Hawaii Ocean Time-series
HOT-241 Operational Cruise Plan

Cruise ID: KOK 12-02
Vessel: R/V *Ka'Imikai-O-Kanaloa*, University of Hawaii
Master of the Vessel: Captain Clary Gutzeit
Chief Scientist: Craig Nosse, University of Hawaii
OTG Marine Technicians: Trevor Young and Jeff Koch

Marine Center phone number: 842-9813
KOK phone number: 842-9818
KOK Cell number: 722-0839

Loading: April 27, 2012 @0900
Departure: April 30, 2012 @0800 (Science personnel on board by 0700)
Arrival: May 4, 2012 @ 0800

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. Three 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 the first day of the cruise 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 during the 2nd, 3rd, and 4th days of the cruise.
3) Station 52, the site of WHOTS-8 Mooring (anchor position: 22°40.1572'N, 157°57.0225'W) will be occupied on the 2nd day of the cruise for about one hour as part of the first Station ALOHA cast.

1.1 SCIENTIFIC OPERATIONS

Station	Activities
Kahe (Sta. 1)	Weight Cast, Hyperpro cast, CTD cast (1000 m)
ALOHA (Sta. 2)	Sediment traps, gas array, net tows, CTD operations, primary productivity measurements, AC9, misc. experiments.
WHOTS mooring station (Sta. 52)	One CTD cast (yo-yo to 200 m), surface instrument intercomparisons, during first Station ALOHA cast.
Underway/continuous	ADCP, thermosalinograph, fluorometry, and meteorology

2.0. SCIENCE PERSONNEL

Participant	Title	Affiliation/HOT Group
Tara Clemente	Research Associate	UH/BEACH
Adriana Harlan	Research Associate	UH/BEACH
Dan Sadler	Research Associate	UH/BEACH
Karin Bjorkman	Research Specialist	UH/BEACH
Blake Watkins	Marine Engineer	UH/BEACH
Donn Viviani	Graduate Student	UH/BEACH
Sean Jungbluth	Graduate Student	UH/BEACH
Jefrey Snyder	Marine Technician	UH/PO
Cameron Fumar	Research Associate	UH/PO
Craig Nosse	Research Associate	UH/PO
Branden Obra	Marine Programmer	UH/PO
Ken Doggett	Research Associate	UH/CMORE
Sandra Martinez-Garcia	Postdoctoral Researcher	UH/CMORE
Trevor Young	Marine Technician	OTG
Jeff Koch	Marine Technician	OTG

3.0. SUMMARY SCHEDULE

25 April	Pre-cruise planning meeting 1330 hrs.
27 April	Ship loading at 0900.
30 April	Depart from Snug harbor at 0800 hrs. **Science personnel on-board by 0700.**
30 April	Station 1 Kahe Pt. operations.
30 April - 3 May	Station ALOHA operations.
3 May	APEX Float retreival
4 May	Arrive back to Snug Harbor. Full offload.

4.0. OPERATIONAL PLANS

4.1. Station Kahe (21°20.6'N, 158°16.4'W)

A 500 lb. weight-test cast, one CTD cast to 1000 m and a Hyperpro cast (Sect. 4.2.7) will be conducted at this location on April 30th. The A-frame, CTD crane and CTD winch will be required for these operations. After the operations are satisfactorily completed, the ship shall proceed towards the WHOTS mooring within Station ALOHA.

4.2. Station ALOHA (22°45'N, 158°W with 6 nm radius)

4.2.1. Upon arrival to the southern edge of Station ALOHA, the sediment traps will be deployed. After the sediment trap deployment is complete, one 200-m cast will be conducted near the WHOTS mooring (safe distance for this cast is 250 m downwind and down current from the buoy) followed by the deployment of the ACS/AC9/FRRf (see 4.2.9). These operations will be followed by the deployment of the Primary Productivity Array (Sect. 4.2.3) and a near-bottom CTD cast.

4.2.2. Sediment trap array deployment

Upon arrival to Station ALOHA, the floating sediment traps will be deployed at a location on the southern edge of Station ALOHA, to be determined enroute to ALOHA by local current conditions (see the Station ALOHA Nowcast/Forecast at http://aloha.manoa.hawaii.edu under “Operations”). The array will be deployed from the stern rail using the small crane and Sea-Mac winch. After deployment we request that the Bridge verify that the radio transmitters are functioning and directionally correct.

The array will drift for about 50 hours before recovery. The array is equipped with 2 ARGOS satellite transmitters (platform #'s 1833, 60843), 2 strobe lights, and 2 radio transmitters (channel 72, 156.625 MHz). Daily positions of the array shall be transmitted by email directly to the ship (argosfix@satellite-email.com, password: argosfix), therefore the ship will **not** need to keep within site of the array until the time of the recovery. Assistance from the bridge is requested in plotting the drift track of the array. We request the use of the ship's radio direction finder for locating the array before recovery.

After deployment of the sediment trap array, the ship shall continue with an ACS/AC9/FRRF cast and CTD cast operations to prepare water for the Primary Productivity Array.

4.2.3 Primary production experiment

Samples for the primary productivity experiment will be collected from the rosette. Before dawn (Sunrise 0600 hrs on May 1st), a free drifting incubation array will be deployed from the stern rail using the small crane and Sea-Mac winch. The array is equipped with two ARGOS satellite transmitters (platform #'s 3028, 60482, emailing positions to argosfix@satellite-email.com, password: argosfix), strobe lights and a radio transmitter (156.425 MHz). The **ship shall keep within site of the array** while performing CTD operations for the last 6 hours of the approximately 12-hour time the array will be in the water unless the array drifts outside of the ALOHA circle. If the array drifts out of the circle, the ship should return inside the circle to conduct CTD casts, and the monitoring of the array will be coordinated with the watch leader. The array will be recovered just at sunset (1857 hrs). CTD operations shall continue after recovery. All radioactive waste generated by the experiment shall be returned to the University of Hawaii. Only qualified personnel shall handle radioactive material.

4.2.4. Water column measurements

Vertical profiles of temperature, conductivity and dissolved oxygen will be made with an instrument package consisting of a Sea-Bird CTD attached to a 24-place rosette with 12 liter Bullister sampling bottles. We will need the ship's CTD winch and boom for these operations. Water samples for biogeochemical measurements will be collected on each cast. The cast after the deployment of the Primary Productivity Array shall be made to the near bottom (approximately 4740 m). Following this cast, a series of 1000-m casts shall be made continuously every 3 hours for a 36-hour period. It is highly desired that this burst sampling be done without interruption and we request the ship to maintain position within the study area for that period of time, and repositioning to the center of the Station before each cast whenever possible.

Whenever pumping of the ship's tanks is needed, it must be conducted outside the circle that defines station ALOHA (Sect. 1.0). To avoid disruptions in the schedule, this operation should be coordinated with the chief scientist or the watch leaders **(Dan Sadler, Karin Bjorkman)**.

4.2.5. Gas Array deployment

A second free drifting incubation array will be deployed the third day of the cruise at Station ALOHA. Samples for the gas array will be collected from CTD cast 8. The gas array will be deployed from the stern rail using the small crane and Sea-Mac winch. The array is equipped with two ARGOS satellite transmitters (platform #'s 60484, 84857), emailing positions to argosfix@satellite-email.com, password: argosfix), a strobe light and a radio transmitter (channel 74, 156.725 MHz). The ship will **not** need to keep within sight of the array until the time of the recovery, approximately 25 hours after its deployment. Assistance from the Bridge is requested in plotting the drift track of the array. CTD operations shall continue after the recovery.

4.2.6. Zoo net tows

A plankton net will be deployed from the stern and shall be towed for half-hour periods. Half-hour periods are scheduled around noon and midnight on the second, third, and fourth days (see

schedule) for a total of six slots. The A-frame and small capstan will be needed for this operation. B. Watkins will be in charge of these operations.

4.2.7. Hyperpro

The Hyperpro is a profiling unit with one up-looking and one down-looking hyperspectral radiometer, a WET Labs ECO-BB2F triplet (measuring Chlorophyll-a fluorescence and backscattering in the blue and red wavelengths), temperature and conductivity sensors. This instrument also incorporates a ship mounted surface radiometer. Around noon on the first and second days, the Hyperpro will be deployed from the stern rail using the small crane. The instrument is hand-lowered and retrieved with assistance from the winch.

4.2.8. ACS/AC9/FRRf/LISST

An optical package including a Wet Labs AC9 that measures water column spectral absorption and attenuation at nine wavelengths, a Chelsea Fast Repetition Rate Fluorometer (FRRf), a SeaBird Seacat with temperature, conductivity, fluorometer, and pressure sensors, and a LISST particle size and distribution analyzer will be deployed two times during the cruise.

Each deployment will consist of two up and two down profiles to a target depth of 200 m at a constant speed of 10 m/min during both the downcast and upcast. An instrument soaking period at just below the surface will be required between the two profiles. The A-frame and capstan will be needed for this operation.

4.3. Floating sediment trap recovery

In the morning of May 3rd, after CTD operations have been completed, we shall transit for the recovery of the floating sediment trap array. The small crane and the Sea-Mac winch will be needed to retrieve the sediment trap array. After the array is recovered, the ship shall transit to recover the Gas Array. After the Gas Array is recovered, the ship shall transit to recover the APEX float.

4.4. APEX Float Recovery

A University of Washington APEX float will be recovered on May 3rd. C. Nosse and B. Watkins will be in charge of this operations; receiving 15 minute interval location fixes via Iridium satellite phone from Dana Swift (425) 213-0289, swift@ocean.washington.edu. The position of the float as of April 29th was 22^{o} 47' N, 157^{o} 15' W. After the float is recovered, the ship shall transit back to Snug Harbor.

4.5. Acoustic Doppler Current Profiler

The ship's acoustic Doppler current profiler (ADCP) will be in operation during the duration of the cruise. The OTG technicians will be in charge of the ADCP system.

4.6. Thermosalinograph and Fluorometer

The ship's thermosalinograph and fluorometer sampling the uncontaminated seawater supply system will be in operation during the duration of the cruise while the ship is outside of Snug Harbor. Salinity samples to calibrate the thermosalinograph will be taken from the intake hose at 4-hour intervals throughout the duration of the cruise by HOT-PO science personnel. The OTG technicians will be in charge of the thermosalinograph and fluorometer operations.

5.0. EQUIPMENT

5.1. The HOT science party shall be bringing the following

1. Seabird CTD system, all sensors, deck boxes and computer CTD acquisition systems
2. Rosette and 24 12L Bullister sampling bottles, and all associated spare parts

3. Two 20 ft. laboratory vans (#23 and Karl Flow Cytometry) with assorted equipment for radioisotope and general use.
4. Distilled, deionized water and all required chemicals and isotopes
5. Large vacuum waste containers
6. Liquid nitrogen dewar
7. Drifting sediment trap array with strobe lights, satellite and radio transmitters, floats, weights
8. Polypropylene line
9. Sediment traps and crosses
10. Drifting primary production array and gas array with light and radio transmitter, floats, weights, polypropylene line, spare buoy, etc.
11. Hyperpro and other optical measuring instruments.
12. Oxygen titration system
13. Plankton nets and towing lines
14. Desktop and laptop personal computers
15. Assorted tools
16. All required sampling bottles
17. Deck incubation system
18. Pertinent MSDS
19. 15-16 deg Incubator Chamber

5.2. We will need the use of the following ship's equipment:

1. A-frame
2. A-frame block assembly
3. Boom and winch with conducting wire for CTD
4. Electric power for winches (440 VAC, 3 phase, 60 Amp breaker) and vans (208 VAC single phase at 60 amps for lab van)
5. Radio direction finder
6. Space in the main deck hangar for one laboratory van (#23)
7. Space on upper deck for two 20 ft. lab vans (OTG Rad Van and Karl Flow Cytometry Van)
8. Space on upper deck for incubators
9. Hand-held VHF transceivers
10. Precision depth recorder
11. Shackles, sheaves, hooks and lines
12. Shipboard Acoustic Doppler Current Profiler
13. Thermosalinograph and Fluorometer
14. Copy machine
15. Grappling hooks and line
16. Navlink2 PC or equivalent
17. Running fresh water and seawater, hoses
18. Electronic mail system
19. GPS system
20. Uncontaminated seawater supply
21. Small capstan (~ 10 m/min)
22. Underway/on-station data acquisition system for meteorological instruments, ADCP, thermosalinograph, fluorometer
23. OTG's 24-place rosette, and 24 12-l water sampling bottles (to be used as spare)
24. 500 lb weight
25. Remote CTD dbar pressure display in the winch operator area
26. Monitor in Rock Lab displaying ship coordinates and UTC

Ship: R/V *Ka'Imikai-O-Kanaloa* HOT 241 CTD CASTS Date: April 30-May 4, 2012

Cast		Samples	#Bottles
Kahe Pt.			
s1c1	1000 m	O_2, Temp, DIC/Alk, Nuts, Chl a, LLN, LLP, DOC, FCM, Salts	24
Station ALOHA			
s2c1	1000 m	Primary Production, DV(pb PP depths), SMG(pb PP depths), Salts	22
s2c2	4740 m (PO-1)	O_2, Temp, DOC, DIC/Alk, Nuts, Salts	24
s2c3	1000 m (PO-2)	O_2, Temp, DOC, DIC/Alk, Nuts, Salts	24
s2c4	1000 m	PC/PN, SMG(1@5,25), DV(1@25), SR(pb DV, 1@5,45,75,100,125,150,175), Salts	24
s2c5	1000 m	PPO4, Salts	14
s2c6	1000 m	Salts	3
s2c7	1000 m	PUR, MC(1@5,25,45,75,100,125,150,175), SW(pb MC), Salts	18
s2c8	1000 m	Gas Array(2@5,25,45,75,100,125), Salts	14
s2c9	1000 m	AP(6@5), KB(3@25,100), Salts	15
s2c10	1000 m	PSi, MC(1@5,25,45,75,100,125,150,175), DV(1@100) SMG(pb MC depths, 1@200), Salts	20
s2c11	1000 m	CS(2@25), BW(4@1000), Salts	9
s2c12	1000 m	ATP, SW(1@200,300,400,500, 600,700,800,900,1000), Salts MC(1@200,300,500,770), SMG(pb SW depth, 1@O2 min)	24
s2c13	1000 m (BEACH)	O_2, Temp, DIC/Alk, Nuts, LLN, LLP, DOC, Keeling, Quay, Salts	23
s2c14	1000 m	HPLC, Chl a, Slides, Salts	22
s2c15	200 m	AT(1@5,25,45,75), DV(6@25), SW(6@25), MSM(2@DCM), SMG(2@5,1@25), MC(1@1000)	22

MC=Matt Church, **SW**=Sam Wilson, **DV=**Donn Viviani, **SMG=**Sandra Martinez-Garcia, **AP**=Adina Paytan, **SR**=Shimi Rii
AT=Anne Thompson, **BW**=Blake Watkins, **KB**=Karin Bjorkman, **MSM**=Maria Segura-Noguera, **CS**=Chris Schwarcz

Ship: R/V *Ka'Imikai-O-Kanaloa* HOT-241 Date: April 30-May 4, 2012

TIME	Mon. 4/30	Tue. 5/1	Wed. 5/2	Thu. 5/3	Fri. 5/4
0000		Arrive ALOHA	Net Tow	Transit sed traps	
0100		Deploy sed traps S2C1 PP/WHOTS			
0200		AC9/FRRF	S2C8 Gas	Recover traps	
0300				Transit gas array	
0400		Deploy PP Array	Deploy Gas Array		
0500		S2C2 PO-1	S2C9 Open	Recover gas array Transit APEX float	
0600					
0700					
0800	Depart Snug		S2C10 PSi		Arrive Snug
0900					
1000	Arrive Kahe (11:00)	Net Tow	Net Tow	Recover APEX	
1100	Weight cast	S2C3 PO-2 (Begin 36 hr)	S2C11 Open		
1200	Hyperpro S1C1 Kahe	Hyperpro AC9/FRRF	Net Tow		
1300				Transit Snug	
1400	Transit ALOHA	S2C4 PC/PN	S2C12 ATP		
1500					
1600					
1700		S2C5 PPO4	S2C13 BEACH		
1800					
1900		Recover PP array			
2000		S2C6 Open	S2C14 HPLC		
2100					
2200		Net Tow	Net Tow		
2300		S2C7 PUR	S2C15 Open (end 36 hours)		

May 1st: Sunrise 0600, Sunset 1857

6.0 HOT-241 Watch Schedule

0300-1500

Adriana Harlan **–** *Water Boss*
Dan Sadler – Watch Leader – *Alt. Tag*
Sean Jungbluth - Tag
Cammy Fumar - *Console*
Jefrey Snyder – *Tag*

1500-0300

Karin Bjorkman – Watch Leader - *Tag*
Tara Clemente **–** *Water Boss*
Branden Obra **-** *Tag*
Craig Nosse – Chief Scientist – *Console*

0900-2100

Ken Doggett

At Large

Blake Watkins
Donn Viviani
Sandra Martinez-Garcia

OTG

Trevor Young
Jeff Koch