Hawaii Ocean Time-series
HOT-177 General Cruise Plan

Vessel: R/V *Kilo Moana*, University of Hawaii
Master of the Vessel: Captain Grey Drewry
Chief Scientist: Thomas K. Gregory
OTG Marine Technicians: Tim McGovern and Dan Fitzgerald

Loading: Jan. 20, 2006 @ 0900 HST
Departure: Jan. 23, 2006 @ 0900
Arrival: Jan. 27, 2006 @ 1000

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 51, is the site of the MOSEAN Mooring, located at 22º 45'N, 158º 6'W will be occupied on the 1st and 4th day of the cruise for about 30 minutes.
4) Station 50 is the site of the WHOTS Mooring, is located at 22º 46.1'N, 157º 53.4'W and will be occupied on the 4th day of the cruise for about 2 hours.
5) 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.

1.1 SCIENTIFIC OPERATIONS

Station	Activities
Kahe (sta. 1)	Weight Cast, PRR cast, CTD cast (1000 m)
ALOHA (sta. 2)	Sediment traps, net tows, CTD operations, primary productivity measurements, AC9/FRRf, misc. experiments
MOSEAN mooring station (sta. 51)	CTD cast (200 m)
WHOTS mooring station (sta. 50)	CTD cast (200 m), small boat ops for repair of anemometer
Kaena (sta. 6)	CTD cast (2400 m)
Underway/continuous	ADCP, thermosalinograph, fluorometry, meteorology

2.0. SCIENCE PERSONNEL

Participant	Affiliation/HOT Group	Title
Appelgate, Bruce	UH/OTG	Director, OTG
Bjorkman, Karin	UH/BEACH	Research Specialist
Chee, Brian	UH/OTG	Computer Network Specialist
Curless, Susan	UH/BEACH	Research Associate
Defelice, Suzanne	UH/PO	Research Associate
Doggett, Ken	UH/BEACH	Research Associate
Fitzgerald, Dan	UH/OTG	Marine Technician
Fujieki, Lance	UH/BEACH	Computer Specialist
Grabowski, Eric	UH/BEACH	Research Associate
Gregory, Thomas	UH/BEACH	Chief Scientist
Harlan, Adriana	UH/BEACH	Research Associate
Lethaby, Paul	UH/PO	Research Associate
Mahaffey, Claire	UH/BEACH	Scientist
McGovern, Tim	UH/OTG	Marine Technician
Morton, Dan	UH/OTG	Computer Network Specialist
Sadler, Dan	UH/BEACH	Research Associate
Santiago - Mandujano, Fernando	UH/PO	Research Associate
Mitchell, Jim	UH/BEACH	Graduate Student
Taylor, Keali'imanauluokeahi	UH/BEACH	Graduate Student
Uchikawa, Joji	UH/PO	Graduate Student
Watkins, Blake	UH/BEACH	Marine Engineer

3.0. SUMMARY SCHEDULE

17 Jan.	Pre-cruise meeting
20 Jan.	Ship loading starting at 0900 hrs
23 Jan.	Depart from Snug harbor at 0900 hrs. Science personnel on-board by 0830.
23 Jan.	Station 1 Kahe Pt. operations
24-26 Jan.	Station ALOHA operations. Station 50 and 51 CTD casts. Station Kaena CTD cast
27 Jan.	Arrive back to Snug harbor. ETA 1000 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 1000 m, and a PRR cast (Sect. 4.2.7) will be conducted at this location in the afternoon of Jan. 23. The CTD winch and 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, A series of CTD casts will commence.

4.2.2. Sediment trap deployment

At midnight on Jan. 24, 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 stern using the A-frame and our 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 52 hours before recovery. The array is equipped with 2 ARGOS satellite transmitters (platform #s 01325 and 01833), 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 deploy the gas array.

4.2.3 Gas Array

Samples for the gas array will be collected from cast 1 and 2. We request the use of the A-frame for this operation and will also use the Seamac winch. The array is equipped with a strobe light and a radio transmitter (frequency to be provided).

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 crane for this operation. Water samples for biogeochemical measurements will also be collected on each cast. Beginning with cast 9, a series of 1000-m casts shall be made continuously every 3 hours for a 36-hour period, ending with a third 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.

4.2.5. Primary production experiment

Samples for the primary productivity experiment will be collected from the rosette (cast 9). Just before dawn (sunrise 0713 on Jan. 25), a third free drifting incubation array will be deployed from the stern. We request the use of the A-frame for this operation and will also use the Seamac winch. The array is equipped with strobe lights and a radio transmitter (channel 72, 156.625 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 (1816). 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.

4.2.6. Plankton net tows

Plankton nets will be deployed from the stern and shall be towed for half-hour periods. Half-hour periods are scheduled at around noon and midnight throughout the cruise. The A-frame and trawl winch will be needed for this operation.

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 main crane. The instrument is hand-lowered and retrieved with assistance from the Seamac winch.

4.2.8. AC9/FRRf

The Wet Labs AC9 is an optical instrument that measures water column spectral absorption and attenuation at nine wavelengths. The AC9 package also includes a Fast Repetition Rate Fluorometer (FRRf), and a Sea-Bird Seacat with temperature, conductivity, fluorometer, and pressure sensors. 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. We request the use of the ship's trawl winch and A-frame for this operation.

4.3 Floating sediment trap recovery

On Jan. 26, after the morning AC9/FRRf cast has been completed, we shall transit for the recovery of the sediment trap array. The main crane and the Seamac winch will be needed to retrieve the sediment trap array. After the array is recovered, the ship shall transit to Station 51 to conduct one 200 m CTD cast.

4.4 Mooring Operations

4.4.1 MOSEAN Mooring (Station 51)

One 200-m CTD cast will be conducted near the MOSEAN Mooring (Station 50). The cast should be conducted downwind, downcurrent, and at about 200 m from the mooring. The nominal position of the mooring is 22^{o} 45'N, 158^{o} 6'W. After this cast is completed, the ship shall transit to Station 50.

4.4.2 WHOTS Mooring (Station 50)

One 200 m cast will be conducted at this mooring as described above for MOSEAN mooring. Additionally, we need to repair an anemometer on this mooring and request the use of the small boat for this operation. After this operation is completed, the ship shall transit to Station Kaena.

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

A near-bottom CTD cast (~2500 m) will be conducted at this location in the evening of Jan. 26, 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 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 electronics technician will be in charge of the thermosalinograph operation.

5.0 EQUIPMENT

5.1 The HOT science party shall be bringing the following

1. Seabird CTD system, all sensors except pinger and altimeter, deck boxes and computer CTD acquisition systems.
3. Two laboratory vans with assorted equipment for radioisotope and general use
4. Distilled, deionized water and all required chemicals and isotopes
5. Storage van with assorted equipment
6. Large vacuum waste container
7. Liquid nitrogen dewars
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 with light and radio transmitter, floats, weights, polypro. Line, spare buoy, etc.
12. PRR, AC-9 and other optical measuring instruments.
13. SEA-MAC winch (440 VAC, 3 phase at 10 amps) and Kevlar line
14. Oxygen titration system
15. Plankton nets and towing lines
16. Desktop and laptop personal computers
17. Assorted tools
18. All required sampling bottles.
19. Deck incubation system
20. 400 lb weight.
21. Acoustic transponders for mooring release
22. Pertinent MSDS

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

1. A-frame and trawl winch
2. A-frame block assembly
3. Appleton crane and winch with conducting wire for CTD

4. 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)
5. Radio direction finder
6. Empty freezer and refrigerator in wet lab
7. Space on the 02 deck for one storage van, SEA-MAC winch
8. Space on the 02 deck for one lab vans
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. Capstan
22. Underway/on-station data acquisition system for meteorological instruments, ADCP, thermosalinograph, fluorometer
23. 24-place rosette with 10-l sampling bottles. SeaPoint Fluorometer, Pinger and Altimeter, spare carousel, spare oxygen sensor.

Ship: R/V KILO MOANA **HOT 177 CTD CASTS** 23-27 Jan., 2006

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	Gas Array (7@5, 25, 45), Salts,	21
s2c2	200 m	Gas Array (7@75, 100, 125), Salts,	21
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	ATP, Salts,	11
s2c6	1000 m	PE, Salts	9
s2c7	1000 m	HPLC, Chl a, Slides, Salts	22
s2c8	1000 m(BEACH)	O_2, Temp, DIC/Alk, Nuts, LLN, LLP, DOC, Keeling, Quay, Salts	20
s2c9	1000 m	Primary Production, Salts	22
s2c10	1000 m	Open, Salts	3
s2c11	1000 m	PSi, Salts	10
s2c12	1000 m	MIT, Salts	14
s2c13	1000 m	PC/PN, Salts	14
s2c14	1000 m	PPO4, Salts	14
s2c15	1000 m	Open, Salts	3
s2c16	4740 m (PO-3)	Oxygen, Salts, MC(1@500,770,1000,4000), PUR	24
s2c17	200 m	ZJ	12
MOSEAN Mooring			
s51c1	200 m	Salts	3
WHOTS Mooring			
S50c1	200 m	Salts	3
Kaena Point			
s6c1	2500 m	Open, Chl a, Salts	13

SHIP R/V KILO MOANA HOT 177 DATE 23 – 27 Jan. 2006

TIME	Mon. 1/23	Tues. 1/24	Wed. 1/25	Thurs. 1/26	Fri. 1/27
0000		Deploy sed traps			
0100		S2C1 Gas 1	Net Tow		
0200		S2C2 Gas 2	S2C9 PP	Net Tow	
0300				AC9/FRRF	
0400			S2C10 Open	Transit sed traps	
0500		Deploy gas array	Deploy PP	Recover traps	
0600		S2C3 PO-1	Transit gas array	Transit Sta 51	
0700			Recover gas array		
0800			S2C11 PSi	S51C1 200-m	
0900	Depart Snug			Transit ALOHA	
1000		Net Tow	Net Tow	S2C17 ZJ	Arrive Snug offload
1100		S2C4 PO-2 (Begin 36 hr)	S2C12 MIT	PRR AC9/FRRF	
1200	Arrive Kahe Weight cast		PRR AC9/FRRF	AC9/FRRF	
1300	PRR S1C1	Net Tow	Net Tow	Transit Sta 50	
1400	Transit ALOHA	S2C5 ATP	S2C13 PC/PN	S50C1 200-m	
1500		St. 51 transit		Transit St. Kaena	
1600			S2C14 PPO4		
1700		S2C6 PE	Recover PP		
1800					
1900					
2000		S2C7 HPLC	S2C15 Open		
2100				S6C1	
2200		Net Tow	Net Tow		
2300	Arrive ALOHA	S2C8 BEACH	S2C16 PO-3 (end 36 hours)	Transit Snug	

Jan 25: Sunrise 0713 Sunset 1816

6.0 HOT-177 Watch Schedule/ Bunk assignment

0300-1500

Eric Grabowski - Watch Leader
Lance Fujieki
Ken Doggett
Adriana Harlan
Fernando S-Mandujano
Joji Uchikawa

1500-0300

Paul Lethaby - Watch Leader
Tom Gregory – Chief Scientist
Susan Curless
Dan Sadler
Karin Björkman
Suzanne Defelice

At Large

Claire Mahaffey
Blake Watkins
Keali'imanauluokeahi Taylor
Jim Mitchell

OTG

Tim McGovern
Gabe Foreman
Bruce Appelgate
Brian Chee
Dan Morton