Hawaii Ocean Time-series
HOT-206 General Cruise Plan
KM 0822

Vessel: R/V Kilo Moana, University of Hawaii
Master of the Vessel: Captain Ross Barnes
Chief Scientist: Eric Grabowski, 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: November 26, 2008 @ 0900
Departure: November 29, 2008 @ 0900
Arrival: December 3, 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 one hour.
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 2 hours.

1.1 SCIENTIFIC OPERATIONS

<table>
<thead>
<tr>
<th>Station</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kahe (sta. 1)</td>
<td>Weight Cast, PRR cast, CTD cast (1000 m)</td>
</tr>
<tr>
<td>ALOHA (sta. 2)</td>
<td>Sediment traps, gas array, net tows, CTD operations, primary productivity measurements, AC9/FRRf, misc. experiments, and Sea Glider Operations.</td>
</tr>
<tr>
<td>WHOTS mooring station (Sta. 50)</td>
<td>One CTD cast (yo-yo to 200 m).</td>
</tr>
<tr>
<td>Kaena (sta. 6)</td>
<td>CTD cast (2400 m)</td>
</tr>
<tr>
<td>Underway/continuous</td>
<td>ADCP, thermosalinograph, fluorometry, meteorology, pCO2</td>
</tr>
</tbody>
</table>
2.0. SCIENCE PERSONNEL

<table>
<thead>
<tr>
<th>Participant</th>
<th>Title</th>
<th>Affiliation/HOT Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eric Grabowski</td>
<td>Chief Scientist – Res. Assoc.</td>
<td>UH/BEACH</td>
</tr>
<tr>
<td>Karin Björkman</td>
<td>Research Specialist</td>
<td>UH/BEACH</td>
</tr>
<tr>
<td>Lance Fujieki</td>
<td>Computer Specialist</td>
<td>UH/BEACH</td>
</tr>
<tr>
<td>Adriana Harlan</td>
<td>Research Associate</td>
<td>UH/BEACH</td>
</tr>
<tr>
<td>Binglin Li</td>
<td>Graduate Student</td>
<td>UH/BEACH</td>
</tr>
<tr>
<td>Dan Sadler</td>
<td>Research Associate</td>
<td>UH/BEACH</td>
</tr>
<tr>
<td>Brett Updyke</td>
<td>Technician</td>
<td>UH/BEACH</td>
</tr>
<tr>
<td>Jay Wheeler</td>
<td>Research Associate</td>
<td>UH/BEACH</td>
</tr>
<tr>
<td>Sam Wilson</td>
<td>Scientist</td>
<td>UH/CMORE</td>
</tr>
<tr>
<td>Ken Doggett</td>
<td>Research Associate</td>
<td>UH/CMORE</td>
</tr>
<tr>
<td>Tara Clemente</td>
<td>Research Associate</td>
<td>UH/BEACH</td>
</tr>
<tr>
<td>Blake Watkins</td>
<td>Marine Engineer</td>
<td>UH/BEACH</td>
</tr>
<tr>
<td>Solange Duhamel</td>
<td>Postdoc</td>
<td>UH/BEACH</td>
</tr>
<tr>
<td>Kathryn MacDonald</td>
<td>Volunteer</td>
<td>UH/BEACH</td>
</tr>
<tr>
<td>Fernando Santiago-Mandujano</td>
<td>Research Associate</td>
<td>UH/PO</td>
</tr>
<tr>
<td>Jeffrey Snyder</td>
<td>Marine Technician</td>
<td>UH/PO</td>
</tr>
<tr>
<td>Paul Lethaby</td>
<td>Research Associate</td>
<td>UH/PO</td>
</tr>
<tr>
<td>Christin Shacat</td>
<td>Research Associate</td>
<td>UH/PO</td>
</tr>
<tr>
<td>Graham Dean</td>
<td>Volunteer</td>
<td>PO</td>
</tr>
<tr>
<td>Amanda Ricardo</td>
<td>Volunteer</td>
<td>PO</td>
</tr>
<tr>
<td>Kuhio Vellalos</td>
<td>Marine Technician</td>
<td>OTG</td>
</tr>
<tr>
<td>Tobin Chen</td>
<td>Marine Technician</td>
<td>OTG</td>
</tr>
</tbody>
</table>

3.0. SUMMARY SCHEDULE

19 November  Pre-cruise meeting, MSB 307, 1030 hrs.
26 November  Ship loading starting at 0900 hrs.
29 November  Depart from Snug harbor at 0900 hrs. Science personnel on-board by 0800.
29 November  Station 1 Kahe Pt. operations.
29 Nov-2 Dec Station ALOHA operations. Station 50 and Kaena Pt. CTD cast
3 December   Arrive back to Snug harbor. ETA 0800 hrs, 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 PRR cast (Sect. 4.2.7) will be conducted at this location in the afternoon of November 29. The CTD winch and crane 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 200-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, to be determined enroute to ALOHA by local current conditions. 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 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 Production Array.

4.2.3 Primary production experiment

Samples for the primary productivity experiment will be collected from the rosette. Before dawn (sunrise 0652 hrs on November 30), 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 03028, 60482), strobe lights and a radio transmitter (channel 68, 156.425 MHz). Position fixes of the array will be e-mailed to the ship (argosfix@km.soest.hawaii.edu, password: argosfix).

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 (1748 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 will need the ship’s CTD winch and crane for these operations. 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 (Fernando Santiago-Mandujano, Tara Clemente).

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 # 01833, emailing positions to argosfix@km.soest.hawaii.edu, password: argosfix), a strobe light and a radio transmitter (channel 72, 156.625 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.

4.2.7. 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 December 2, 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 50 to conduct one yo-yo CTD cast. After which time the ship shall transit to ALOHA to conduct one PRR cast, and two AC9/FRRf casts.

4.4 WHOTS Mooring (Station 50)
One 200-m CTD yo-yo cast with at least 6 full cycles will be conducted near the WHOTS mooring on December 2. This cast 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 will transit back inside the St. ALOHA circle to complete optical casts. Once those operations are complete, the ship will either attempt sea glider recovery or transit to Station Kaena.

4.5 Sea Glider Deployment and Recovery Operations
If weather permits, a Seaglider will be launched off of the stern using the A-frame. An iridium handset will be provided for communication between OTG and the glider pilots on island for use in this operation. Please turn on the ship location email broadcast. There are multiple time slots scheduled for these operations in case of inclement weather conditions or communication issues between land and sea based teams. If the Seaglider misbehaves the small boat will be launched to aid in the recovery operation.

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 December 1, after which the ship shall return to Snug harbor.

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 OTG electronics technician will be in charge of the ADCP system.

4.8 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
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 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. Iridium handset and other pertinent items needed for sea glider operations.

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, and OTG 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, pCO2 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, thermostalinograph, fluorometer, $p$CO$_2$  
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 Lab Van  
29. Ship’s location email broadcast
### Ship: R/V *KILO MOANA*  
**HOT 206 CTD CASTS**  
**Nov.29-Dec.3, 2008**

<table>
<thead>
<tr>
<th>Cast</th>
<th>Samples</th>
<th>#Bottles</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Kahe Pt.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>s1c1 1000 m</td>
<td>O$_2$, Temp, DIC/Alk, Nuts, Chl a, LLN, LLPO$_4$, DOC, FCM, Salts</td>
<td>24</td>
</tr>
<tr>
<td><strong>Station ALOHA</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>s2c1 200 m</td>
<td>CMORE(5@25, 5@45, 5@75)</td>
<td>15</td>
</tr>
<tr>
<td>s2c2 1000 m</td>
<td>Primary Production, Salts, SW (1@25, 1@125), MB(pb on all depths), KB(pb PPdepths 150,175)</td>
<td>24</td>
</tr>
<tr>
<td>s2c3 4740 m (PO-1)</td>
<td>O$_2$, Temp, DOC, DIC/Alk, Nuts, Salts</td>
<td>24</td>
</tr>
<tr>
<td>s2c4 1000 m (PO-2)</td>
<td>O$_2$, Temp, Nuts, DIC/Alk, DOC, Salts</td>
<td>24</td>
</tr>
<tr>
<td>s2c5 1000 m</td>
<td>PC/PN, SW(1@5,25,45,75,100,125,150,175), BL(1@25,45), Salts</td>
<td>24</td>
</tr>
<tr>
<td>s2c6 1000 m</td>
<td>PPO$_4$, DS(1@1000,750), Salts</td>
<td>18</td>
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<tr>
<td>s2c7 1000 m (BEACH)</td>
<td>O$_2$, Temp, DIC/Alk, Nuts, LLN, LLP, DOC, Keeling, Quay, Salts</td>
<td>23</td>
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<tr>
<td>s2c8 1000 m</td>
<td>PUR, CMORE(5@1000,5@770,5@500), Salts</td>
<td>24</td>
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<tr>
<td>s2c9 1000 m</td>
<td>Gas Array (2@125,100) (3@5,25,45,75) MB(1@175,150,125,100,75,45,25,5)</td>
<td>24</td>
</tr>
<tr>
<td>s2c10 1000 m</td>
<td>CMORE(5@125,5@200), PO(6@1000), Salts</td>
<td>18</td>
</tr>
<tr>
<td>s2c11 1000 m</td>
<td>PSi, MC(5,25,45,75,100,125,150,175), Salts</td>
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<tr>
<td>s2c12 1000 m</td>
<td>MIT, BL(1@75,DCM)(3@175), Salts</td>
<td>21</td>
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<tr>
<td>s2c13 1000 m</td>
<td>ATP, MC(200,300,500,770), SW (1@200,300,400,500, 600,700,800,900,1000), Salts</td>
<td>24</td>
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<tr>
<td>s2c14 1000 m</td>
<td>PE, MC(5,25,45,75,100,125,150,175), SW(pb MC), Salts</td>
<td>22</td>
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<tr>
<td>s2c15 1000 m</td>
<td>HPLC, Chl a, Slides, Salts</td>
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<tr>
<td>s2c16 4740 m (PO-3)</td>
<td>Oxygen, MC(1000,2000,3000,4000), Salts</td>
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</tr>
<tr>
<td><strong>WHOTS Mooring</strong></td>
<td></td>
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<tr>
<td>S50c1 200 m yo-yo</td>
<td>BC (1@DCM,70,40,15), BL( 3@ 5,25,45,75,100,125,150)</td>
<td>24</td>
</tr>
<tr>
<td><strong>Kaena</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S6c1 2400 m</td>
<td>Chl, Salts</td>
<td>13</td>
</tr>
<tr>
<td>TIME</td>
<td>Sat, 11/29</td>
<td>Sun, 11/30</td>
</tr>
<tr>
<td>------</td>
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<td>0000</td>
<td></td>
<td>S2C1</td>
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<td>0100</td>
<td>S2C2</td>
<td>PP</td>
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<tr>
<td>0200</td>
<td></td>
<td>S2C9</td>
</tr>
<tr>
<td>0300</td>
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</tr>
<tr>
<td>0400</td>
<td>Deploy PP Array</td>
<td>Deploy Gas Array</td>
</tr>
<tr>
<td>0500</td>
<td>S2C3</td>
<td>PO-1</td>
</tr>
<tr>
<td>0600</td>
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<td>ATE</td>
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<tr>
<td>0700</td>
<td></td>
<td>Deploy Seaglider</td>
</tr>
<tr>
<td>0800</td>
<td></td>
<td>S2C11</td>
</tr>
<tr>
<td>0900</td>
<td>Depart Snug</td>
<td></td>
</tr>
<tr>
<td>1000</td>
<td></td>
<td>Net Tow</td>
</tr>
<tr>
<td>1100</td>
<td>Arrive Kahe (11:30)</td>
<td>Weight cast</td>
</tr>
<tr>
<td>1200</td>
<td>PRR</td>
<td>Net Tow</td>
</tr>
<tr>
<td>1300</td>
<td>S1C1</td>
<td>Deploy Seaglider</td>
</tr>
<tr>
<td>1400</td>
<td></td>
<td>S2C5</td>
</tr>
<tr>
<td>1500</td>
<td>Transit ALOHA</td>
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</tr>
<tr>
<td>1600</td>
<td></td>
<td>S2C6</td>
</tr>
<tr>
<td>1700</td>
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<td>Recover PP array</td>
</tr>
<tr>
<td>1800</td>
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<tr>
<td>1900</td>
<td></td>
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<tr>
<td>2000</td>
<td></td>
<td>S2C7</td>
</tr>
<tr>
<td>2100</td>
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<tr>
<td>2200</td>
<td></td>
<td>Net Tow</td>
</tr>
<tr>
<td>2300</td>
<td>Arrive ALOHA</td>
<td>Deploy sed traps</td>
</tr>
</tbody>
</table>

**November 30:** Sunrise 0652       Sunset 1748
6.0 HOT-206 Watch Schedule

**0300-1500**
Adriana Harlan - *Water Boss*
Lance Fujieki – *Tag*
Jay Wheeler– *Alt Tag*
Eric Grabowski - Chief Scientist
Kathryn MacDonald
Fernando Santiago-Mandujano– Watch Leader-*Console*
Jefrey Snyder- *Tag*
Amanda Ricardo

**1500-0300**
Karin Björkman –*Alt Tag*
Dan Sadler – *Water Boss*
Tara Clemente - Watch Leader- *Tag*
Paul Lethaby - *Console*
Christin Shacat - *Tag*
Graham Dean

**At Large**
Blake Watkins
Ken Doggett
Brett Updyke - *Alt Tag*
Binglin Li
Sam Wilson - *Alt Tag*
Solange Duhamel

**OTG**
Kuhio Vellálos
Tobin Chen
1. SCIENTIFIC OBJECTIVES

The objective of the cruise was to maintain a collection of hydrographic and biogeochemical data at the Hawaii Ocean Time-series (HOT) stations. Four stations are to 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 2\textsuperscript{nd}, 3\textsuperscript{rd}, and 4\textsuperscript{th} 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 4\textsuperscript{th} 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 will be occupied on the 4\textsuperscript{th} day of the cruise for about 2 hours.

Upon arrival to Station Kahe a 1,300 lb. weight-test cast to 500 m, one CTD cast to 1000 m, and a PRR cast was to be conducted at this location in the afternoon of November 29th. The single CTD cast was to be conducted to collect continuous profiles of various physical and chemical parameters. Water samples were to be collected at discrete depths for biogeochemical measurements. After these operations were satisfactorily completed, the ship was to proceed to Station ALOHA.

Upon arrival at Station ALOHA, the free-drifting sediment trap array was to be deployed. The sediment trap array was to stay in the water for about 52 hours. This was to be followed by one shallow CTD cast to 200 m and one 1000 m CTD cast to collect water for the primary productivity array. After this, the free-drifting primary productivity array was to be deployed for 12 hours. A full-depth CTD cast was to be conducted after the deployment of the primary production array, followed by 1000-m CTD casts at strict 3
hour intervals for at least 36 hours for continuous and discrete data collection, ending with another full-depth CTD cast on December 2nd.

Another free-drifting array (gas array) was to be deployed for 24 hours for incubation experiments on December 1st. The gas array was to be recovered at 0700 on December 2nd.

A plankton net was to be towed near noon and midnight for 30-min intervals on November 30th and December 1st at Station ALOHA.

A Profiling Reflectance Radiometer (PRR) was to be deployed for half-hour periods near noon time on December 1st and 2nd.

A package including a Wet Labs AC9, a Chelsea Fast Repetition Rate Fluorometer (FRRf), and a SeaBird Seacat was to be used to profile the upper 200 m at Station ALOHA around noon time on December 1st and 2nd and in the early morning on December 2nd.

After CTD work at Station ALOHA was accomplished, the ship was to transit to recover the floating sediment trap array and the gas array on December 2nd.

After recovering the arrays, the ship was to transit to Station 50 to conduct a one-hour 200-m CTD yo-yo cast.

Following the yo-yo CTD cast, light casts (PRR and AC9/FRRf) were to be completed at Station ALOHA.

After operations at Station ALOHA ended, the ship was to transit to Station Kaena.

A near-bottom CTD cast (~2500 m) was to be conducted at Station 6 including salinity and chlorophyll samples for calibration, after which the ship was to transit to Snug Harbor.

A Seaglider was to be deployed at some point during the cruise.

The ATE sampler was to be deployed during the cruise.

The following instruments were to collect data throughout the cruise: shipboard ADCP, thermostalinograph, underway fluorometer, two anemometers, and the pCO2 system.
## 2. SCIENCE PERSONNEL

<table>
<thead>
<tr>
<th>Cruise Participant</th>
<th>Title</th>
<th>Affiliation</th>
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<tr>
<td><strong>BEACH group:</strong></td>
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<tr>
<td>Eric Grabowski</td>
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<tr>
<td>Karin Björkman</td>
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</tr>
<tr>
<td>Lance Fujieki</td>
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<td>Binglin Li</td>
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<td>Sam Wilson</td>
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<td>UH/CMORE</td>
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<td>Ken Doggett</td>
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<tr>
<td>Tara Clemente</td>
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<td>UH/BEACH</td>
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<tr>
<td>Blake Watkins</td>
<td>Marine Engineer</td>
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<tr>
<td>Solange Duhamel</td>
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<tr>
<td>Kathryn MacDonald</td>
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<td>Fernando Santiago-Mandujano</td>
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<td>Jefrey Snyder</td>
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<tr>
<td>Paul Lethaby</td>
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<td>Amanda Ricardo</td>
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<tr>
<td>Kuhio Vellalos</td>
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<td>OTG</td>
</tr>
<tr>
<td>Tobin Chen</td>
<td>Marine Technician</td>
<td>OTG</td>
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3. GENERAL SUMMARY

Most operations during the cruise were conducted as planned. The swell was quite large (10-12ft with 15ft sets) at the beginning and at the end of the cruise which contributed to the delays in the schedule. One CTD cast (s2c8) was canceled and made up at the end of the cruise. An extra array was deployed because Karin Björkman’s samples were inadvertently left off of the primary production array. The Seaglider was not deployed on this cruise because of the rough conditions. All AC-9/FRRf casts were canceled. One of the pins broke off in the MPAK so the battery could not be charged. The dummy plug for the FRRf was also left behind. Without the plug it was too risky to deploy the package. An extra 200-m CTD cast was added at Station 50. On December 1st at approximately 1400hrs the ships power went down. This caused the computer that logs the surface PRR to shut down. This was not noticed until December 2nd at approximately 1215, at the time of the PRR cast. The computer was then brought back on-line. The CTD cast at Station Kaena was canceled because of the large swell. The rosette hit the side of the ship during the s2c1 recovery and its tag ring got damaged. The ring was welded later in the cruise.

One 500 m weight cast was performed with a 1,300 lb. weight and one 1000-m CTD cast was conducted at Station Kahe (1). Two near-bottom deep casts, twelve 1000-m CTD casts and two 200-m CTD casts were conducted at Station ALOHA (2). One, one hour 200 m yo-yo CTD cast and one 200-m CTD cast was conducted near the WHOTS mooring (Station 52).

The array of floating sediment traps, the gas array, the primary production array and Karin Björkman’s array were deployed and recovered without any incidents.

All of the arrays drifted to the NNW of ALOHA.
- Primary Production Array – recovered at 22 47.051N 158 1.493W.
- Karin Björkman’s array – recovered at 22 47.051N 158 1.493W.
- Gas Array – recovered at 22 52.582N 157 59.871W
- Sediment Trap Array – recovered at 22 57.287N 158 7.669W

Six net tows were completed, three were conducted at night, and three during the day.

The AC9/FRRf was not deployed on this cruise.

The PRR was deployed three times around noon.

The ATE sampler was successfully deployed and recovered.

The uncontaminated water system turned off during the power outage. As a result, there was a 20 minute gap in the thermosalinograph and pCO2 data.

The ADCP and the two anemometers ran without interruption throughout the cruise.
Winds ranged from the SW at 5 knots, N at 15 knots to the NE at 15 knots gusting to 20 during the course of the cruise. The swell ranged from 4-12ft with 15ft sets.

4. R/V KILO MOANA, OFFICERS AND CREW, TECHNICAL SUPPORT

The R/V Kilo Moana continues to maintain excellent ship support for our work.

The Captain and crew were most helpful and accommodating throughout the cruise. They were very flexible in receiving changes to our operational schedule. Throughout our cruise, the entire crew showed enthusiasm, concern, and dedication to our scientific mission.

Technical support during this cruise was excellent. OTG personnel were available at any time to assist in our work and helped keep operations running smoothly.

5. DAILY REPORT OF ACTIVITIES (HST)

November 26, 2008 – Loading Day

0900 - Heavy equipment, the blue storage van and all hand carried gear was loaded during this day.

CTD wire was not reterminated for this cruise.

November 29, 2008

Departed Snug Harbor at 0900hrs
Fire and boat drill at 0945hrs, all science personnel attended. After, all of the new personnel attended a meeting about the life rafts and survival suits.
Science and Safety meeting at 1015hrs
Arrived Station Kahe at 1145hrs, conducted a weight cast at 1200hrs, PRR at 1245hrs, and a 1400-m CTD cast at 1330hrs.
Underway to Station ALOHA at 1515hrs
Arrived Station ALOHA at 2345hrs

November 30, 2008

The sediment trap array was deployed at 0056hrs. The array was deployed at the location of 22 45.968N, 158 0.181W. Communication problems with the TSRB delayed the deployment. The problem was resolved.
One 200-m CTD cast (s2c1) was conducted at 0134hrs. This was followed by another 200-m CTD cast (s2c2) at 0304hrs to collect water for the primary productivity experiment. Cast 2 was scheduled to be deployed to 1000-m but this was changed to 200-m because the first 200-m cast took 45 minutes to complete. We were already behind schedule at the time of the first cast.

The primary production array was deployed at 0445hrs at the location of 22 45.591N, 157 59.905W. Karin Björkman intended to add samples onto this array but this was not effectively communicated so the samples were inadvertently left off of the array.

Another array was deployed at 0535 at the location of 22 46.084N, 157 58.771W with all of Karin Björkman’s samples.

At 0610hrs a near-bottom PO/CTD (s2c3) cast was conducted. This cast took 4 hours to complete.

Two net tows were conducted by Blake Watkins at 1115hrs and 2205hrs. One net tow was canceled because of the delays.

The 36hr burst period started at 1237hrs with a 1000-m CTD cast (s2c4). This cast took 1 hour 30 minutes to complete. The second CTD cast (s2c5) of the period started at 1535hrs. The ISUS was installed in the rosette and connected before the first CTD cast of the 36hr period.

As part of the 36hr period, two more 1000-m CTD casts were conducted on this day.

s2c6-at 1938hrs
s2c7-at 2307hrs

Because of the delays the PUR cast (scheduled as s2c8) was canceled. This cast was to be made up in place of the deep cast (2300hrs on Dec.1). The second deep cast was rescheduled for 0200hrs on Dec.2.

The Seaglider operations were canceled because of the rough conditions.

The primary production array was recovered at 1811hrs. At the time of recovery the array was located at 22 47.051N 158 1.493W.

Karin Björkman’s array was recovered at 1855hrs. At the time of recovery the array was located at 22 47.051N 158 1.493W.

Weather conditions observed at 1500hrs; winds from the SW at 5 knots, seas 10-12ft with 15ft sets, cloud cover around 6/8.

**December 1, 2008**

As part of the 36hr period, eight 1000-m CTD casts were conducted on this day.

s2c8 at 0223hrs
s2c9 at 0600hrs
s2c10 at 0830hrs
s2c11 at 1100hrs
s2c12 at 1500
s2c13 at 1700
s2c14 at 2000
s2c15 at 2304

Four net tows were completed by Blake Watkins; 0059hrs, 1015hrs, 1335hrs and 2203hrs.
The gas array was deployed at 0443hrs at the location of 22 44.99N 157 59.99W. The ATE was successfully deployed at 0745hrs. One PRR cast was conducted at 1200hrs. All AC-9/FRRf casts were canceled. One of the pins broke off in the MPAK so the battery could not be charged. The dummy plug for the FRRf was also left behind. Without the plug it was risky too deploy the package. At approximately 1400hrs the ships power went down. This caused the computer that logs the surface PRR to shut down. The computer was not brought back on-line until Dec.2 at 1215hrs. The Seaglider operations were canceled because of the rough conditions. Weather conditions observed at 1500hrs; winds from the N at 15 knots, seas 4-6ft and cloud cover 1/8.

December 2, 2008

The 36hr burst period ended with a second deep cast (s2c16) at 0203hrs. The sediment trap array was recovered at 0730hrs after drifting 12nm to the NW from the center of ALOHA. The array was recovered at 22 57.287N 158 7.669W. The gas array was recovered at 0900hrs after drifting 6nm to the N from the center of ALOHA. The array was recovered at 22 52.582N 157 59.871W. One PRR cast was conducted at Station ALOHA at 1245hrs. Yesterday at approximately 1400hrs the ships power went down. This caused the computer that logs the surface PRR to shut down. This was not noticed until the time of the PRR cast (1215hrs). The computer was brought back on-line. All AC-9/FRRf casts were canceled. The Seaglider operations were canceled because of the rough conditions. One, one hour, 200-m yo-yo CTD cast was conducted near the WHOTS mooring at 1100hrs. A second 200-m CTD cast was conducted at 1330hrs to collect water. The last CTD cast conducted at the WHOTS mooring showed significant spikes in the tension read-out. At 1515hrs we departed Station ALOHA and transited to Station Kaena where a near-bottom CTD cast was scheduled to be completed. Because of the rough conditions the CTD cast was canceled. Weather conditions at 1500; winds from the NE at 15 knots gusting to 20 knots, seas 10-12ft with 15ft sets and cloud cover 4/8.

December 3, 2008

0720- Arrived Snug Harbor. 0745- Offloaded. Most gear was left aboard the ship in the science hold for the next cruise.
HOT program sub-components:

<table>
<thead>
<tr>
<th>Investigator</th>
<th>Project/Institution</th>
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<tbody>
<tr>
<td>Dave Karl</td>
<td>Core Biogeochemistry/UH</td>
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<tr>
<td>Roger Lukas</td>
<td>Hydrography/UH</td>
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<tr>
<td>Bob Bidigare</td>
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<tr>
<td>Mike Landry</td>
<td>Zooplankton dynamics/UH</td>
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<td>Mark Abbott/Ricardo Letelier</td>
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Ancillary programs:

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<td>CO2 dynamics and intercalibration/SIO</td>
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<td>Paul Quay</td>
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<td>Penny Chisholm</td>
<td>Prochlorococcus population dynamics/MIT</td>
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<td>Zehr/Church/Montoya</td>
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<td>CMORE PI’s</td>
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<td>Mark Brzezinski</td>
<td>Silica production and dissolution rate measurements/UCSB</td>
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Additional programs

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<tr>
<td>Sam Wilson</td>
<td>Reduced gases in the upper ocean: The cycling of methane, sulfide and nitrous oxide/CMORE/UH</td>
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## Hawaiian Ocean Time-Series

### HOT-206

#### KAHE Station Data Sheet

**Station #** 1  
**Cast #** 1  
**Date:** 11/29/08  
**Time:** 1330  
**Operator(s):** KB, KM, DS, TC

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### Notes:


Station # 2  
Cast # 1  
Operator(s): DS, TC, KB  
Date: 11/30/08 (HST)  
Time: 1134 (HST)  

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Notes:
**Hawaiian Ocean Time-series**

**HOT-206**

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Notes: MB will piggy back all PP depths. PLEASE SAMPLE PP FIRST and CONSERVE WATER!!
## Hawaiian Ocean Time-series

**HOT-206**

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**Notes:**
Hawaiian Ocean Time-series
HOT-206
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Notes:
# Hawaiian Ocean Time-series

**HOT- 206**

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### Notes:

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Hawaiian Ocean Time-series  
HOT- **206**  
Particulate Phosphorus Data Sheet

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Notes:
# Hawaiian Ocean Time-series
## HOT-206
### BEACH Shallow Data Sheet

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**Time:** 2300 (HST)  
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Hawaiian Ocean Time-series
HOT- 206
Gas Array Experiment Data Sheet

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Notes:
# Hawaiian Ocean Time-series

## HOT-206

### CMORE CAST Data Sheet

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**Notes:**
Hawaiian Ocean Time-series
HOT-206
Particulate Silica Data Sheet

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Cast # 10  Time: 0830  (HST)
Operator(s): AH, LF, EG, JW  Pre-screen mesh size: none
Blank # B1, B2, B3

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Notes: SW will go first on MC depths 150 and 175.
Hawaiian Ocean Time-series
HOT- 206
MIT Data Sheet

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Operator(s): Ah,lf, eg, jw

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Notes:
# Hawaiian Ocean Time-series

**HOT- 206**

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**Notes:**
Hawaiian Ocean Time-series
HOT-206
Phycoerythrin Data Sheet

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Time: 1700 (HST)
Operator(s): DS, KB, TC
Pre-screen mesh size: None

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Notes:
Hawaiian Ocean Time-series
HOT-206
HPLC & Chl a. Bottle Data Sheet

Station # 2
Cast # 14
Date: 12/01/08 (HST)
Time: 2000 (HST)
Operator(s): DS, KB, TC

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Notes: DO NOT PRE-SCREEN.
Hawaiian Ocean Time-series  
HOT-206  
PUR/CMORE Data Sheet

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Notes: PO group will sample niskin #1 for salts before it is drained for CMORE.
# Hawaiian Ocean Time-series
## HOT-206
### WOCE Deep 2 Data Sheet

**Station #**: 2  
**Cast #**: 16  
**Date**: 12/02/08 (HST)  
**Time**: 0200 (HST)  
**Operator(s)**: DS, TC, KB

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**Notes:**
Hawaiian Ocean Time-series
HOT- 206
STATION 50 Data Sheet

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Hawaiian Ocean Time-series
HOT-206
In Situ Gas Array Data Sheet

Operator(s): AH, LF, EG, BW, BU, JW

Date in: 12/1/08
Time in: 0450
Position in: 22 44.991 N 157 59.986 W
Notes:

Operator(s): LF, EG, BW, BU, JW, AH

Date out: 12/2/08
Time out: 0900
Position out: 22 52.582 N 157 59.871 W
Notes:
Hawaiian Ocean Time-series
HOT- 206
In Situ Primary Production Data Sheet

Operator(s): AH, LF, BW, BU, EG, JW

Date in: 11/30/08 Time in: 0445 (HST)
Date out: 11/30/08 Time out: 1811 (HST)

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<td>45</td>
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<td>25</td>
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<td>5</td>
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</tbody>
</table>

Position in: 22 45.591 N 157 59.905 W
Position out: 22 47.051 N 158 1.493 W

Average weather condition during incubation:

Average sea state during incubation:

Notes:

Begin Inoculation

End Inoculation

Filtration time
Hawaiian Ocean Time-series
HOT- 206 KARIN ARRAY
In Situ Primary Production Data Sheet

Operator(s): AH, LF, BW, JW, EG

Date in: 11/30/08  Time in: 0535 (HST)
Date out:  Time out: ________________ (HST)

Incubation Depth | Insertion Depth | Owner
--- | --- | ---
175 | | |
150 | | |
125 | | |
100 | | |
75 | | |
45 | | |
25 | | |
5 | | |

Position in: 22 46.084 157 58.771
Position out: ________________

Average weather condition during incubation:

Average sea state during incubation:

Notes:

Begin Inoculation: ________________  End Inoculation: ________________
Filtration time: ________________
Hawaiian Ocean Time-series
HOT-206
Sediment Trap Data Sheet

Type of traps: 150M PIT
Operator(s): BW, DS, KB, TC
Date: 11/30/08
Position in: 22 45.968N  158 0.181W
Wind: 10-20kts
Sea State: 10-15ft

Time in: 150 m X LIVE  0040
Notes: Start at 0031 finished at 0056
          X DEAD  0048
          300 m
          500 m

Operator(s): Ah,lf,eg,jw,bw,bu
Date: 12/2/08
Position out: 22 57.287 N  158 7.669 W
Wind: 15 knots
Sea State: 10-15 ft

Time out: 150 m 0730
          300 m
          500 m

General processing procedure:

1) Cap traps immediately upon retrieval.
2) Mark interface and 2 inches above.
3) Remove baffles.
4) Aspirate overlying sea water to 2 inch interface mark.
5) Prescreen all traps at a given depth through a single screen and save screened material in trap blank solution.
6) Pour the contents of 9 individual screened traps into separate filtration bottles (do not combine trap solutions) marked A-I.
7) Pour the contents of 3 screened traps back into respective traps (do not combine trap solutions) for mass flux analysis (J,K,L).
8) Filter 3 two liter and 3 one liter time zero blanks for PC/PN & PPO$_4$ respectively.
9) Filter 6 individual traps for PC/PN (A-F) and 3 for PPO$_4$ (G-I).