Hawaii Ocean Time-series
HOT-263 Operational Cruise Plan

Cruise ID: KOK 14-04
Vessel: R/V *Ka'Imikai-O-Kanaloa*, University of Hawaii
Master of the Vessel: Captain Don Jack
Chief Scientist: Susan Curless, University of Hawaii
OTG Marine Technicians: Dave Hashisaka and Justin Smith

Marine Center phone number: 842-9813
KOK phone number: 842-9818
KOK Cell number: 722-0839
KOK Satellite Phone Numbers: 011-870-764-144557 or 011-870-764-144559

Loading: May 29, 2014 @0900
Departure: May 30, 2014 @0800 (Science personnel on board by 0700).
Arrival: June 3, 2014 @ 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. Four 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 May 30th 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 May 31st-June 2nd.
3) Station 52, the site of WHOTS-10 Mooring (anchor position 22° 40.12'N 157° 57.01'W) will be occupied for about one hour on June 2nd.
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 June 2nd for about 2 hours.

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, optics casts, misc. experiments.
WHOTS mooring station (Sta. 52)	One CTD cast (yo-yo to 200 m), surface instrument intercomparisons.
Underway/continuous	ADCP, thermosalinograph, fluorometry, meteorology

2.0. SCIENCE PERSONNEL

Participant	Title	Affiliation
Susan Curless	Research Associate	UH
Adriana Harlan	Research Associate	UH
Dan Sadler	Research Associate	UH
Lance Fujieki	Research Associate	UH
Christopher Schvarcz	Graduate Student	UH
Stuart Goldberg	Postdoctoral Researcher	UH
Jamie Becker	Postdoctoral Researcher	MIT
Charles Roman Battisti	Graduate Student	HPU
Brenner Wai	Technician	UH
Blake Watkins	Marine Engineer	UH
Jefrey Snyder	Marine Technician	UH
Fernando Santiago-Mandujano	Research Associate	UH
Daniel McCoy	Research Associate	UH
Robert (Walt) Deppe	Research Associate	UH
Kristine Tofte	Graduate Student	UH
Seth Travis	Graduate Student	UH
Kayla Svelling	Undergraduate Student	UH
Justin Smith	Marine Technician	OTG
Dave Hashisaka	Marine Technician	OTG

3.0. SUMMARY SCHEDULE

22 May	Pre-cruise planning meeting 1330 hrs, Moore Conference Center, CMH
29 May	Ship loading at 0900 hrs.
30 May	Depart from Snug harbor at 0800 hrs. **Science personnel on-board by 0700.**
30 May	Station 1 Kahe Pt. operations.
31 May – 2 June	Station ALOHA operations. Station 52 CTD yo-yo cast, Station Kaena
3 June	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 May 30th. The CTD winch and small North American Crane will be required for these operations. After the operations are satisfactorily completed, the ship shall proceed to Station ALOHA.

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

4.2.1. Upon arrival to Station ALOHA, the sediment traps will be deployed. After the sediment trap deployment is complete, one 200-m and one 1000-m CTD cast will be conducted before deploying the Primary Productivity Array (Sect. 4.2.3). These operations will be followed by 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 within Station ALOHA, to be determined enroute to ALOHA by local current conditions. The array will be deployed from the stern rail using the small crane and the 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 53 hours before recovery. The array is equipped with 2 ARGOS satellite transmitters (platform #'s 3028, 60482), 2 strobe lights, and 2 radio transmitters (channel 68: 156.425 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 0547 hrs on May 31st), a free drifting incubation array will be deployed from the stern rail using the small crane and the Sea-Mac winch. The array is equipped with two ARGOS satellite transmitters, (platform #'s 60484, 84857) strobe lights and a radio transmitter (channel 74: 156.725 MHz). Positions of the array will be emailed to argosfix@satellite-email.com, password: argosfix. 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 (1913 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 crane 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, ending with a second near-bottom cast. 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 **(Jefrey Snyder, Fernando Santiago-Mandujano)**.

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 9. The gas array will be deployed from the stern rail using the small crane and the 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. Zooplankton 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, second and fourth days, the Hyperpro will be deployed from the stern through a small block hung from the A-frame. The instrument is lowered and retrieved by hand. Each deployment will consist of three profiles before the instrument is retrieved.

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.

4.2.9. Automated Trace Element Sampler (ATE)

On the morning of June 1st, the ATE will be hand deployed off the back deck to a depth of 10 m to collect at Trace Metal Free Sample. The ATE will be recovered after 30 minutes in the water. The ATE is approximately 1’ tall and 4’’ in diameter, weighting 5 lbs.

If the ship has been stationary at ALOHA for previous cruise activities, it is requested that the ship steams approximately 10-15 minutes up current from current position prior to each ATE deployment to limit contamination of the trace metal sample from the ship’s hull.

4.3. Floating sediment trap recovery

In the morning of June 2nd, after the AC9/FRRf cast has 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 Station 52 to conduct one 200 m yo-yo cast.

4.4 Station 52 - WHOTS-10 Mooring

The anchor position of the WHOTS-10 mooring is 22° 40.12'N 157° 57.01'W. The watch circle of the buoy is about 2 nautical miles. Generally, the buoy stays on the edge of the watch circle. The buoy can be detected via radar in good weather conditions but is harder to detect with larger sea states.

4.4.1 CTD yo-yo cast (subsurface instrument intercomparison)

One 200-m CTD yo-yo cast with at least 5 full cycles will be conducted near the WHOTS mooring on June 2nd for subsurface instrument intercomparison. This cast should be conducted downwind, down current, and about 200 m from the mooring.

4.4.2 Surface instrument intercomparison

While on station, the ship’s meteorological system shall be in operation for surface instrument

intercomparisons with the WHOTS mooring. Once the yo-yo cast is completed, a Hyperpro cast will be conducted within the circle that defines Station ALOHA. Once the Hyperpro cast is completed, an APEX float will be deployed.

4.5. Seaglider Operations

Seaglider 146 will be diving and profiling in the Station ALOHA area and at times transiting within the circle boundaries of Station ALOHA.

sg146 ARGOS – 90990

There is no plan to recover the seaglider on this cruise; however the seaglider is operating without communication with the pilot and with decreasing battery pack voltage. The glider pilot (Steve Poulos) will be monitoring the KOK's position and the free drifting array positions relative to the glider positions throughout the duration of the cruise. He will also notify the ship should the situation with the gilder change (go into recovery mode).

4.6. 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.

4.7. 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 the 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 12-l water sampling bottles, all spare parts
3. One 20 ft. laboratory van (#23) 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
20. Large stand up incubator

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

1. A-frame
2. A-frame block assembly
3. Crane 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, 110 VAC 10 amps for equipment van)
5. Radio direction finder
6. Space in the main deck hanger for one laboratory van **(#23)**
7. Space on upper deck for incubators
8. Hand-held VHF transceivers
9. Precision depth recorder
10. Shackles, sheaves, hooks and lines
11. Shipboard Acoustic Doppler Current Profiler
12. Thermosalinograph and Fluorometer
13. Copy machine
14. Grappling hooks and line
15. Navlink2 PC or equivalent
16. Running fresh water and seawater, hoses
17. Electronic mail system
18. GPS system
19. Uncontaminated seawater supply
20. Small capstan (~ 10 m/min)
21. Underway/on-station data acquisition system for meteorological instruments, ADCP, thermosalinograph, fluorometer
22. OTG's 24-place rosette, and 24 12-l water sampling bottles (to be used as spare)
23. 500 lb weight
24. Remote CTD dbar pressure display in the winch operator area.
25. Monitor in Rock Lab displaying ship coordinates and GMT.

Ship: R/V *Ka'Imikai-O-Kanaloa* HOT 263 CTD CASTS Date: May 30 - June 3, 2014

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	200 m	JB(22@200), SG(2@25)	24
s2c2	1000 m	Primary Production, Salts	22
s2c3	4740 m (PO-1)	O_2, Temp, DOC, DIC/Alk, Nuts, Salts	24
s2c4	1000 m (PO-2)	O_2, Temp, DOC, DIC/Alk, Nuts, Salts	24
s2c5	1000 m	PC/PN, Salts	14
s2c6	1000 m	PPO4, SF-S(1@25), JB(10@5), Salts	24
s2c7	1000 m (BEACH)	O_2, Temp, DIC/Alk, Nuts, LLN, LLP, DOC, Keeling, Quay, Salts, SF-S(1@25)	24
s2c8	1000 m	PUR, SF-S(1@25), JB(13@500), Salts	24
s2c9	1000 m	Gas Array(2@5,25,45,75,100,125), SF-S(1@25), Salts	15
s2c10	1000 m	PO(6@1000), SF-S(1@25), JB(15@1000), Salts	24
s2c11	1000 m	PSi, MC(1@5,25,45,75,100,125,150,175), SF-S(1@25), SG(1@35,60,200), Salts	22
s2c12	1000 m	CS(2@5,25,45,75,100,125,150,175), SF-S(1@25), Salts	19
s2c13	1000 m	ATP, MC(1@200,300,500,770), SF-S(1@25), SW(1@700), SG(1@35,60,200), Salts	20
s2c14	1000 m	MC(1@5,25,45,75,100,125,150,175), SW(pb MC), SF-S(1@25), JB(13@DCM), Salts	24
s2c15	1000 m	HPLC, Chl a, Slides, Salts	22
s2c16	4740 m (PO-3)	Oxygen, MC(1@1000,2000,3000,4000), SG(1@4000), JB(11@5), Salts	24
WHOTS Mooring			
s52c1	200 m yo-yo	DIC/TA(1@5), JB(2@MLD,DCM,150,200), KT(1@5,25,45,75,100,125), DV(1@25), SW(4@25)	20
Kaena			
s6c1	2400 m	Chl, Salts	13

MC=Matt Church, **SW**=Sam Wilson, **CS=**Chris Schvarcz, **SG=**Stu Goldberg, **SF-S=**Sara Ferrón-Smith, **JB=**Jamie Becker, **KT=**Kendra Turk-Kubo

Ship: R/V *Ka'Imikai-O-Kanaloa* HOT 263 Date: May 30- June 3, 2014

TIME	Fri. 5/30	Sat. 5/31	Sun. 6/1	Mon. 6/2	Tues. 6/3
0000		Arrive ALOHA Deploy sed traps			Transit Snug
0100		S2C1 Open			
0200		S2C2 PP	S2C9 Gas		
0300				AC9/FRRF	
0400		Deploy PP Array	Deploy Gas Array		
0500		S2C3 PO-1	S2C10 Open	Transit gas array	
0600				Recover gas array Transit sed traps	
0700				Recover traps	
0800	Depart Snug		S2C11 PSi	Transit ALOHA	Arrive Snug
0900					
1000	Arrive Kahe (11:00)	Net Tow	Net Tow ATE	AC9/FRRF	
1100	Weight cast	S2C4 PO-2 (Begin 36 hr)	S2C12 Open		
1200	Hyperpro S1C1 Kahe		Net Tow	Transit St. 52 S52C1 WHOTS	
1300		Hyperpro			
1400	Transit ALOHA	S2C5 PC/PN	S2C13 ATP	Hyperpro	
1500				Transit St. Kaena	
1600					
1700		S2C6 PPO4	S2C14 OPEN		
1800					
1900		Recover PP array			
2000		S2C7 BEACH	S2C15 HPLC		
2100				S6C1 Kaena	
2200		Net Tow Net Tow	Net Tow		
2300		S2C8 PUR	S2C16 PO-3 (end 36 hours)		

May 31st: Sunrise 0547, Sunset 1913

6.0 HOT-263 Watch Schedule

0300-1500

Adriana Harlan **–** *Water Boss*
Dan Sadler – *Tag*
Lance Fujieki – *Alt. Tag*
Danny McCoy **-***Console*
Jefrey Snyder – Watch Leader – *Tag*
Kristine Tofte

1500-0300

Susan Curless– Chief Scientist – *Water Boss*
Brenner Wai – *Tag*
Walt Deppe – *Tag*
Fernando Santiago-Mandujano **-** Watch Leader **–***Console*
Seth Travis

0900-2100

Kayla Svelling

1000-2200

Stu Goldberg
Roman Battisti

At Large

Blake Watkins
Jamie Becker
Chris Schvarcz

OTG

Justin Smith
Dave Hashisaka