Hawaii Ocean Time-series
HOT-240 Operational Cruise Plan

Cruise ID: KM 12-05
Vessel: R/V *Kilo Moana*, University of Hawaii
Master of the Vessel: Captain Gray Drewry
Chief Scientist: Craig Nosse, University of Hawaii
OTG Marine Technicians: Dan Fitzgerald and Ben Colello

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

Loading: March 22, 2012 @0930
Departure: March 23, 2012 @0900 (Science personnel on board by 0800)
Arrival: March 27, 2012 @ 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 (anchor 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)
ALOHA (Sta. 2)	Sediment traps, gas array, net tows, CTD operations, primary productivity measurements, AC9, misc. experiments.
WHOTS mooring station (Sta. 52)	One CTD cast (yo-yo to 200 m), surface instrument intercomparisons.
Kaena (Sta. 6)	One CTD cast (near-bottom)
Underway/continuous	ADCP, thermosalinograph, pCO_2 system, fluorometry, and meteorology

2.0. SCIENCE PERSONNEL

Participant	Title	Affiliation/HOT Group
Susan Curless	Research Associate	UH/BEACH
Adriana Harlan	Research Associate	UH/BEACH
Dan Sadler	Research Associate	UH/BEACH
Brett Updyke	Research Associate	UH/BEACH
Blake Watkins	Marine Engineer	UH/BEACH
Donn Viviani	Graduate Student	UH/BEACH
Shimi Rii	Graduate Student	UH/BEACH
Sean Jungbluth	Graduate Student	UH/BEACH
Jefrey Snyder	Marine Technician	UH/PO
Cameron Fumar	Research Associate	UH/PO
Craig Nosse	Research Associate	UH/PO
Joseph Gum	Research Technician	UH/PO
Sandra Martinez-Garcia	Postdoctoral Researcher	UH/CMORE
Dan Fitzgerald	Marine Technician	OTG
Ben Colello	Marine Technician	OTG
Ashley Stinson	OTG Intern	UNOLS/MATE

3.0. SUMMARY SCHEDULE

20 March	Pre-cruise planning meeting 1330 hrs.
22 March	Ship loading at 0930.
23 March	Depart from Snug harbor at 0900 hrs. **Science personnel on-board by 0800.**
23 March	Station 1 Kahe Pt. operations.
23 - 26 March	Station ALOHA operations. Station 52 CTD yo-yo cast, Station Kaena
27 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 March 23rd. The A-frame, CTD crane and CTD winch 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, the sediment traps will be deployed. After the sediment trap deployment is complete, 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 (see the Station ALOHA Nowcast/Forecast at http://aloha.manoa.hawaii.edu under “Operations”). 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 1833, 60843), 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@satellite-email.com, 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 0631 hrs on March 24th), a free drifting incubation array will be deployed from the stern using the A-frame and Sea-Mac winch. The array is equipped with two ARGOS satellite transmitters (platform #'s 3028, 60482, emailing positions to argosfix@km.soest.hawaii.edu, password: argosfix), strobe lights and a radio transmitter (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 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 (1844 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 winch and crane for these operations. Water samples for biogeochemical measurements will 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 **(Cameron Fumar, 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 CTD cast 8. The gas array will be deployed from the stern using the A-frame and 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. 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 around noon and midnight on the second, third, and fourth days (see

schedule) for a total of six slots. The A-frame and small capstan will be needed for this operation. B. Watkins will be in charge of these operations.

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, second 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 two times during the cruise.

Each deployment will consist of two up and two down profiles to a target depth of 200 m at a constant speed of 10 m/min during both the downcast and upcast. An instrument soaking period at just below the surface will be required between the two profiles. 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, weighting 5 lbs.

4.3. Floating sediment trap recovery

In the morning of March 26th, 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 Gas Array is recovered, the ship shall transit to Station 52 to 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 March 26th 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. After those operations and a final 200 m CTD cast at Station ALOHA is complete, an Apex profiling drifter will be deployed.

4.4.3 Apex profiling drifter

Blake Watkins will be deploying an Apex profiling drifter from the University of Washington. The instrument weighs about 75 pounds and can be handled by a single person. We request the ship's A-frame for this operation. Once deployed in the water, the instrument will sink and self-activate. The instrument will not be recovered. The Chief Scientist will choose the deployment location. After deployment, 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 26th, 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 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 HOT-PO 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 van (#23) with assorted equipment for radioisotope and general use.
4. One 12 ft. equipment van ("Blue" Van)
5. Distilled, deionized water and all required chemicals and isotopes
6. Large vacuum waste containers
7. Liquid nitrogen dewar
8. Drifting sediment trap array with strobe lights, satellite and radio transmitters, floats, weights
9. Polypropylene line
10. Sediment traps and crosses
11. Drifting primary production array and gas array with light and radio transmitter, floats, weights, polypropylene 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
20. 15-16 deg Incubator Chamber

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

1. A-frame
2. A-frame block assembly
3. Caley winch and crane 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 upper deck for one laboratory van (#23)
7. Space on main deck for one equipment van
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 systen, 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, pCO_2 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)

Ship: R/V *Kilo Moana* **HOT 240 CTD CASTS** **Date: March 23-27, 2012**

Cast		Samples	#Bottles
Kahe Pt.			
s1c1	1000 m	O_2, Temp, DIC/Alk, Nuts, Chl a, LLN, LLP, DOC, FCM, Salts	24
Station ALOHA			
s2c1	1000 m	Primary Production, DV(pb PP depths), KR(2@250) SMG(pb PP depths), Salts	24
s2c2	4740 m (PO-1)	O_2, Temp, DOC, DIC/Alk, Nuts, Salts, KR(pb all depths)	24
s2c3	1000 m (PO-2)	O_2, Temp, DOC, DIC/Alk, Nuts, Salts	24
s2c4	1000 m	PC/PN, SMG(1@200,350,500,650,O2min, 900,1000), Salts	21
s2c5	1000 m	PPO4, SR(1@5,25,45,75,100,125,150,175), Salts	22
s2c6	1000 m (BEACH)	O_2, Temp, DIC/Alk, Nuts, LLN, LLP, DOC, Keeling, Quay, Salts	23
s2c7	1000 m	PUR, Salts	10
s2c8	1000 m	Gas Array(2@5,25,45,75,100,125), Salts	14
s2c9	1000 m	PO(6@1000), AP(6@5), Salts	14
s2c10	1000 m	PSi, MC(1@5,25,45,75,100,125,150,175), DV(1@25,100) SMG(pb MC depths, 1@200), Salts	21
s2c11	1000 m	Salts	3
s2c12	1000 m	ATP, SW(1@200,300,400,500, 600,700,800,900,1000), Salts MC(1@200,300,500,770)	23
s2c13	1000 m	PE, MC(5,25,45,75,100,125,150,175), SW(pb MC), SR(pb MC), SMG(1@5,25), Salts	24
s2c14	1000 m	HPLC, Chl a, Slides, Salts	22
s2c15	4740 m (PO-3)	Oxygen, MC(1@1000,2000,3000,4000), KR(2@4000), Salts	14
s2c16	200 m	SR/DV(18@25), JR (2@25), AT(1@5,35,40,70)	24
WHOTS Mooring			
s52c1	200 m yo-yo	SMG(1@5,100,125,2@25), SR(1@5,25,45,75,100,125,150,175), MSM(2@DCM), DdV(4@50), DB/SW(4@25)	23
Kaena			
s6c1	2400 m	Chl, Salts	13

MC=Matt Church, **SW**=Sam Wilson, **DV=**Donn Viviani, **SMG=**Sandra Martinez-Garcia, **AP**=Adina Paytan, **DdV**=Daniela del Valle, **SR**=Shimi Rii, **KR**=Kathleen Ruttenberg, **MSM**, Marona Segura-Noguera, **JR**=Julie Robidart, **AT**=Anne Thompson, **DB**=Daniela Bottjer

Ship: R/V *Kilo Moana* **HOT-240** **Date: March 23-27, 2012**

TIME	Fri. 3/23	Sat. 3/24	Sun. 3/25	Mon. 3/26	Tue. 3/27
0000			Net Tow		
0100					
0200		S2C1 PP	S2C8 Gas	AC9/FRRF	
0300					
0400		Deploy PP Array	Deploy Gas Array		
0500		S2C2 PO-1	S2C9 Open	Transit sed traps	
0600					
0700				Recover traps Transit gas array	
0800			S2C10 PSi	Recover gas array	Arrive Snug
0900	Depart Snug			Transit St. 52	
1000		Net Tow	Net Tow	S52C1 WHOTS	
1100	Arrive Kahe (11:30) Weight cast	S2C3 PO-2 (Begin 36 hr)	S2C11 Open	Hyperpro	
1200	Hyperpro	Hyperpro	Net Tow	AC9/FRRF	
1300	S1C1 Kahe	ATE			
1400		S2C4 PC/PN	S2C12 ATP	Transit ALOHA S2C16	
1500	Transit ALOHA			Deploy drifter Transit St. Kaena	
1600		S2C5 PPO4			
1700			S2C13 PE		
1800		Recover PP array			
1900					
2000		S2C6 BEACH	S2C14 HPLC		
2100				S6C1 Kaena	
2200		Net Tow	Net Tow		
2300	Arrive ALOHA Deploy sed traps	S2C7 PUR	S2C15 PO-3 (end 36 hours)	Transit Snug	

March 24th: Sunrise 0631, Sunset 1844

6.0 HOT-240 Watch Schedule

0300-1500

Adriana Harlan **–** *Water Boss*
Dan Sadler – *Alt. Tag*
Sean Jungbluth – *Tag*
Cammy Fumar– Watch Leader - *Console*
Jefrey Snyder – *Tag*

1500-0300

Susan Curless – *Water Boss*
Brett Updyke – Watch Leader **-** *Tag*
Joseph Gum – *Console*
Craig Nosse – Chief Scientist – *Tag*

At Large

Blake Watkins
Donn Viviani
Sandra Martinez-Garcia
Shimi Rii

OTG

Dan Fitzgerald
Ben Colello
Ashley Stinson