Hawaii Ocean Time-series
HOT-200 General Cruise Plan

Vessel: R/V *Kilo Moana*, University of Hawaii
Master of the Vessel: Captain Brian Wehmeyer
Chief Scientist: Eric Grabowski, University of Hawaii
OTG Marine Technicians: Kuhio Vellalos and Elly Speicher

Kilo Moana phone number: 842-9817, cell # 864-0065
Marine Center phone number: 842-9813

Loading: February 21, 2008 @ 0900
Departure: February 22, 2008 @ 0900
Arrival: February 26, 2008 @ 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 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 one 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.

1.1 SCIENTIFIC OPERATIONS

Station	Activities
Kahe (sta. 1)	Weight Cast, PRR cast, CTD cast (1000 m), Go-Flo cast (~ 20m)
ALOHA (sta. 2)	Sediment traps, gas array, net tows, CTD operations, primary productivity measurements, AC9/FRRf, misc. experiments.
WHOTS mooring station (Sta. 52)	One 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
Eric Grabowski	Chief Scientist – Res. Assoc.	UH/BEACH
Susan Curless	Research Associate	UH/BEACH
Lance Fujieki	Computer Specialist	UH/BEACH
Adriana Harlan	Research Associate	UH/BEACH
Karin Björkman	Research Specialist	UH/BEACH
Binglin Li	Graduate Student	UH/BEACH
Brett Updyke	Technician	UH/BEACH
Blake Watkins	Marine Engineer	UH/BEACH
Sam Wilson	Scientist	UH/CMORE
Tara Clemente	Research Associate	UH/BEACH
Jay Wheeler	Research Associate	UH/BEACH
Solange Duhamel	Postdoc	UH/BEACH
Paul Lethaby	Research Associate	UH/PO
Christin Shacat	Research Associate	UH/PO
Fernando Santiago-Mandujano	Research Associate	UH/PO
Jefrey Snyder	Marine Technician	UH/PO
Sarah Yasui	Volunteer	UH/PO
Nicolas Petrochilos	Volunteer	UH/PO
John Fitzpatrick	Volunteer	UH/PO
Kathryn Stanaway	Volunteer	UH/BEACH
Janice Jones	Technician	UCSB
Sara Yeo	Technician	UH/HIMB
Gordon Walker	Teacher	UH/CMORE
Doug Weidman	Teacher	UH/CMORE
Dan Hendricks	Teacher	UH/CMORE
Kate Achilles	CMORE Educator	UH/CMORE
Kuhio Vellalos	Marine Technician	OTG
Elly Speicher	Marine Technician	OTG

3.0. SUMMARY SCHEDULE

14 February	Pre-cruise meeting, MSB 307, 1030hrs
21 February	Ship loading starting at 0900 hrs
22 February	Depart from Snug harbor at 0900 hrs. Science personnel on-board by 0800.
22 February	Station 1 Kahe Pt. operations.
22-25 February	Station ALOHA operations. Station 52 and Kaena CTD casts.
26 February	Arrive back to Snug harbor. ETA 0800 hrs, full offload

4.0. OPERATIONAL PLANS

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

A 1000 lb. weight-test cast, one CTD cast to 1000 m, one Go-Flo cast to approx. 20m and a PRR cast (Sect. 4.2.7) will be conducted at this location in the afternoon of February 22nd. The CTD winch and crane will be required for these operations. The Go-Flow cast will require the use of the capstan and A-frame. 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, one 350-m and one 1000-m casts 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, 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 the 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 01833, 03028, 60482, 60484), 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@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 Primary production experiment

Samples for the primary productivity experiment will be collected from the rosette. Before dawn (sunrise 0657 hrs on February 23), a 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 68, 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. The array will be recovered just at sunset (1833 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 crane for this operation. Water samples for biogeochemical measurements will also 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 (**Fernando Santiago-Mandujano, Paul Lethaby**).

4.2.5. Gas Array deployment

A second free drifting incubation array will be deployed the third day of the cruise at ALOHA station. Samples for the gas array will be collected from cast 9. 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 68, 156.425 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.

4.2.6. 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, 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. B. Watkins will be in charge of these operations.

4.2.6.1 Kate Achilles net tows

The hand held surface net tows are deployed off the stern for about 15-20 minutes. The ships deck equipment is not needed for this operation. We request that the ship remain stationary during these tows . Kate Achillies will be in charge of 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 A-frame. The instrument is hand-lowered and retrieved with assistance from the 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. The A-frame and capstan will be needed for this operation.

4.3 Floating sediment trap recovery

In the morning of February 25, after the AC9/FRRf cast has been completed, 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 recover the Gas Array. After the array is recovered, the ship shall transit to Station ALOHA to conduct one PRR cast, and two AC9/FRRf casts, after which the ship shall transit to Station 52 to conduct one CTD cast.

4.4 WHOTS Mooring (Station 52)

One 200-m CTD yo-yo cast will be conducted near the WHOTS mooring on February 25. 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. After the cast is completed the ship shall transit to Station Kaena.

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 February 25, 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 and fluorometer operations.

4.8 Magnetometer

The ship's magnetometer will be deployed two times during the cruise. The first deployment will be during the transit to Station ALOHA on February 22 and the second will be during the transit to Station Kaena on February, 25. It will take roughly 10 minutes to deploy and recover this instrument. The magnetometer needs to be deployed before the ship reaches cruising speed. OTG personnel will be incahrge of this operation. They will notify the watch leaders when the magnetometer is deployed and recovered.

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 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 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/FRRf 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

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, 3 phase, 60 Amp breaker) and vans (208 VAC single phase at 60 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 upper deck for two lab vans port side, one OTG rad van starboard side
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, pCO_2 system, 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, $pCO2$
23. OTG's 24-place rosette, and 24 12-l water sampling bottles (to be used as spare)
24. Pinger (to be used as spare)
25. 1000 lb weight.
26. Remote CTD decibar pressure display in the winch operator cabin.
27. Large Sea-Mac winch (Mod. 1025 EHS). 60 Amp Hubbel plug/connector (440 VAC, 3 phase, 60 Amp breaker)
28. OTG rad van

Ship: R/V *KILO MOANA* HOT 200 CTD CASTS Feb. 22 – Feb. 26 2008

Cast		Samples	#Bottles
Kahe Pt.			
s1c1	1000 m	O_2, Temp, DIC/Alk, Nuts, Chl a, LLN, $LLPO_4$, DOC, FCM, KA(sample at 750,25,5),Salts	24
Station ALOHA			
s2c1	350 m	CMORE(5@25, 5@45, 5@75) KB(1@350,200)(7@30)	24
s2c2	1000 m	Primary Production, Salts, SW (2@10),SD(pb PP depths) MB(pb on all depths),KB(1@1000)	24
s2c3	4740 m (PO-1)	O_2, Temp, DOC, DIC/Alk, Nuts, KA(pb oxygen),Salts	24
s2c4	1000 m (PO-2)	O_2, Temp, Nuts, DIC/Alk, Quay, DOC, SD(pb nut depths), Salts	24
s2c5	1000 m	PC/PN, SW(1@5,25,45,75,100,125,150,175), Salts	22
s2c6	1000 m	PPO4, CMORE(5@125, 5@200), Salts	24
s2c7	1000 m (BEACH)	O_2, Temp, DIC/Alk, Nuts, LLN, LLP,DOC, Keeling, Quay, SD(pb nut depths), Salts	23
s2c8	1000 m	PUR, CMORE(5@1000, 5@770, 5@500), Salts	24
s2c9	1000 m	Gas Array (2@125,100) (3@5,25,45,75) MB (1@175,150,125,100,75,45,25,5)	24
s2c10	1000 m	Open, MR(1000,800,600,400,200,175,150,125,100,75,45,10), BL(1@300)(6@45), Salts	21
s2c11	1000 m	PSi, MC(5,25,45,75,100,125,150,175), Salts SW(1@5,25,45,75,100,125),SW(pbMC,150,175),KA(pbMC)	24
s2c12	1000 m	MIT, Salts	16
s2c13	1000 m	ATP, Quay(100,125,150,200,300), MC(200,300,500,770), SD(pb all ATP depths), Salts	20
s2c14	1000 m	PE, Salts, MC(5,25,45,75,100,125,150,175),SW(pb MC) Quay (5,25,45,75), Salts	24
s2c15	1000 m	HPLC, Chl a, Slides, Salts	22
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	JE(8@15),BL(1@5,25,45,75,100,125,150), Salts	18
Kaena			
S6c1	2400 m	Chl, Salts	13

SHIP R/V *KILO MOANA* HOT 200 Date Feb. 22 - Feb. 26, 2008

TIME	Fri. 2/22	Sat. 2/23	Sun. 2/24	Mon. 2/25	Tue. 2/26
0000		S2C1			
0100		S2C2 PP	Net Tow		
0200			S2C9 Gas		
0300				AC9/FRRF	
0400		Deploy PP Array	Deploy Gas Array	Transit sed traps	
0500		S2C3 PO-1	S2C10 Open		
0600				Recover traps Transit gas array	
0700					
0800			S2C11 PSi	Recover gas array	Arrive Snug
0900	Depart Snug			Transit ALOHA	
1000		Net Tow	Net Tow		
1100	Arrive Kahe (11:30) Weight cast	S2C4 PO-2 (Begin 36 hr)	S2C12 MIT	PRR AC9/FRRF	
1200	PRR	Net Tow	PRR AC9/FRRF	AC9/FRRF	
1300	S1C1	KA hand net tow	Net Tow	Transit St. 52	
1400	Go-Flo cast	S2C5 PC/PN	S2C13 ATP	S52C1	
1500	Transit ALOHA deploy magnetometer			Transit St. Kaena deploy magnetometer	
1600					
1700		S2C6 PPO4	S2C14 PE		
1800		Recover PP array			
1900					
2000		S2C7 BEACH	S2C15 HPLC	Recover magnet	
2100				S6C1	
2200	Recover magnet	Net Tow	Net Tow		
2300	Arrive ALOHA Deploy sed traps	S2C8 PUR	S2C16 PO-3 (end 36 hours)	Transit Snug	

February 23: Sunrise 0657 Sunset 1833

6.0 HOT-200 Watch Schedule

0300-1500

Adriana Harlan - *Water Boss , altTag*
Lance Fujieki — *Tag*
Eric Grabowski – Chief Scientist -*alt water boss*
Kathryn Stanaway-
Jefrey Snyder– *Tag*
Fernando Santiago-Mandujano - Watch Leader - *Console*
Sarah Yasui

1500-0300

Susan Curless –*Water Boss*
Karin Björkman – *alt Tag*
Paul Lethaby - Watch Leader - *Console*
Christin Shacat – *Tag*
John Fitzpatrick- *Tag*

1700-0500

Brett Updyke

At Large

Nicolas Petrochilos
Blake Watkins
Sara Yeo
Janice Jones
Binglin Li
Sam Wilson
Jay Wheeler (help-0300-1500)
Tara Clemente (help-1500-0300)
Gordon Walker
Doug Weidman
Dan Hendricks
Kate Achilles
Solange Duhamel

OTG

Kuhio Vellalos
Elly Speicher