

Hawaii Ocean Time-series HOT-253 Operational Cruise Plan

Cruise ID: KM1311

Vessel: R/V *Kilo Moana*, University of Hawaii

Master of the Vessel: Captain Rick Meyer

Chief Scientist: Susan Curless, University of Hawaii

Marine Technicians: Trevor Goodman and Dave Hashisaka

Loading: June 21, 2013 @1200

Departure: June 24, 2013 @0900 (Science personnel on board by 0800).

Arrival: June 28, 2013 @ 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 June 24th 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 June 25-27th.
- 3) Station 50, the site of WHOTS-9 Mooring (anchor position 22° 46.071'N 157° 53.956'W) will be occupied on for about one hour on June 27th.
- 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 June 27th for about 2 hours.

1.1 SCIENTIFIC OPERATIONS

<u>Station</u>	<u>Activities</u>
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. 50)	One CTD cast (yo-yo to 200 m), surface instrument intercomparisons.
Kaena (sta. 6)	One CTD cast (near bottom)
Underway/continuous	ADCP, thermosalinograph, fluorometry, and meteorology.

2.0. SCIENCE PERSONNEL

Participant	Title	Affiliation
Susan Curless	Research Associate	UH
Dan Sadler	Research Associate	UH
Stuart Goldberg	Postdoctoral Researcher	UH
Brett Updyke	Research Associate	UH
Adriana Harlan	Research Associate	UH
Lance Fujieki	Research Associate	UH
Donn Viviani	Graduate Student	UH
Sara Thomas	Graduate Student	UH
Blake Watkins	Marine Engineer	UH
Christopher Schvarcz	Graduate Student	UH
Jefrey Snyder	Marine Technician	UH
Fernando Santiago-Mandujano	Research Associate	UH
Cameron Fumar	Research Associate	UH
Daniel McCoy	Research Associate	UH
Carly Goodman	Undergraduate Student	UH
Conor Jerolmon	Undergraduate Student	UH
Mike Grissom	Graduate Student	UH
Irina Shilova	Postdoctoral Researcher	UCSC
Brandon Carter	Research Specialist	UCSC
Zbigniew Kolber	Scientist	UCSC
Matt Mills	Research Specialist	Stanford
Jim Foley	Marine Educator	UH
Matthew Kanemoto	STARS Participant	Kahuku HS and Intermediate
Katherine Loke Roseguo	STARS Participant	Ke Kula 'O Nawahiokalani'opu'u
Deelynn Ka'aha'aina	STARS Participant	UH West Oahu
Trevor Goodman	Marine Technician	OTG
Dave Hashisaka	Marine Technician	OTG

3.0. SUMMARY SCHEDULE

14 June	Pre-cruise planning meeting 1330 hrs, MSB 307.
21 June	Ship loading at 1200 hrs.
24 June	Depart from Snug harbor at 0900 hrs. Science personnel on-board by 0800.
24 June	Station 1 Kahe Pt. operations.
24-27 June	Station ALOHA operations. Station 50 CTD yo-yo cast, Station Kaena
28 June	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, a Hyperpro cast (Sect. 4.2.7), and a 20 m neuston cast will be conducted at this location on June 24th. The A-frame, and trawl winch will be needed 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 (Sect. 4.2.2). 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 SeaMac winch. 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, 60841), 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 (Shipboard e-mail account argosfix@km.soest.hawaii.edu and 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 0549 hrs on June 25th), 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 SeaMac 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 (1921 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
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the A-frame for this operation and will also use the SeaMac winch. The array is equipped with two ARGOS satellite transmitters (platform #'s 03028, 60482 emailing positions to argosfix@km.soest.hawaii.edu, password: argosfix), a strobe light and a radio transmitter (156.425 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 and third 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 1500 on June 26th. 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, second and fourth days, the Hyperpro will be deployed from the stern through a small block hung from the A-frame. The instrument is lowered and retrieved by hand. Each deployment will consist of three profiles before the instrument is retrieved.

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 morning of June 26th, the ATE will be hand deployed off the back deck to a depth of 10 m to collect at Trace Metal Free Sample. The ATE will be recovered after 30 minutes in the water. The ATE is approximately 1' tall and 4'' in diameter, weighting 5 lbs.

If the ship has been stationary at ALOHA for previous cruise activities, it is requested that the ship steams approximately 10-15 minutes up current from current position prior to ATE deployment to limit contamination of the trace metal sample from the ship's hull.

4.3 Gas Array and floating Sediment Trap recovery

In the early morning of June 27th, the ship shall transit for the recovery of the Gas Array. The A-frame and SeaMac winch will be needed to retrieve the arrays. After the Gas Array is recovered, the ship shall transit to recover the floating sediment trap array. After the sediment traps are recovered, the ship shall transit to Station ALOHA for an AC9/FRRf cast and a Hyperpro cast. Once the optics work is complete, the ship shall transit to Station 50 and conduct one 200 m CTD yo-yo cast.

4.4 Station 50 - WHOTS-9 Mooring

The anchor position of the WHOTS-9 mooring is 22° 46.071'N 157° 53.956'W. The watch circle of the buoy is about 2 nautical miles. Generally, the buoy stays on the edge of the watch circle. The buoy can be detected via radar in good weather conditions but is harder to detect with larger sea states.

4.4.1 CTD yo-yo cast (subsurface instrument intercomparison)

One 200-m CTD yo-yo cast with at least 5 full cycles will be conducted near the WHOTS mooring on June 27th 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 conduct another 200 m CTD cast, and then 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 June 27th. Once the CTD cast is complete, the ship shall return to Snug Harbor.

4.6 Seaglider Operations

One seaglider (sg148) is currently deployed at Station ALOHA. Throughout the cruise, it will be diving and profiling in the Station ALOHA area and at times transiting within the circle boundaries of Station ALOHA. The seaglider GPS fixes and alert info will be sent to the onboard email address seaglider@km.soest.hawaii.edu which is accessible both by the science party and Captain.

ARGOS message ref # - sg148 ARGOS - 90992

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

4.7 Acoustic Doppler Current Profiler

The ship's acoustic Doppler current profiler (ADCP) will be in operation during the duration of the cruise. The shipboard technicians will be in charge of the ADCP system.

4.8 Thermosalinograph, Fluorometer, and meteorological system

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 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.

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 (FCM Van and Van #23)
4. One 12 ft. equipment van ("Blue" Van)
5. Distilled, deionized water and all required chemicals and isotopes
6. Liquid nitrogen dewar

7. Drifting sediment trap array with strobe lights, satellite and radio transmitters, floats, weights sediment traps and crosses
8. Drifting primary production array and gas array with light and radio transmitter, floats, weights, polypro. line, spare buoy, etc.
9. Hyperpro and other optical measuring instruments.
10. Oxygen titration system
11. Plankton nets and towing lines
12. Desktop and laptop personal computers
13. Assorted tools
14. All required sampling bottles
15. Deck incubation system
16. Pertinent MSDS

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

1. A-frame
2. A-frame block assembly
3. CTD winch and boom
4. Space on deck for two 20ft laboratory vans and one equipment van
5. Electric power for three vans
 - 208 VAC single phase at 60 amps for #23 lab van,
 - 120 VAC 10 amps for blue equipment van,
 - and any VAC (480, 280, 208) for FCM van
6. Radio direction finder
7. Space on deck and power for small capstan = 4700lbs, and the power requirements are 440/480 VAC, 3 phase 60Hz, 60amp
8. Space on deck for sea water incubators
9. Space on deck for ~4 deck baskets of array gear
10. Precision depth recorder
11. Shackles, sheaves, hooks and lines
12. Shipboard Acoustic Doppler Current Profiler
13. Thermosalinograph and Fluorometer
14. Meteorological suite
15. Grappling hooks and line
16. Display in the lab of ship's position (charting software/GPS feed)
17. Running fresh water and seawater hoses
18. Electronic mail system
19. GPS system
20. Underway/on-station data acquisition system for meteorological instruments, ADCP, thermosalinograph, fluorometer, and access to real-time data through the network.
21. OTG's 24-place rosette, and 24 12L water sampling bottles (to be used as spare)

Ship: R/V Kilo Moana**HOT 253 CTD CASTS****Date: June 24-28, 2013**

Cast	Depth	Samples	#Bottles
<u>Kahe Pt.</u>			
s1c1	1000 m	O ₂ , Temp, DIC/Alk, Nuts, Chl a, LLN, LLP, DOC, FCM, Salts JF(pb all depths)	24
<u>Station ALOHA</u>			
s2c1	200 m	IS (24@25)	24
s2c2	1000 m	Primary Production, DV(pb@25), IS(1@25,600, and pb@25), Salts	24
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, JF(pb@8 O ₂ depths)	24
s2c5	1000 m	PC/PN, IS(1@25,DCM), Salts	16
s2c6	1000 m	PPO4, ST(1@200,600,650,700,770,800,900,1000), Salts	21
s2c7	1000 m (BEACH)	O ₂ , Temp, DIC/Alk, Nuts, LLN, LLP, DOC, Keeling, Quay, Salts	23
s2c8	1000 m	PUR, ST(1@175,225,250,300,350,400,500,550), Salts	18
s2c9	1000 m	Gas Array(2@5,25,45,75,100,125), DV(2@25)Salts	16
s2c10	1000 m	AP(6@5), PO(6@1000), Salts	14
s2c11	1000 m	PSi, MC(1@5,25,45,75,100,125,150,175), Salts	18
s2c12	1000 m	CS(2@5,25,45,75,100,125,150,175), IS(1@25,DCM),Salts JF(pb 1@5,25,45,75,100,125,150,175), DV(1@25)	21
s2c13	1000 m	ATP, MC(1@200,300,500,770), SW(1@200,300,400,500, 600,700,800,900,1000), Salts	23
s2c14	1000 m	MC(1@5,25,45,75,100,125,150,175), SW(pb MC), Salts	11
s2c15	1000 m	HPLC, Chl a, Slides, Salts	22
s2c16	4740 m (PO-3)	Oxygen, MC(1@1000,2000,3000,4000), Salts	12
<u>WHOTS Mooring</u>			
s50c1	200 m yo-yo	CS(7@25), BB(2@75,1@90), SG(2@175,5@5), IS(1@25,DCM)	19
<u>Kaena</u>			
s6c1	2400 m	Chl, Salts	13

MC=Matt Church, SW=Sam Wilson, DV=Donn Viviani, AP=Adina Paytan, CS=Chris Schvarcz, JF=Jim Foley,
IS=Irina Shilova, BB=Barbara Balestra, ST=Sara Thomas, SG=Stu Goldberg

Ship: R/V Kilo Moana**HOT 253****Date: June 24-28, 2013**

TIME	Mon. 6/24	Tues. 6/25	Wed. 6/26	Thurs. 6/27	Fri. 6/28
0000		S2C1 OPEN	Net Tow		Transit Snug
0100					
0200		S2C2 PP	S2C9 Gas		
0300				AC9/FRRF	
0400		Deploy PP Array	Deploy Gas Array		
0500		S2C3 PO-1	S2C10 Open	Transit gas array	
0600				Recover gas array Transit sed traps	
0700				Recover traps	
0800			S2C11 PSi	Transit ALOHA	Arrive Snug
0900	Depart Snug				
1000		Net Tow	Net Tow ATE	AC9/FRRF	
1100	Arrive Kahe (11:30) Weight cast	S2C4 PO-2 (Begin 36 hr)	S2C12 Open		
1200	Hyperpro	Hyperpro	Net Tow	Hyperpro	
1300	S1C1 Kahe			Transit St. 50 S50C1 WHOTS	
1400		S2C5 PC/PN	S2C13 ATP		
1500	20m Niskin cast Transit ALOHA		Hand net tow	Transit St. Kaena	
1600					
1700		S2C6 PPO4	S2C14 OPEN		
1800					
1900		Recover PP array			
2000		S2C7 BEACH	S2C15 HPLC		
2100				S6C1 Kaena	
2200		Net Tow	Net Tow		
2300	Arrive ALOHA Deploy sed traps	S2C8 PUR	S2C16 PO-3 (end 36 hours)		

June 25th: Sunrise 0549, Sunset 1921

6.0 HOT-253 Watch Schedule

0300-1500

Adriana Harlan – *Water Boss*

Dan Sadler – *Alt. Tag*

Lance Fujieki – *Tag*

Cammy Fumar – *Console*

Jefrey Snyder – *Watch Leader - Tag*

Conor Jerolmon

1500-0300

Susan Curless – *Chief Scientist – Water Boss*

Brett Updyke – *Watch Leader - Tag*

Fernando Santiago-Mandujano – *Tag*

Danny McCoy – *Console*

Carly Goodman

0900-2100

Chris Schvarcz – *Alt. Tag*

Mike Grissom – *Alt. Tag*

At Large

Blake Watkins

Donn Viviani

Stu Goldberg

Sara Thomas

Brandon Carter

Irina Shilova

Matt Mills

Zbigniew Kolber

Jim Foley

Matthew Kanemoto

Katherine Loke Roseguo

Deelynn Ka'aha'aina

OTG

Trevor Goodman

Dave Hashisaka