Hawaii Ocean Time-series
HOT-184 General Cruise Plan

Vessel: R/V *Kilo Moana*, University of Hawaii
Master of the Vessel: Captain Bryon Wilson
Chief Scientist: Dan Sadler, University of Hawaii
OTG Marine Technicians: Tim McGovern, Dan Fitzgerald

Loading: August 3, 2006, PO CTD termination and PO hand carry equipment.
August 4, 2006 @ 0900 HST rest of the equipment loading.
Departure: August 7, 2006 @ 0900
Arrival: August 11, 2006 @ 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 21^{o} 20.6'N, 158^{o} 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^{o} 45'N, 158^{o}W. 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 22^{o} 45'N, 158^{o} 6'W will be occupied on the 4th day of the cruise for about 30 minutes.
4) Station 50, is the site of the WHOTS Mooring, located at 22^{o} 45.994'N, 157^{o} 53.992'W will be occupied on the 4th day of the cruise for about 30 minutes.
5) Station 6, referred to as Station Kaena, is located off Kaena Point at 21^{o} 50.8'N, 158^{o} 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, gas array, 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).
Kaena (sta. 6)	CTD cast (2400 m)
Underway/continuous	ADCP, thermosalinograph, fluorometry, meteorology

2.0. SCIENCE PERSONNEL

Participant	Title	Affiliation/HOT Group
Sheldon Blackman	Technician	RPSC
Susan Curless	Research Associate	UH/BEACH
Ken Doggett	Research Associate	UH/BEACH
Dan Fitzgerald	Marine Technician	OTG
Lance Fujieki	Computer Specialist	UH/BEACH
Cooper Guest	Technician	RPSC
Eric Grabowski	Research Associate	UH/BEACH
Adriana Harlan	Technician	UH/BEACH
Paul Lethaby	Research Associate	UH/PO
Claire Mahaffey	Postdoctoral Researcher	UH/BEACH
Matthew Markley	Undergraduate Student	UH/PO
Tim McGovern	Marine Technician	OTG
Kellee Nolan	Graduate Student	UH/PO
Cynthia Peacock	Postdoctoral Researcher	UW/BEACH
Marc Pomeroy	Technician	RPSC
Damion Rosbrugh	Undergraduate Student	UH/PO
Dan Sadler	Research Associate	UH/BEACH
Fernando Santiago-Mandujano	Research Associate	UH/ PO
Jefrey Snyder	Marine Technician	UH/PO
Blake Watkins	Marine Engineer	UH/BEACH
Doug White	Research Associate	UH/BEACH

3.0. SUMMARY SCHEDULE

31 July	Pre-cruise meeting 1000 hrs, MSB306
3 August	CTD retermination and PO hand carry loading
4 August	Ship loading starting at 0900 hrs
7 August	Depart from Snug harbor at 0900 hrs. Science personnel on-board by 0830.
11 August	Station 1 Kahe Pt. operations.
7-10 August	Station ALOHA operations. Stations 51, 50 and 6 CTD casts.
11 August	Arrive back to 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 1000 m, and a PRR cast (Sect. 4.2.8) will be conducted at this location around noon of August 7. 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 net will be towed followed by deployment of the sediment trap array. Afterwards, two 200-m and one 100-m casts will be conducted before deploying the Gas 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 stern using the A-frame and our Sea-Mac 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 01325 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 (argosfix@km.soest.hawaii.edu, 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 return to the center of Station ALOHA to continue with CTD cast operations.

4.2.3 Gas Array deployment

Samples for the gas array will be collected from casts 1 and 2. We request the use of the A-frame for the gas array deployment, and will also use the Sea-Mac winch. The array is equipped with one ARGOS satellite transmitter (platform # 08500, emailing positions to argosfix@km.soest.hawaii.edu, password: argosfix), a strobe light and a radio transmitter (channel 69, 156.475 MHz). The ship will **not** need to keep within sight of the array until the time of the recovery, approximately 24 hours after its deployment. CTD operations shall continue after the recovery.

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. The cast after the deployment of the gas array (cast 4) 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 (Eric Grabowski, Paul Lethaby).

4.2.5. Primary production experiment

Samples for the primary productivity experiment will be collected from the rosette (cast 10). Just before dawn (sunrise 0600 hrs on August 9), a second 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 Sea-Mac winch. The array is equipped with one ARGOS satellite transmitter (platform # 60481, emailing positions to argosfix@km.soest.hawaii.edu, password: argosfix), strobe lights and a radio transmitter (channel 72, 156.625 MHz). The ship shall keep within sight 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 (1917 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.

4.2.6. Plankton net tows

Two types of net tows will be conducted during the cruise

4.2.6.1. Zoo net tows

These are our standard HOT zooplankton 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 two consecutive half-hour periods at midnight on the second, third, and fourth days (see schedule) with a total of eight available slots to accommodate cancellations due to sea state or other unforeseen problems. The A-frame and capstan will be needed for this operation.

4.2.6.2. Claire net tows

These tows are hand-deployed off the stern for about half-hour periods, about two times during the cruise. We request that the ship remain stationary during these 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 main crane. The instrument is hand-lowered and retrieved with assistance from the capstan.

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. The A-frame and capstan will be needed for this operation.

4.2.9. Automated Trace Element Sampler (ATE)

On August 8 at 0930, the ATE will be hand deployed off the back deck to a depth of 10 m. The ATE will be recovered after 30 minutes in the water. The ATE is approximately 1’ tall and 4’’ in diameter, weighting 5 lbs.

4.3 Floating sediment trap recovery

On August 10, after the AC9/FRRf cast has been completed, we shall transit for the recovery of the floating sediment trap array. The main 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 Station 51 to conduct a 200-m CTD cast.

4.4 MOSEAN Mooring (Station 51)

A 200-m CTD cast will be conducted near the MOSEAN mooring. The cast should be conducted downwind, downcurrent, and at about 200 m from the mooring. The nominal position of the mooring is 22º 45'N, 158º 6’W. After this cast, the ship shall transit to Station ALOHA to continue operations. After operations at ALOHA are completed, the ship shall transit to Station 50 to conduct one 200 m CTD cast.

4.5 WHOTS Mooring (Station 50)

One 200-m CTD cast will be conducted near the WHOTS mooring. The cast should be conducted downwind, downcurrent, and at about 200 m from the mooring. The nominal position of the mooring is 22º 45.994'N, 157º 53.992’W. 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 July 15, 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.

4.8 Collection of Low Nutrient Sea Water (LNSW)

LNSW will be collected from the ship’s scientific sea water supply into 4 separate 330 gallon IBC containers. We propose the IBC containers be secured inside the hanger along the starboard side or in another suitable place. Each container has a 48”x40” footprint and will weigh approx. 3000 lbs when full. The full containers will be unloaded at the end of the cruise.

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. Four 12-l water sampling bottles, all spare parts
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 (main deck)
6. Large vacuum waste container
7. Liquid nitrogen dewers
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/FRRf 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. Pertinent MSDS
22. Automated Trace Element Sampler (ATE)
23. 4 x 330 gallon IPC containers

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

1. A-frame
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. Space on the main deck for one storage van
7. Space on the upper deck for two lab vans
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
23. Underway scientific seawater system at 1-10 gallons/min.

Ship: R/V *KILO MOANA* **HOT 184 CTD CASTS** 7 – 11 August, 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	100m	CM (24@30m)	24
s2c4	4740 m (PO-1)	O_2, Temp, DOC, DIC/Alk, Nuts, Salts, Sharp/BATS	24
s2c5	1000 m (PO-2)	O_2, Temp, Nuts, DIC/Alk, Quay, DOC, Salts , Sharp/BATS	24
s2c6	1000 m	ATP, Salts, MC (200,300,500,770), KB(100,125,150,200)	19
s2c7	1000 m	PE, Salts, KB(5,25,45,75)	24
s2c8	1000 m	HPLC, Chl a, Slides, Salts, MC(5,25,45,75,100,125,150,175)	22
s2c9	1000 m(BEACH)	O_2, Temp, DIC/Alk, Nuts, LLN, LLP, DOC, Keeling, Quay, Salts	23
s2c10	1000 m	Primary Production, Salts	22
s2c11	1000 m	Open	3
s2c12	1000 m	Open, MC(5,25,45,75,100,125,150,175)	11
s2c13	1000 m	PSi, CM(8@30), Salts	22
s2c14	1000 m	PC/PN, CM(8@30), Salts	22
s2c15	1000 m	PPO4, Salts	14
s2c16	1000 m	PUR, BW slides	14
s2c17	4740 m (PO-3)	Oxygen, Salts, MC(1@1000,2000,3000,4000)	24
s2c18	200m	MIT, ZJ	14
MOSEAN Mooring			
S51c1	200m		3
WHOTS Mooring			
S50c1	200 m	Salts, LB(4@5)	4
Kaena			
S6c1		chl, salts	13

SHIP R/V *KILO MOANA* HOT 184 DATE 7 – 11 August, 2006

TIME	Mon. 8/7	Tues. 8/8	Wed. 8/9	Thu. 8/10	Fri. 8/11
0000		S2C1 Gas 1			
0100		S2C2 Gas 2	Net Tow		
0200			S2C10 PP		
0300		S2C3 CM		AC9/FRRF	
0400		Deploy gas array	S2C11 Open	Transit sed traps	
0500		S2C4 PO-1	Deploy PP array		
0600			Transit gas array	Recover traps	
0700			Recover gas array	Transit St. 51	
0800			S2C12 Open		Arrive Snug offload
0900	Depart Snug Transit Kahe	ATE Sampler	Claire Net	S51C1 MOSEAN	
1000		Net Tow	Net Tow	Transit ALOHA	
1100	Weight cast	S2C5 PO-2 (Begin 36 hr)	S2C13 PSi	S2C18 MIT/ZJ	
1200	PRR		PRR AC9/FRRF	PRR AC9/FRRF	
1300	S1C1	Net Tow		AC9/FRRF	
1400	Transit ALOHA	S2C6 ATP	Net Tow S2C14 PC/PN		
1500				Transit St. 50	
1600				S50C1	
1700		S2C7 PE	S2C15 PPO4	Transit St. Kaena	
1800					
1900			Recover PP array		
2000		S2C8 HPLC	S2C16 PUR		
2100				S6C1	
2200	Net Tow	Net Tow	Net Tow		
2300	Deploy sed traps	S2C9 BEACH	S2C17 PO-3 (end 36 hours)	Transit Snug	

August 9: Sunrise 0600 Sunset 1917

6.0 HOT-184 Watch Schedule

0300-1500

Fernando S-Mandujano
Jefrey Snyder – *tag*
Matthew Markley - *alt tag*
Eric Grabowski– Watch Leader
Ken Doggett – *alt tag*, *alt water boss*
Adriana Harlan -*water boss*
Blake Watkins - *tag (net tow)*

1500-0300

Paul Lethaby - Watch Leader
Kellee Nolan
Damion Rosbrugh- *tag*
Dan Sadler – Chief Scientist *(net tow)*
Lance Fujieki – *tag*
Susan Curless - *water boss*
Doug White - *tag, alt water boss*

At Large

Claire Mahaffey
Cynthia Peacock
Cooper Guest
Sheldon Blackman
Marc Pomeroy

OTG

Dan Fitzgerald
Tim McGovern