**Hawaii Ocean Time-series**
**HOT-202 General Cruise Plan**

Vessel: R/V *Kilo Moana*, University of Hawaii
Master of the Vessel: Captain Brian Wehmeyer
Chief Scientist: Susan Curless, University of Hawaii
OTG Marine Technicians: Kuhio Vellalos and Tobin Chen

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

Loading: June 23, 2008 @ 0900
Departure: June 24, 2008 @ 0900
Arrival: June 28, 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 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, is the site of the WHOTS Mooring, located at 22° 46'N, 157° 53.83'W will be occupied on the 4th day of the cruise for about two hours.
4) Station 6, referred to as Station Kaena, is located off Kaena Point at 21° 50.8'N, 158° 21.8'W will be occupied on the 4th day of the cruise for about 3 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. 50) | Two CTD casts (200 m). |
| Kaena (sta. 6) | CTD cast (2400 m) |
| Underway/continuous | ADCP, thermosalinograph, fluorometry, meteorology |

## 2.0. SCIENCE PERSONNEL

| Participant | Title | Affiliation/HOT Group |
|---|---|---|
| Susan Curless | Chief Scientist – Res. Assoc. | UH/BEACH |
| Lance Fujieki | Computer Specialist | UH/BEACH |
| Eric Grabowski | Research Associate | UH/BEACH |
| Adriana Harlan | Research Associate | UH/BEACH |
| Binglin Li | Graduate Student | UH/BEACH |
| Dan Sadler | Research Associate | UH/BEACH |
| Brett Updyke | Technician | UH/BEACH |
| Donn Viviani | Graduate Student | UH/BEACH |
| Blake Watkins | Marine Engineer | UH/BEACH |
| Sam Wilson | Scientist | UH/CMORE |
| Jay Wheeler | Research Associate | UH/BEACH |
| Jesse Yonover | Undergraduate Student | U Colorado |
| Paul Lethaby | Research Associate | UH/PO |
| Christin Shacat | Research Associate | UH/PO |
| Jefrey Snyder | Marine Technician | UH/PO |
| Sarah Yasui | Undergraduate Student | UH/PO |
| Amanda Vinson | Volunteer | UH/PO |
| Michael Gray | Volunteer | UH/PO |
| Janice Jones | Technician | UCSB |
| John Bullister | Scientist | PMEL |
| David Wisegarver | Scientist | PMEL |
| Courtney Daniels | Intern/Graduate Student | UH/CMORE |
| Scott LaChance | Teacher | UH/CMORE |
| Kim Weersing | CMORE Educator | UH/CMORE |
| Kate Achilles | CMORE Educator | UH/CMORE |
| Kuhio Vellalos | Marine Technician | OTG |
| Tobin Chen | Marine Technician | OTG |

## 3.0. SUMMARY SCHEDULE

| | |
|---|---|
| 17 June | Pre-cruise meeting, MSB 315, 1030hrs |
| 23 June | Ship loading starting at 0900 hrs |
| 24 June | Depart from Snug harbor at 0900 hrs. Science personnel on-board by 0800. |
| 24 June | Station 1 Kahe Pt. operations. |
| 25-27 June | Station ALOHA operations. Station 50 and Kaena CTD casts. |
| 28 June | 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 June 24th. 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 3028, 60482), 2 strobe lights, and 2 radio transmitters (channel 68, 156.425 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 0549 hrs on June 25), 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 # 8500, emailing positions to argosfix@km.soest.hawaii.edu, password: argosfix), strobe lights and a radio transmitter (channel 69, 156.475 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 (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 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 (**Jefrey Snyder, 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 69, 156.475 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 June 27, 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 50 to conduct one CTD cast.

4.4 WHOTS Mooring (Station 50)

Two 200-m CTD yo-yo casts will be conducted near the WHOTS mooring on June 27. These casts should be conducted downwind, downcurrent, and at about 200 m from the mooring. The nominal position of the mooring is 22° 46'N, 157° 53.83’W. After these operations are completed, 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 June 27, 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, $pCO_2$ system, and Fluorometer

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 OTG electronics technician will be in charge of the thermosalinograph and fluorometer 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 12-l water sampling bottles, all spare parts and extra rosette cage
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, *p*CO2 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, *p*CO2
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 Radiation Van

**Ship: R/V *KILO MOANA*  HOT 202 CTD CASTS  June 24 – June 28, 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), JB(pb oxygen/DIC), Salts | 24 |
| **Station ALOHA** | | | |
| s2c1 | 350 m | CMORE(5@25, 5@45, 5@75), JW(4@350, 5@30) | 24 |
| s2c2 | 1000 m | Primary Production, Salts, SW (1@25, 1@125), MB(pb on all depths) | 24 |
| s2c3 | 4740 m (PO-1) | $O_2$, Temp, DOC, DIC/Alk, Nuts, KA(pb oxygen), JB(pb oxygen/DIC), Salts | 24 |
| s2c4 | 1000 m (PO-2) | $O_2$, Temp, Nuts, DIC/Alk, DOC, JB(pb oxygen/DIC) Salts | 24 |
| s2c5 | 1000 m | PC/PN, SW(1@5,25,45,75,100,125,150,175), Salts | 24 |
| s2c6 | 1000 m | PPO4, BL(1@5,25,45,75,100,125,150), DV(1@5m, 1@DCM), Salts | 23 |
| s2c7 | 1000 m (BEACH) | $O_2$, Temp, DIC/Alk, Nuts, LLN, LLP,DOC, Keeling, Quay, JB(pb oxygen/DIC), 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, CMORE(5@125, 5@200), Salts | 12 |
| 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, BL(1@5,25,45,75,100,125,150), Salts | 23 |
| s2c13 | 1000 m | ATP, MC(200,300,500,770), SW(1@200,300,400,500, 600,700,800,900,1000), Salts | 24 |
| 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(1000,2000,3000,4000),JW (1@4000), Salts | 13 |
| **WHOTS Mooring** | | | |
| S50c1 | 200 m yo-yo | BC (1@70,40,15), Salts | 3 |
| S50c2 | 200 m yo-yo | | |
| **Kaena** | | | |
| S6c1 | 2400 m | Chl, Salts | 13 |

**SHIP R/V *KILO MOANA* HOT 202 Date: June 24 – June 28, 2008**

| TIME | Tue. 6/24 | Wed. 6/25 | Thur. 6/26 | Fri. 6/27 | Sat. 6/28 |
|---|---|---|---|---|---|
| 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 | |
| 0700 | | | | Transit gas array | |
| 0800 | | | S2C11 PSi | Recover gas array<br>Transit St. 50 | Arrive Snug |
| 0900 | Depart Snug | | | | |
| 1000 | | Net Tow | Net Tow | S50C1 | |
| 1100 | Arrive Kahe (11:30)<br>Weight cast | S2C4 PO-2<br>(Begin 36 hr) | S2C12 MIT | PRR<br>AC9/FRRF | |
| 1200 | PRR | Net Tow | PRR<br>AC9/FRRF | AC9/FRRF | |
| 1300 | S1C1 | KA hand net tow<br>ATE | Net Tow | | |
| 1400 | Go-Flo cast | S2C5 PC/PN | S2C13 ATP | S50C2 | |
| 1500 | Transit ALOHA<br>Deploy magnetometer | | | Transit St. Kaena | |
| 1600 | | | | Deploy magnetometer | |
| 1700 | | S2C6 PPO4 | S2C14 PE | | |
| 1800 | | | | | |
| 1900 | | Recover PP array | | | |
| 2000 | | S2C7 BEACH | S2C15 HPLC | | |
| 2100 | | | | Recover magnetometer<br>S6C1 | |
| 2200 | Recover<br>magnetometer | Net Tow | Net Tow | | |
| 2300 | Arrive ALOHA<br>Deploy sed traps | S2C8 PUR | S2C16 PO-3<br>(end 36 hours) | Transit Snug | |

**June 25: Sunrise 0549 Sunset 1921**

## 6.0 HOT-202 Watch Schedule

**0300-1500**

Adriana Harlan - *Water Boss*
Lance Fujieki — *altTag*
Eric Grabowski – *Tag, alt water boss,*
Jefrey Snyder– Watch Leader -*Tag*
Christin Shacat – *Console*
Amanda Vinson

**1500-0300**

Susan Curless – Chief Scientist - *Water Boss*
Dan Sadler – *Tag, alt water boss*
Paul Lethaby - Watch Leader - *Console*
Sarah Yasui – *Alt Tag*
Michael Gray - *Tag*

**At Large**

Blake Watkins
Brett Updyke
Janice Jones
Binglin Li
Donn Viviani
Sam Wilson – alt tag
Jay Wheeler – alt tag
Jesse Yonover
Kate Achilles
Kim Weersing
Courtney Daniels
Scott LaChance
John Bullister
David Wisegarver

**OTG**

Kuhio Vellalos
Tobin Chen