Hawaii Ocean Time-series
HOT-196 General Cruise Plan

Vessel: R/V *Ka'Imikai O Kanaloa*, University of Hawaii
Master of the Vessel: Captain Ross Barnes
Chief Scientist: Paul Lethaby, University of Hawaii
OTG Marine Technicians: Kuhio Velallos, Elly Sphiecher

Loading: September 30, 2007, loading of HOT lab vans, heavy equipment, and HOT gear.
Departure: October 1, 2007 @ 0800
Arrival: October 5, 2007 @ 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. Five stations will be occupied during the cruise, in the following order:

1) Station 1, referred to as Station Kahe, is located at 21º 20.6'N, 158º 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 22º 45'N, 158ºW. This is the main HOT station and will be occupied during the 2nd, 3rd, and 4th days of the cruise.
3) Station 52, is the site of the WHOTS Mooring, located at 22º 40.208'N, 157º 57.001'W will be occupied on the 4th day of the cruise for about 1 hour.
4) Station 6, referred to as Station Kaena, is located off Kaena Point at 21º 50.8'N, 158º 21.8'W will be occupied on the 4th day of the cruise for about 2 hours.

In addition it is planned to recover one autonomous glider which is located at the northern point of the circle around ALOHA. It is anticipated that the recovery shall take 2 hours.

1.1 SCIENTIFIC OPERATIONS

Station	Activities
Kahe (sta. 1)	Weight Cast, PRR 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)	CTD operations, CTD cast (200 m).
Kaena (sta. 6)	CTD cast (2400 m)
Underway/continuous	ADCP, thermosalinograph, fluorometry, meteorology

2.0. SCIENCE PERSONNEL

Participant	Title	Affiliation/Group
Lucas Beversdorf	Graduate Student	UH/BEACH
Karin Björkman	Research Specialist	UH/BEACH
Susan Curless	Research Associate	UH/BEACH
Ken Doggett	Research Assocoiate	UH/BEACH
Lance Fujieki	Computer Specialist	UH/BEACH
Adriana Harlan	Research Associate	UH/BEACH
Paul Lethaby	Chief Scientist – Res. Assoc.	UH/PO
Binglin Li	Graduate Student	UH/BEACH
Barbara Mayer	Teacher (Volunteer)	UH/PO
Misty Miller	Technician	UH/Rappé
Ben Pittenger	Teacher (Volunteer)	UH/PO
Dan Sadler	Research Associate	UH/BEACH
Fernando Santiago-Mandujano	Research Associate	UH/PO
Justin Smith	Undergraduate Student	UH/PO
Jefrey Snyder	Marine Technician	UH/PO
Elly Sphiecher	Marine Technician	OTG
Brett Updyke	Technician	UH/BEACH
Kuhio Velallos	Marine Technician	OTG
Donn Viviani	Graduate Student	UH/BEACH
Blake Watkins	Marine Engineer	UH/BEACH
Sam Wilson	Scientist	UH/CMORE

3.0. SUMMARY SCHEDULE

24 September	Pre-cruise meeting MSB 306 1030 hrs.
30 September	Ship loading starting at 0900 hrs
1 October	Depart from Snug harbor at 0800 hrs. Science personnel on-board by 0700.
1 October	Station 1 Kahe Pt. operations.
1-4 October	Station ALOHA operations. Stations 52 and 6 CTD casts.
5 October	Arrive Snug harbor. ETA 0800 hrs, full offload

4.0. OPERATIONAL PLANS

4.1. Station Kahe (21^{o}20.6'N, 158^{o}16.4'W)

A 400 lb. weight-test cast, one CTD cast to 500 m, a hand held surface net tow and a PRR cast (Sect. 4.2.7) will be conducted at this location in the afternoon of October 1. The CTD winch and boom will be required for the weight test and CTD operations. The small aft

crane will be required for the PRR cast and the SeaMac winch to aid with retrieval. 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. Afterwards, two 200-m casts will be conducted before deploying the Primary Production array. These operations will be followed by a near-bottom CTD cast.

4.2.2. Sediment trap deployment

Upon arrival to Station ALOHA, the floating sediment traps will be deployed at a location within Station ALOHA, which will be determined by local current conditions to be determined enroute to ALOHA. The array will be deployed from the side using the small crane and the SeaMac winch. Power requirement for the winch is 440 VAC, three phase at 10 amps. 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 01833 and 03028), 2 strobe lights, and 2 radio transmitters (channel 74, 156.725 MHz). Daily positions of the array shall be transmitted by email directly to the ship, 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 return to the center of Station ALOHA to continue with CTD cast operations.

4.2.3 Primary production experiment

Samples for the primary productivity experiment will be collected from the rosette. Before dawn (sunrise 0624 hrs on October 2), a second free drifting incubation array will be deployed from the stern. We request the use of the small crane for this operation and will also use the SeaMac winch. The array is equipped with one ARGOS satellite transmitter (platform # 60481), strobe lights and a radio transmitter (channel 68, 156.425 MHz). The **ship shall keep within site of the array** while performing CTD operations for the approximately 12-hour duration the array will be in the water. The array will be recovered just at sunset (1818 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 sampling bottles. We need the ship's CTD winch and boom for this operation. Water samples for biogeochemical measurements will also be collected on each cast. The cast after the deployment of the gas 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 **(Fernando Santiago-Mandujano, Susan Curless).**

4.2.5. Gas Array deployment

Samples for the gas array will be collected from cast 9. At 0400 on October 3, the gas array will be deployed at a location within Station ALOHA, which will be determined by local current conditions to be determined at ALOHA. We request the use of the small crane for the gas array deployment, and will also use the SeaMac winch. The array is equipped with a ARGOS satellite transmitter (platform #08500), a strobe light and a radio transmitter (channel 69, 156.475MHz). The ship will **not** need to keep within sight of the array until the time of the recovery, approximately 24 hours after its deployment.

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 at around noon and two consecutive half-hour periods at midnight on the second and third days (see schedule) with a total of seven available slots to accommodate cancellations due to sea state or other unforeseen problems. The A-frame and ship's overhead winch / Capstan will be needed for this operation. B. Watkins will be in charge of these operations.

4.2.6.1 Hand held net tows

These surface net tows are hand-deployed off the stern for about 15 minute periods. One net tow is scheduled for October 1 at Kahe but others may be introduced to the schedule at appropriate time slots. We request that the ship remain stationary during these tows. L. Beversdorf and D. Viviani will be conducting the net tows.

4.2.7. Profiling Reflectance Radiometer (PRR).

Around noon on each day a profiling reflectance radiometer will be deployed from the main deck using the A-frame. The instrument is hand-lowered and retrieved with assistance from the winch.

4.2.8. AC9

The Wet Labs AC9 is an optical instrument that measures water column spectral absorption and attenuation at nine wavelengths. The package will be deployed to a target depth of 250 m at a constant speed of 10 m/min during the downcast and upcast. The A-frame and capstan will be needed for this operation.

4.3 Floating sediment trap recovery

In the morning of October 4 we shall transit for the recovery of the floating sediment trap array. The A-frame and the Sea-Mac winch will be needed to retrieve the sediment trap array. After the array is recovered, the ship shall transit to the location of the gas array for recovery. Following this the ship shall transit to the location of the glider to the north of the circle.

4.4 WHOTS Mooring (Station 52)

One 200-m CTD cast will be conducted near the WHOTS mooring. This cast should be conducted downwind, downcurrent, and at about 200 m from the mooring. The nominal position of the mooring is 22º 40.208'N, 157º 57.001'W. The cast will be an approximately one hour yo-yo cast to 200 m. After this cast is completed, the ship shall transit to Station Kaena to conduct one near-bottom CTD cast.

4.5 Station Kaena (21º 50.8'N, 158º 21.8'W)

A near-bottom CTD cast (~2500 m) will be conducted at this location in the evening of September 4, after which the ship shall return to Snug harbor.

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 electronics technician 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 and chlorophyll samples will be periodically taken to calibrate the thermosalinograph and fluorometer respectively, throughout the duration of the cruise by the science personnel. The OTG electronics technician 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. Two HOT laboratory vans (Hanger and 02 deck) with assorted equipment for radioisotope and general use.
4. Distilled, deionized water and all required chemicals and isotopes
5. Storage van with assorted equipment (02 deck)
6. Large vacuum waste container
7. Liquid nitrogen dewer
8. Drifting sediment trap array with strobe lights, satellite and radio transmitters, floats, weights
9. Kevlar line, polypropylene line
10. Sediment traps and crosses
11. Drifting primary production array and gas array with light and radio transmitter, floats, weights, polypro. Line, spare buoy, etc.
12. PRR, AC-9 and other optical measuring instruments.
13. Oxygen titration system
14. Plankton nets and towing lines
15. Desktop and laptop personal computers

16. Assorted tools
17. All required sampling bottles.
18. Deck incubation system
19. Pertinent MSDS.
20. Automated Trace Element Sampler (ATE)
21. Drifting gas array with light and radio transmitter, floats, weights, line, buoy, etc.
22. Hand held net.
23. Kevlar line

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

1. A-frame and starboard side crane
2. A-frame block assembly
3. Markey winch with conducting wire for CTD
4. Sea-Mac winch (440 VAC, 3 phase at 10 amps)
5. Electric power for winches (440 VAC three phase at 10 amps) and vans (208 VAC single phase at 30 amps for labvan, 110 VAC 10 amps for equipment van)
6. Radio direction finder
7. Space on the 02 deck for two vans
8. Space in hanger for one lab van
9. Space on upper deck for incubators
10. Hand-held VHF transceivers.
11. Radio direction finder
12. Precision depth recorder
13. Shackles, sheaves, hooks and lines
14. Shipboard Acoustic Doppler Current Profiler
15. Thermosalinograph and Fluorometer
16. Copy machine
17. Grappling hooks and line
18. Navlink2 PC or equivalent
19. Running fresh water and seawater, hoses
20. Electronic mail system
21. GPS system
22. Uncontaminated seawater supply
23. Small capstan (~ 10 m/min)
24. Underway/on-station data acquisition system for meteorological instruments, ADCP, thermosalinograph, fluorometer
25. Refrigerator, freezer, and ultra-low freezer
26. Ultrapure fresh water system (reverse osmosis and NANOpure analytical system [18MOhm])
27. OTG’s 24-place rosette, and 24 12-l water sampling bottles (to be used as spare)
28. OTG’s Pinger (to be used as spare)
29. OTG’s 400 lb weight
30. Small boat for glider recovery
31. Spare O2 sensor

Ship: R/V *Ka'Imikai O Kanaloa* HOT 196 CTD CASTS 1-5 October, 2007

Cast		Samples	#Bottles
Kahe Pt.			
s1c1	1000 m	O_2, Temp, DIC/Alk, Nuts, Chl a, LLN, $LLPO_4$, DOC, FCM, Salts	24
Station ALOHA			
s2c1	200 m	CMORE(5@25, 5@45), MR (2@45), LB(5,25,45,75,100,125,150,175,200)	21
s2c2	1000 m	Primary Production, Salts DV(2@10)	24
s2c3	4740 m (PO-1)	O_2, Temp, DOC, DIC/Alk, Nuts, Salts	24
s2c4	1000 m (PO-2)	O_2, Temp, Nuts, DIC/Alk, Quay, DOC, Salts	24
s2c5	1000 m	PC/PN,CMORE(5@75, 5@125), BL(2L), Salts	24
s2c6	1000 m	PPO4, LB(5,25,45,75,100,125,150,175,200), Salts	23
s2c7	1000 m	HPLC, Chl a, Slides, Salts	23
s2c8	1000 m (BEACH)	O_2, Temp, DIC/Alk, Nuts, LLN, LLP,DOC, Keeling, Quay, Salts	23
s2c9	1000 m	Gas Array (4@5, 25, 45, 75, 100, 125)	24
s2c10	1000 m	Open, MR(1000,800,600,400,200,175,150,125,100,75,45,10), CMORE(5@ 770), DV(2@10),Salts	21
s2c11	1000 m	PSi, MC(5,25,45,75,100,125,150,175), Salts	19
s2c12	1000 m	MIT, CMORE(5@500), BL(2L), Salts	23
s2c13	1000 m	ATP, Quay(100,125,150,200,300), MC(200,300,500,770), MR(2@1000,2@500), Salts	24
s2c14	1000 m	PE, Salts, MC(5,25,45,75,100,125,150,175), Quay(5,25,45,75), Salts	24
s2c15	1000 m	PUR, CMORE(5@1000, 5@200), Salts	24
s2c16	4740 m (PO-3)	Oxygen, Salts, MC(1000,2000,3000,4000), MR(4000,3000,2000,1000,800,600,400,175,125,100,75,10)	24
WHOTS Mooring			
S52c1	200 m [1 hour yo-yo]	BL (20L@5 depths), Salts	13
Kaena			
S6c1	2400 m	Chl, Salts	13

SHIP R/V *Ka'Imikai O Kanaloa* HOT 196 Date 1-5 October 2007

TIME	Mon. 10/1	Tue. 10/2	Wed. 10/3	Thur. 10/4	Fri. 10/5
0000		S2C1			
0100		S2C2 PP	Net Tow		
0200			S2C9 Gas	Transit sed traps	
0300					
0400		Deploy PP Array	Deploy Gas Array		
0500		S2C3 PO-1	S2C10 Open	Recover traps Transit gas array	
0600					
0700				Recover gas array	
0800	Depart Snug		S2C11 PSi	Transit to Glider	Arrive Snug offload
0900				Recover Glider	
1000		Net Tow	Net Tow	Transit ALOHA	
1100	Arrive Kahe (11:30) Weight cast	S2C4 PO-2 (Begin 36 hr)	S2C12 MIT	PRR AC9	
1200	PRR	Net Tow	PRR AC9	AC9	
1300	S1C1	ATE	Net Tow	Transit St. 52	
1400	Hand Net Tow Transit ALOHA	S2C5 PC/PN	S2C13 ATP	S52C1	
1500				Transit St. Kaena	
1600					
1700		S2C6 PPO4	S2C14 PE		
1800		Recover PP array			
1900					
2000		S2C7 HPLC	S2C15 PUR		
2100				S6C1	
2200		Net Tow	Net Tow		
2300	Arrive ALOHA Deploy sed traps	S2C8 BEACH	S2C16 PO-3 (end 36 hours)	Transit Snug	

October 2: Sunrise 0624 Sunset 1818

6.0 HOT-196 Watch Schedule

0300-1500

Jefrey Snyder - *Deck Boss*
Adriana Harlan - *Water Boss*
Lance Fujieki - *Alt Water Boss , Alt Tag*
Blake Watkins - *Tag*
Brett Updyke - *Tag*
Fernando Santiago-Mandujano – Watch Leader, *console*
Barbara Mayer
Ken Doggett

1500-0300

Susan Curless - Watch Leader, *Water Boss*
Karin Björkman - *Alt Water Boss, Alt Tag*
Paul Lethaby - Chief Scientist, *console*
Dan Sadler – *Alt Tag*
Justin Smith – *Deck Boss*
Ben Pittenger - *Tag*
Sam Wilson - *Tag*

At Large

Lucas Beversdorf
Donn Viviani
Binglin Li
Misty Miller

OTG

Kuhio Velallos
Elly Sphiecher