Hawaii Ocean Time-series
HOT-234 Operational Cruise Plan

Cruise ID: KM 11-24
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:

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

Loading: August 26, 2011@0900
Departure: August 27, 2011 @0800 **Science personnel on board by 0700.**
Arrival: August 31, 2011 @ 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 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 52, the site of WHOTS-8 Mooring, approximate position 22°40.1572'N, 157°57.0225'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), 20 m Niskin cast.
ALOHA (sta. 2)	Sediment traps, gas array, net tows, CTD operations, primary productivity measurements, ACS/AC9/FRRf, misc. experiments.
WHOTS mooring station (Sta. 52)	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
Karin Björkman	Research Specialist	UH/BEACH
Susan Curless	Chief Scientist- Res. Assoc.	UH/BEACH
Lance Fujieki	Computer Specialist	UH/BEACH
Adriana Harlan	Research Associate	UH/BEACH
Shimi Rii	Graduate Student	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
Sam Wilson	Postdoctoral Researcher	UH/CMORE
Cameron Fumar	Research Associate	UH/PO
Jefrey Snyder	Marine Technician	UH/PO
Craig Nosse	Research Associate	UH/PO
Emily Crigler	Volunteer	PO
Brandon Carter	Research Specialist	UCSC
Anne Thompson	Postdoctoral Researcher	UCSC
Angel White	Assistant Professor	OSU
Katie Watkins-Brandt	Research Associate	OSU
Jim Foley	Marine Educator	UH/CMORE
Jim Cox	Teacher	Kapa'a Highschool
Jo'el Nathansen	Teacher	Keaau Highschool
Elizabeth Shaw	Teacher	Santa Cruz County Education Office
Trevor Goodman	Marine Technician	OTG
Trevor Young	Marine Technician	OTG

3.0. SUMMARY SCHEDULE

18 August	Pre-cruise planning meeting 0900 hrs.
25 August	FCM van loading
26 August	Ship loading at 0900 hrs.
27 August	Depart from Snug harbor at 0800 hrs. **Science personnel on-board by 0700.**
27 August	Station 1 Kahe Pt. operations.
27 Aug – 31 Aug	Station ALOHA operations. Station 52 CTD yo-yo cast, Station Kaena
31 August	Arrive back to Snug Harbor. Partial 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, a Hyperpro cast (Sect. 4.2.7), and a 20 m Niskin cast will be conducted at this location on August 27th. The A-frame, Sea-Mac winch, CTD crane and CTD winch will be required for these operations. A line with a small weight (~10lbs) deployed through the A-frame shall be used to attach the Niskin bottle. The Niskin will be deployed to a depth of approximately 20 m and will be lowered and retrieved by hand.

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 CTD cast and one 1000-m CTD 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 53 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 and other experiments.

4.2.3 Primary Production experiment

Samples for the primary productivity experiment will be collected from the rosette. Before dawn (sunrise 0613 hrs on August 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 (1853 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 CTD crane and winch 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 **(Jefrey Snyder, Brett Updyke)**.

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 hand net tow

Surface net tows are hand-deployed off the stern for about 15-20 minute periods. One hand net tow is scheduled for 13:30 on August 28th. We request that the ship remain stationary during this tow.

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.

4.2.9. Automated Trace Element Sampler (ATE)

On the 2nd day of the cruise, 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, weighing 5 lbs.

4.3 Floating sediment trap recovery

In the early morning of August 30th, 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 52 and conduct one 200 m yo-yo cast.

4.4 Station 52 - WHOTS-8 Mooring
(nominal position of mooring = 22°40.1572'N, 157°57.0225'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 August 30th for subsurface instrument intercomparison. This cast should be conducted downwind, down current, 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 one 200 m CTD cast. 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.

4.5 APEX profiling float deployment

Deployment of an APEX profiling float will occur once all other operations at Station ALOHA are complete. Blake Watkins will be in charge of this deployment.

After the profiler is in the water and Station ALOHA operations are complete, the ship shall transit to Station Kaena.

4.6 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 August 30th. Once the CTD cast is complete, the ship shall return to Snug Harbor.

4.7 Seaglider Operations

Two seagliders (sg148 & sg512) will be diving and profiling in the Station ALOHA area and at times transiting within the circle boundaries of Station ALOHA.

There is no plan to recover these seagliders on this cruise and the following information is provided on a need basis as the KM conducts its operations within Station ALOHA. The seaglider GPS fixes and alert info will be sent to the onboard email seaglider@km.soest.hawaii.edu which is accessible both by the science party and Captain.
The seaglider ARGOS information is as follows:
sg148 - ARGOS = Pgm 24194 ID# 090992; sg512 - ARGOS = Pgm 24194 ID# 090993

It is requested that when the KM is within the circle, the OTG initiated cronjob (forwarding the ship's position) send out the message to poulos@soest.hawaii.edu once every two hour period.

4.8 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.

4.9 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. Two 20 ft. laboratory vans with assorted equipment for radioisotope and general use (Van #23 and Karl FCM Van)
4. One 12 ft. equipment van ("Blue" Van)
5. Distilled, deionized water and all required chemicals and isotopes
6. Large vacuum waste container
7. Liquid nitrogen dewar
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. Hyperpro 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. 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 lab van, 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 three 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 spare)
28. OTG's Radiation Laboratory Van

Ship: R/V *KILO MOANA* **HOT 234 CTD CASTS** **Date: August 27-31, 2011**

Cast		Samples	#Bottles
Kahe Pt.			
s1c1	1000 m	O_2, Temp, DIC/Alk, Nuts, Chl a, LLN, LLP, DOC, FCM, Salts JF(pb on 5,25,750,900,1000)	24
Station ALOHA			
s2c1	200 m	CMORE(5@25,5@45,5@75), AW(7@5), SW(2@25)	24
s2c2	1000 m	Primary Production, DV(pb PP depths), AT(pb@5,25,45,75), AW(1@300), KB (pb PP depths), Salts	23
s2c3	4740 m (PO-1)	O_2, Temp, DOC, DIC/Alk, Nuts, Salts	24
s2c4	1000 m (PO-2)	O_2, Temp, DOC, DIC/Alk, Nuts, Salts	24
s2c5	1000 m	PC/PN, JF(1@5,45,100,200,350,500,1000), Salts	18
s2c6	1000 m	PPO4, SR(1@5,25,45,75,100,125,150,175), Salts	22
s2c7	1000 m (BEACH)	O_2, Temp, DIC/Alk, Nuts, LLN, LLP, DOC, Keeling, Quay, Salts, AT(1@tbd)	24
s2c8	1000 m	PUR, AW(7@5), DV(2@25,2@100), AT(1@tbd), Salts	22
s2c9	1000 m	Gas Array(6@5,25,45,1@75,100,125), Salts	23
s2c10	1000 m	CMORE(5@125,5@200, 5@1000), PO(6@1000), Salts, AT(1@tbd)	23
s2c11	1000 m	PSi, MC(1@5,25,45,75,100,125,150,175), SW(pbMC@5,25,45), AT(1@tbd), Salts	22
s2c12	1000 m	CMORE (5@770, 5@500), Salts, AT(1@tbd) SR(1@5,25,45,75,100,125,150,175), JF (1@200, pb SR)	22
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, SW(pb Slides@5,25,45), Salts, AT(1@tbd)	23
s2c16	4740 m (PO-3)	Oxygen, MC(1@1000,2000,3000,4000), AW(7@5), Salts	21
s2c17	200 m	SR(12@5,1@5,25,45,75,100,125,150,175), EWC(1@25,75,125), AT(1@tbd)	24
WHOTS Mooring			
S52c1	200 m yo-yo	AW(24@75)	24

MC=Matt Church, **SW**=Sam Wilson, **DV=**Donn Viviani, **SR=**Shimi Rii, **JF=**Jim Foley, **AW=**Angel White, **AT=**Anne Thompson

Ship: R/V *KILO MOANA* HOT 234 Date: August 27-31, 2011

TIME	Sat. 8/27	Sun. 8/28	Mon. 8/29	Tues. 8/30	Wed. 8/31
0000		S2C1			
0100		S2C2 PP	Net Tow		
0200			S2C9 Gas		
0300		Deploy PP Array		AC9/FRRF	
0400			Deploy Gas Array	Transit sed traps	
0500		S2C3 PO-1	S2C10 Open	Recover traps Transit gas array	
0600				Recover gas array	
0700				Transit St. 52	
0800	Depart Snug		S2C11 PSi	S52C1 WHOTS	Arrive Snug
0900				Transit St. ALOHA	
1000	Arrive Kahe (10:30) Weight cast	Net Tow	Net Tow		
1100	Hyperpro	S2C4 PO-2 (Begin 36 hr)	S2C12 Open	AC9/FRRF	
1200	S1C1 Kahe	Net Tow	Hyperpro AC9/FRRF	Hyperpro	
1300	Niskin Cast	ATE Hand Net Tow		S2C17	
1400	Transit ALOHA	S2C5 PC/PN	S2C13 ATP	Deploy APEX float	
1500				Transit St. Kaena	
1600					
1700		S2C6 PPO4	S2C14 PE		
1800					
1900		Recover PP array			
2000		S2C7 BEACH	S2C15 HPLC		
2100				S6C1 Kaena	
2200	Arrive ALOHA	Net Tow	Net Tow		
2300	Deploy sed traps	S2C8 PUR	S2C16 Open (end 36 hours)	Transit Snug	

August 28th: Sunrise 0613, Sunset 1853

6.0 HOT-234 Watch Schedule

0300-1500

Adriana Harlan **–** *Water Boss*
Dan Sadler – *Tag*
Lance Fujieki – *Alt. Tag*
Brett Updyke – *Alt. Tag*
Cammy Fumar– *Console*
Jefrey Snyder–Watch Leader – *Tag*

1500-0300

Susan Curless – Chief Scientist –*Water Boss*
Karin Björkman – *Tag*
Craig Nosse – Watch Leader – *Console, Tag*
Emily Crigler– *Alt. Tag, Alt Console*

At Large

Sam Wilson
Blake Watkins
Donn Viviani
Shimi Rii
Jim Foley
Jim Cox
Jo'el Nathansen
Elizabeth Shaw
Brandon Carter
Anne Thompson
Angel White
Katie Watkins-Brandt

OTG

Trevor Goodman
Trevor Young