CTD samples (PI D. Karl, via R. Tabata) |
| Oscar Sosa | High molecular weight dissolved organic matter sampling. |

Genomics of marine zooplankton

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Rationale.

The oceans are becoming more acidic as they absorb rising levels of CO₂ from the atmosphere at geologically unprecedented rates. Understanding the impact of these changes on marine biodiversity is a top priority for scientists, managers and policy makers. Planktonic gastropods, specifically pteropods, have been the subject of intense research into the effects of ocean acidification (OA), and are proposed as bioindicators to monitor the impacts of global change on open ocean ecosystems. Planktonic heteropods represent an independent mollusc colonization of the pelagic realm, and are also expected to be vulnerable to OA. Both the pteropods and heteropods contain fully shelled, partially shelled, and entirely unshelled lineages, providing a unique and particularly valuable comparative framework within which to study the evolution and historical selective pressure on biomineralization genes (used in calcification of shells).

Our primary research objectives on this cruise were to obtain material for studies in:

1. Transcriptomics and phylogenomics of pteropods and heteropods
2. flow cytometry to estimate genome sizes for several target zooplankton taxa (molluscs & crustaceans).

In addition, we collected material for a range of exploratory and early-stage projects that were secondary objectives on this cruise (e.g., proteomic and population genomic analyses of shelled pteropods). Finally, all bulk plankton material was preserved to revitalize teaching collections at the University of Hawaii and University of Amsterdam. Teaching laboratories in both the undergraduate and graduate curriculum at UH Manoa will draw from this material (OCN201, OCN627), as will a MSc level course in Biological Oceanography at U Amsterdam.

Methods.

Plankton tows were conducted with a 2m diameter ring net (505 µm), and a single tow was made with a 0.71m- diameter CalBOBL bongo net (200 µm). A total of 7 tows were conducted in the vicinity of station ALOHA (Table 1), with 2 tows during daytime and 5 tows during night time. All plankton material was sorted live immediately following collection, and animals were individually identified, and preserved in RNALater, cryopreserved, and in some cases used for live imaging prior to preservation. These animals will be used for molecular, genomic and transcriptomic analyses. In total, over > 330 animals from 43 target species were individually sorted and preserved for transcriptomics and phylogenomics. Over > 650 animals from 26 target species were individually sorted and preserved for flow cytometric measurement of genome size. Following live sorting and imaging of the samples, the remaining plankton was preserved

either in 5% buffered formalin or 100% ethyl alcohol for morphological and DNA barcoding studies (teaching collections, early stage student projects).



Figure 1. 2m ring net – used in plankton collections on KOK1703.



Figure 2. *Carinaria lamarkii*, a target heteropod collected on KOK1703.

Table 1. List of all plankton tows conducted during the KOK1703 cruise. Time is local time, CalBOBL indicates a bongo oblique tow. Latitude and longitude were recorded at the start of each tow. Duration at bottom indicates the time spent fishing at the bottom (ca 250m line out).

Tow ID	Latitude	Longitude	Date	Tow type	Start time	End time	Duration at bottom
KOK1703-01	22° 54.8 N	157° 43.2W	3/7/17	CalBOBL	3:45	4:21	10 min
KOK1703-02	22° 34.4N	157° 40.8W	3/7/17	2m ring	13:10	13:46	10 min
KOK1703-03	22° 39.1N	157° 41.1W	3/7/17	2m ring	23:03	23:45	20 min
KOK1703-04	failed tow - immediate redeployment			2m ring			
KOK1703-05	22° 39.1N	157° 41.1W	3/8/17	2m ring	2:21	2:53	10 min
KOK1703-06	23° 31.1N	156° 46.9W	3/8/17	2m ring	14:58	15:37	15 min
KOK1703-07	23° 36.9N	157° 36.4W	3/8/17	2m ring	23:10	23:54	20 min
KOK1703-08	23° 36.9N	157° 36.4W	3/9/17	2m ring	3:23	3:59	10 min