Hawaii Ocean Time-series
HOT-230 Draft Cruise Plan

Cruise ID: KM 11-08
Vessel: R/V *Kilo Moana*, University of Hawaii
Master of the Vessel: Captain Gray Drewry
Chief Scientist: Susan Curless, University of Hawaii
OTG Marine Technicians: Trevor Goodman and Kuhio Vellalos

Kilo Moana phone number: 842-9817, cell # 864-0065, satellite # 001-870-336-956510
Marine Center phone number: 842-9813

Loading: February 25, 2011 @ 1000
Departure: February 27, 2011 @ 0900
Arrival: March 3, 2011 @ 0800

**Warning - Navigational and array deployment hazard. **

HOT Profiler Mooring (HPM)- Deployed at Station ALOHA October 2010

This mooring's nominal location is **22° 44.800'N 158° 01.455'W**, approximately 1.5 miles WSW of the center of Station ALOHA. It has a small surface tether telemetry marker buoy and an instrument platform 80 m below the surface. There have been reports that **the marker buoy may be submerged beneath the surface**. This area of the circle should be avoided.

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 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° 45'N, 158°W. This is the main HOT station and will be occupied during the 2nd, 3rd, and 4th days of the cruise.
3) Station 50, the site of WHOTS-7 Mooring, approximate position 22° 46.0052'N 157° 53.9897'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 21° 50.8'N, 158° 21.8'W and 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, Hyperpro cast, CTD cast (1000 m)
ALOHA (sta. 2)	Sediment traps, gas array, net tows, CTD operations, primary productivity measurements, ACS/AC9/FRRf, misc. experiments
WHOTS mooring station (Sta. 50)	One CTD cast (yo-yo to 200 m), surface instrument intercomparisons.
Kaena (sta. 6)	CTD cast (near bottom)
Underway/continuous	ADCP, thermosalinograph, pCO2 system, fluorometry, and meteorology

2.0. SCIENCE PERSONNEL

Participant	Title	Affiliation/HOT Group
Susan Curless	Research Associate	UH/BEACH
Lance Fujieki	Computer Specialist	UH/BEACH
Adriana Harlan	Research Associate	UH/BEACH
Dan Sadler	Research Associate	UH/BEACH
Brett Updyke	Research Associate	UH/BEACH
Donn Viviani	Graduate Student	UH/BEACH
Blake Watkins	Marine Engineer	UH/BEACH
Cameron Fumar	Research Assoicate	UH/PO
Jefrey Snyder	Marine Technician	UH/PO
Craig Nosse	Research Associate	UH/PO
David Hashisaka	Research Associate	UH/PO
James Stubbs	Volunteer	PO
Dave Wisegarver	Technician	NOAA/PMEL
Shimi Rii	Graduate Student	UH/BEACH
Sara Thomas	Technician	UH/CMORE
Lydia Baker	Graduate Student	UH/CMORE
Trevor Goodman	Marine Technician	OTG
Kuhio Vellalos	Marine Technician	OTG

3.0. SUMMARY SCHEDULE

18 February	Pre-cruise planning meeting 1330 hrs.
25 February	Ship loading at 1000 hrs.
27 February	Depart from Snug harbor at 0900 hrs. Science personnel on-board by 0800.
27 February	Station 1 Kahe Pt. operations.
27 Feb - 3 March	Station ALOHA operations. Station 50 CTD yo-yo cast, Station Kaena
3 March	Arrive back to Snug Harbor. 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, and a Hyperpro cast (Sect. 4.2.7) will be conducted at this location on February 27th. The A-frame, Sea-Mac winch, CTD crane and CTD winch will be required for these operations.

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 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, using the A-frame and 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 50 hours before recovery. The array is equipped with 2 ARGOS satellite transmitters (platform #'s 01833, 60481), 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 continue with 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 0654 hrs on February 28th), 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 two ARGOS satellite transmitters (platform #'s 60484, 84857, emailing positions to argosfix@km.soest.hawaii.edu, password: argosfix), strobe lights and a radio transmitter (channel 74, 156.725 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 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 (1835 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 A-frame and trawl winch (outfitted with 0.681 wire) for these operations. Water samples for biogeochemical measurements will be collected on each CTD 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. 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 **(TBD personnel)**.

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 Station 2 CTD cast 9. We request the use of the A-frame for this operation and will also use the Sea-Mac winch. The array is equipped with two ARGOS satellite transmitters (platform #'s 60484, 84857), emailing positions to argosfix@km.soest.hawaii.edu, 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.

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 around noon and midnight on the second, third, and fourth days (see schedule) for a total of six slots. The A-frame and capstan will be needed for this operation. B. Watkins will be in charge of these operations.

4.2.6.1 Surface net tow

Surface net tows are hand-deployed off the stern for about 15-20 minute periods. One net tow is scheduled for 13:00 on February 28th but others may be introduced to the schedule at appropriate time slots. We request that the ship remain stationary during these tows.

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, third and fourth days, the Hyperpro will be deployed from the stern through a small block hung from the A-frame. The instrument is hand-lowered and retrieved with assistance from the winch.

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 to a target depth of 200 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 early morning of March 2nd, after the WHOTS yo-yo 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 50 conduct one 200 m yo-yo cast.

4.4 Station 50 - WHOTS-7 Mooring

(nominal position of mooring = 22° 46.0052'N 157° 53.9897'W)

4.4.1 CTD yo-yo cast (subsurface instrument intercomparison)

One 200-m CTD yo-yo cast with at least 6 full cycles will be conducted near the WHOTS mooring on March 2nd for subsurface instrument intercomparions. This cast should be conducted downwind, downcurrent, 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, the ship shall transit to Station ALOHA to conduct one AC9/FRRf cast, one Hyperpro cast and two 200 m CTD casts. If the mooring is positioned such that it is within the Station ALOHA circle, these operations can be performed as close to the WHOTS mooring as safely possible to extend the surface instrument intercomparison.

After the operations are complete, the ship shall transit to Station Kaena.

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

A near-bottom CTD cast (~2500 m) will be conducted at this location in the evening of March 2nd. Once the CTD cast is complete, 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 technicians will be in charge of the ADCP system.

4.7 Thermosalinograph, pCO_2 system, Fluorometer, and meteorological system

The ship's thermosalinograph, pCO_2 system 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 ship's meteorological system shall be in operation throughout the cruise. Access to real-time underway data through the ship's network will be required. The OTG technicians will be in charge of the thermosalinograph, pCO_2 system, Fluorometer, and meteorological suite 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 12L Bullister sampling bottles, and all associated spare parts
3. One 20 ft. laboratory vans with assorted equipment for radioisotope and general use ("23" Van)
4. One 20 ft. NOAA/PMEL laboratory van (Bullister Van)
5. One 12 ft. equipment van ("Blue" Van)
6. Distilled, deionized water and all required chemicals and isotopes
7. Large vacuum waste container
8. Liquid nitrogen dewar
9. Drifting sediment trap array with strobe lights, satellite and radio transmitters, floats, weights
10. Kevlar line, polypropylene line
11. Sediment traps and crosses
12. Drifting primary production array and gas array with light and radio transmitter, floats, weights, polypro. line, spare buoy, etc.
13. Hyperpro and other optical measuring instruments.
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. Pertinent MSDS

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

1. A-frame
2. A-frame block assembly
3. Trawl 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 equipment van
7. Space on upper deck for two laboratory vans
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, *p*CO2 system, and Fluorometer
14. Meteorological suite
15. Copy machine
16. Grappling hooks and line
17. Laptop with Nobeltec charting software and GPS feed
18. Running fresh water and seawater hoses
19. Electronic mail system
20. GPS system
21. Uncontaminated seawater supply
22. Small capstan (~ 10 m/min)
23. Underway/on-station data acquisition system for meteorological instruments, ADCP, thermosalinograph, fluorometer, *p*CO2 and access to real-time data through the network.
24. OTG's 24-place rosette, and 24 12-l water sampling bottles (to be used as spare)
25. 1000 lb weight.
26. Large Sea-Mac winch (Mod. 1025 EHS). 60 Amp Hubbel plug/connector (440 VAC, 3 phase, 60 Amp breaker)
27. Seapoint fluorometer (to be used as a spare)
28. Lifting basket to transport carboys from the main deck to the 02 deck
29. CTD sled and pallet jack.
30. Table at CTD sampling area.

Ship: R/V *KILO MOANA* **HOT 230 CTD CASTS** **Date: February 27 – March 3, 2011**

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@45,5@75)	15
s2c2	200 m	Primary Production, DV(pb PP depths), Salts	22
s2c3	4740 m (PO-1)	O_2, Temp, DOC, DIC/Alk, Nuts, Salts, JB(pb O2/DIC)	24
s2c4	1000 m (PO-2)	O_2, Temp, Nuts, DIC/Alk, DOC, Salts, JB(pb O2/DIC)	24
s2c5	1000 m	PC/PN, SR(1@5,25,45,75,100,125,150,175), Salts	22
s2c6	1000 m	PPO4, LB(1@5,45,100, 2@DCM), Salts	19
s2c7	1000 m (BEACH)	O_2,Temp,DIC/Alk, Nuts,LLN, LLP,DOC,Keeling,Quay,Salts, JB(pb O2/DIC)	23
s2c8	1000 m	PUR, CMORE(5@1000,5@770,5@500), Salts	24
s2c9	1000 m	Gas Array(2@5,25,45,75,100,125), Salts	12
s2c10	1000 m	CMORE(5@125,5@200), PO(6@1000), Salts	17
s2c11	1000 m	PSi, MC(1@5,25,45,75,100,125,150,175), LB(1@5,45,100, 2@DCM), Salts	18
s2c12	1000 m	MIT, Salts	10
s2c13	1000 m	ATP, MC(1@200,300,500,770), Salts SW(1@200,300,400,500, 600,700,800,900,1000)	23
s2c14	1000 m	PE, MC(5,25,45,75,100,125,150,175), SW(pb MC), Salts	22
s2c15	1000 m	HPLC, Chl a, Slides, Salts	22
s2c16	4740 m (PO-3)	Oxygen, MC(1@1000,2000,3000,4000), DV(1@4800,4750), Salts	14
s2c17	200 m	DV(24@5m)	24
s2c18	200m	SR(1@5,25,45,75,100,125,150,175)	8
WHOTS Mooring			
S50c1	200 m yo-yo	LB(1@5,45,100, 2@DCM)	5

MC=Matt Church, **SW**=Sam Wilson, **DV=**Donn Viviani, **SR**=Shimi Rii, **JB=**John Bullister, **LB=**Lydia Baker

Ship: R/V *KILO MOANA* HOT 230 Date: February 27 – March 3, 2011

TIME	Sun. 2/27	Mon. 2/28	Tues. 3/1	Wed. 3/2	Thur. 3/3
0000		S2C1			
0100		S2C2 PP	Net Tow		
0200			S2C9 Gas		
0300		Deploy PP Array		AC9/FRRF	
0400		S2C3 PO-1	Deploy Gas Array	Transit sed traps	
0500			S2C10 Open	Recover traps Transit gas array	
0600				Recover gas array	
0700				Transit St. 50	
0800			S2C11 PSi	S50C1 WHOTS	Arrive Snug
0900	Depart Snug			Transit St. ALOHA	
1000		Net Tow	Net Tow		
1100	Arrive Kahe (11:30) Weight cast	S2C4 PO-2 (Begin 36 hr)	S2C12 MIT	AC9/FRRF	
1200	Hyperpro	Net Tow	Hyperpro ACS/AC9/FRRF	Hyperpro	
1300	S1C1	Hand Net Tow		S2C17	
1400		S2C5 PC/PN	S2C13 ATP	S2C18	
1500	Transit ALOHA			Transit St. Kaena	
1600					
1700		S2C6 PPO4	S2C14 PE		
1800		Recover PP array			
1900					
2000		S2C7 BEACH	S2C15 HPLC		
2100				S6C1	
2200		Net Tow	Net Tow		
2300	Arrive ALOHA Deploy sed traps	S2C8 PUR	S2C16 Open (end 36 hours)	Transit Snug	

February 28th: Sunrise 0654, Sunset 1835

6.0 HOT-230 Watch Schedule

0300-1500

Adriana Harlan **–** *Water Boss*
Dan Sadler
Lance Fujieki – *Tag*
Jefrey Snyder – Watch Leader – *Tag*
Cammy Fumar - *Console*

1500-0300

Susan Curless – Chief Scientist - *Water Boss*
Brett Updyke – *Tag*
Craig Nosse – Watch Leader - *Console*
Dave Hashisaka – *Tag*
James Stubbs – *Alt. Tag*

At Large

Blake Watkins
Donn Viviani – *Alt Tag*
Lydia Baker
Shimi Rii
Sara Thomas
Dave Wisegarver

OTG

Trevor Goodman
Kuhio Vellalos