U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE/NOAA FISHERIES
Pacific Islands Fisheries Science Center
2570 Dole St. • Honolulu, Hawaii 96822-2396
(808) 983-5300 • Fax: (808) 983-2902

CRUISE REPORT[1]

VESSEL: *Oscar Elton Sette*, Cruise 07-06 (OES-54)

CRUISE PERIOD: July 18–August 14, 2007

AREA OF OPERATION: Papahānaumokuākea Marine National Monument (PMNM)

TYPE OF OPERATION: In support of a Pacific Islands Fisheries Science Center (PIFSC) marine debris removal operation

ITINERARY:

July 18 Departed Ford Island, Pearl Harbor at 0900. En route to French Frigate Shoals (FFS) to drop off Robert Dollar (Protected Species Division (PSD)), Dane Johnson (PSD), and Marie Medina (U.S. Fish and Wildlife Service (USFWS)). Most scientific personnel settled into their staterooms, attended the welcome aboard orientation, and were reminded about safety procedures and the ship's standing orders, rules, and regulations. The weather was favorable and helicopter emergency evacuation drills were successfully conducted outside Barbers Point, Oahu. Abandon ship drills were also conducted to orient everyone with their lifeboat stations and other safety precautions. Ship averaged 10–11 knots and ship personnel prepared for conductivity-temperature-depth (CTD) operations the next day at Nihoa and Necker Islands.

July 19 Project heads for the Marine Debris Program and Fish Survey Teams met to coordinate our field efforts at Kure Atoll and Pearl and Hermes Reef to maximize our efficiency and ensure all cruise objectives were met. The remainder of the scientists conducted last minute gear preparations for our upcoming operations. CTD casts at Nihoa and Necker Islands were successfully conducted. *Oscar Elton Sette*'s ETA for French Frigate Shoals was 1400, July 20. Robert Dollar, Dane Johnson, and Marie Medina planned to disembark at FFS. Ship averaged 10–11 knots.

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[1] PIFSC Cruise Report CR-08-001
Issued 14 March 2008

July 20 Arrived at FFS at 1130 to drop off PSD personnel Robert Dollar, Dane Johnson, and USWFS personnel Marie Medina. The personnel, gear, and fuel transfers at FFS were successfully completed and we were en route to Laysan to conduct marine debris land removal operations. We contacted Laysan and they informed us that there was a good amount of derelict fishing gear that had washed ashore over the last year. The CTD cast at Gardner Pinnacle was successfully completed and we continued on to conduct a CTD cast at Maro Reef before reaching Laysan. Received news that the flight to Midway had some technical difficulty and did not leave today. We were scheduled to pick up three Department of Land and Natural Resources (DLNR) personnel that were supposed to be on that flight on July 24, 2007.

July 21 Successfully completed the Maro Reef CTD cast and are en route to Laysan. After lunch we held a meeting with our scientific party to remind everyone about the monument permit restrictions and reviewed the new invasive species protocols. Last minute soaking of any dive gear that was not soaked before leaving Honolulu was decontaminated. Personnel going to Laysan to remove debris above high water mark froze their new clothes in preparation for tomorrow's operation. A briefing was given to all scientific party members on launch and recovery operations and safety. All Coral Reef Ecosystem Division (CRED) Avons were inspected one last time before operations tomorrow morning and were prepped with fuel, tarps, and cargo nets. We have slowed to reach Laysan early morning of July 22. The DLNR flight out of Honolulu did not leave yesterday and will be grounded until possibly July 25, 2007. We are scheduled to be at Midway on July 24, 2007 and continue to be on schedule. The U.S. Coast Guard (USCG) is going to work at Midway until July 27, 2007 and have offered to transport the three DLNR personnel to Kure that we were originally going to pick up at Midway.

We arrived at Laysan this morning and prepared our boats for launch. Jason Saxe, Operations Officer, conducted the safety briefing at 0730 and we launched soon after. We launched three Avons and 18 scientific personnel to conduct the Laysan shoreline derelict fishing gear cleanup effort. The USFWS and PSD camps had some derelict fishing gear staged at their camp sites while other piles of derelict fishing were staged around the island. Debris piles were bug bombed so we would not transport any unwanted guest onto the ship, other atolls, or islands. A cooperative effort among USFWS, PSD, and CRED personnel dragged 2073 kg of derelict fishing gear across the shoreline of Laysan to where small boats could come ashore to load and transport the derelict fishing gear back to the *Oscar Elton Sette*. All scientists were safely aboard the *Oscar Elton Sette* by 1300. Boat and gear used at Laysan Island were then soaked in a mild bleach solution to follow the new monument invasive species protocols. The first day of marine debris operations went well. We contacted Kure

Atoll concerning getting their three personnel from Midway to Kure. We decided that they should take the USCG's offer to transport their personnel.

July 22 In transit.

July 23 The *Oscar Elton Sette* was en route to Kure Atoll and was conducting last minute preparations for our first marine debris surveys of the season. Both the fish and marine debris teams were busy coordinating their operation and filing maps with their float plans to submit to the ship. A scientist held a debriefing on the launch and recovery operation, making adjustments to make it safer and more efficient. The ship conducted a safety briefing at 1300 followed by an abandon ship drill and later a fire drill where scientists were used to aid in testing fire hose stations. The CTD cast at Lisianski was successfully completed and we should reach Kure Atoll by morning.

July 24 The first day at Kure Atoll went well for both the Marine Debris Team and Fish Survey Team. The four Marine Debris Teams surveyed a total of 0.5 square km and removed 640 kg of derelict fishing gear from Kure's backreefs. Five hundred twenty kg of Green Island's land debris were removed. In addition the teams received delivery of all their gear and supplies. One Marine Debris Team found a challenging net and spent most of the day carefully removing it from the coral substrate. The Fish Team was nearby and came to their aid after completing all their survey sites. Despite the extra help, a large portion of the net still remains. The Team returned the next day with a couple of small lift bags to aid in the tedious surgical removal of this net.

The Fish Team (Raymond Boland and Brian Zgliczynski) was aboard to conduct an ancillary study to that of the Marine Debris Project. The objectives of the study were to: (1) estimate densities of recruit reef fishes in backreef habitats, (2) estimate densities of resident piscivore fishes that prey upon recruit sized fishes, and (3) characterize the percentage rates of major types of benthic cover in the transect area surveyed for fishes. A total of 24 sites were selected along the backreef at Kure Atoll, with each site separated from adjacent sites at 0.60-mile intervals. The fish team completed surveys at six of the preselected backreef sites. The surveys targeted six priority sites on the leeward side of the atoll working west to the northwest.

July 25 The Marine Debris Team surveyed 0.55 square km of Kure's shallow reef habitat and removed 849 kg of derelict fishing gear. In addition to the derelict fishing gear removed during water operations, 393 kg of derelict fishing gear were removed from Kure's Green Island. The Kure CTD cast was also conducted and successfully completed.

The Fish Team (Ray Boland and Brian Zgliczynski) completed recruit reef fish density estimates along the windward side of Kure Atoll working in a northerly direction. A total of six surveys were completed along the shallow backreefs of the atoll. The belted wrasse (*Stethojulis balteata*) is the most abundant recruit size (< 5 cm TL) fish species observed during the survey period.

July 26

The Marine Debris Team surveyed 0.83 square km of Kure's shallow reef habitat and removed 313 kg of derelict fishing gear. In addition to the derelict fishing gear removed during water operations, 366 kg of derelict fishing gear were removed from Kure's Green Island.

The Fish Team (Ray Boland and Brian Zgliczynski) completed five recruit reef fish surveys along the northern region of the shallow backreef and one survey along the southeastern portion of the channel opening. Notable observations included two large (100 cm TL) giant trevallies (*Caranx ignobilis*), and knife jaws (*Oplignathus punctatus*) were observed during the survey period. A juvenile Hawaiian monk seal (*Monachus schauinslandi*, ID=K22) was also observed during the northern backreef surveys.

July 27

The Marine Debris Team surveyed 0.77 square km of Kure's shallow reef habitat and removed 532 kg of derelict fishing gear. In addition to the derelict fishing gear removed during water operations, 152 kg of derelict fishing gear were removed from Kure's Green Island. The flight transporting the three DLNR personnel from Honolulu to Midway arrived the afternoon of July 26. The USCG vessel *Kukui* arrived at Kure to deliver the three DLNR personnel.

July 28

The Marine Debris Team consisting of 16 divers conducted marine debris surveys at Kure Atoll for 5 days. During those 5 days, surveys conducted on all marine debris accumulation rate sites, the modified high entanglement risk zone near Green Island, and the remainder of backreef sites not surveyed last year, were completed successfully. A total of 4290.5 kg were removed from Kure's shoreline and shallow reefs less than 30 ft.

A team of PIFSC scientists (Ray Boland and Brian Zgliczynski) conducted recruit reef fish density estimates and classification of habitats at backreefs at Kure Atoll ancillary to the marine debris removal operations. Accordingly, the objectives of their research project were to: (1) estimate the densities of recruit reef fishes along the backreefs at Kure Atoll comparing windward and leeward recruitment patterns, (2) estimate the densities of resident piscivore fishes that prey on recruit-sized fishes

(< 5 cm TL), and (3) characterize the percent area of major types of benthic cover in the transect area surveyed for fishes.

A total of 30 recruit fish density estimates were completed at Kure Atoll during the period of July 24–28, 2007 (Fig. 1). The Global Positioning System locations of the sites were recorded and are shown in Table 1. Sites were selected along the backreef of Kure Atoll with 15 sites chosen on the leeward and 15 sites chosen on the windward side of the atoll. Preliminary analysis of the data identifies the belted wrasse (*Stethojulis balteata*) as the most abundant recruit sized (< 5 cm TL) fish observed during the survey period. The saddle wrasse (*Thalassoma duperrey*) was also commonly observed along the backreef.

Departed Kure Atoll 1700 en route to Pearl and Hermes Reef (PHR).

July 29 — Arrived at PHR. A safety briefing was conducted at 0730 and all four marine debris boat teams were launched by 0740. The marine debris teams removed 1132 kg of derelict fishing gear from PHR's shallow coral reef environment. The marine debris team's surveys covered 0.30 square km.

The Fish Team (Ray Boland and Brian Zgliczynski) continued their reef fish surveys along the shallow backreefs of PHR.

July 30 — A small boat safety briefing was conducted at 0730 and all four marine debris boat teams were launched by 0740. The marine debris teams removed 2500 kg of derelict fishing gear from PHR's shallow coral reef environment. The marine debris team's surveys covered 0.59 square km.

The Fish Team (Ray Boland and Brian Zgliczynski) continued their reef fish surveys along the shallow backreefs of PHR.

July 31 — A small boat safety briefing was conducted at 0730 and all four debris boat teams were launched by 0740. The marine debris teams removed 1482 kg of derelict fishing gear from PHR's shallow coral reef environment and 84 kg from its shoreline. The total derelict fishing gear recovered for the day was 1512 kg. The marine debris team's surveys covered 0.59 square km.

The Fish Team (Ray Boland and Brian Zgliczynski) continued their reef fish surveys along the shallow backreefs of PHR.

Aug 1 — A small boat safety briefing was conducted at 0730 and all four marine debris boat teams were launched by 0740. The marine debris teams

removed 1466 kg of derelict fishing gear from PHR's shallow coral reef environment. The marine debris team's surveys covered 0.44 square km.

The Fish Team (Ray Boland and Brian Zgliczynski) continued their reef fish surveys along the shallow backreefs of PHR.

Aug 2 The Marine Debris Team today surveyed 0.63 square km of PHR shallow backreef habitat around the southwest corner and removed 1064 kg of derelict fishing gear. We have been moving around PHR to coordinate with the Fish Team's survey site to increase efficiency and decrease fuel consumption. Our current status of small boat fuel is close so we are trying to get ahead by having the ship move around with us. Tomorrow, we plan to work on the north side of PHR to do some preliminary marine debris surveys while the Fish Team conducts their survey in the area.

The Fish Team (Ray Boland and Brian Zgliczynski) completed six more surveys at sites along the southwest backreefs at PHR. They have been pushing hard to complete their goal of 5-6 sites a day to get all the necessary data to make their study sound. Both the marine debris and fish surveys are going well. Early next week we will begin planning to add the oceanography instrument deployments and night CTD operations to our daily logistics. All is well.

Aug 3 A small boat safety briefing was conducted at 0730 and all four marine debris boat teams were launched at 0740. The marine debris teams removed 1830 kg of derelict fishing gear from PHR's shallow coral reef environment. The marine debris team's surveys covered 0.57 square km.

The Fish Team (Ray Boland and Brian Zgliczynski) continued their reef fish surveys along the shallow backreefs of PHR.

Aug 4 A small boat safety briefing was conducted at 0730 and all four marine debris boat teams were launched by 0740. The marine debris teams removed 1814 kg of derelict fishing gear from PHR's shallow coral reef environment. The marine debris team's surveys covered 0.25 square km.

The Fish Team (Ray Boland and Brian Zgliczynski) continued their reef fish surveys along the shallow backreefs of PHR.

Aug 5 A small boat safety briefing was conducted at 0730 and all four marine debris boat teams were launched. The marine debris teams removed 1334 kg of derelict fishing gear from PHR's shallow coral reef environment. The marine debris team's surveys covered 0.35 square km.

The Fish Team (Ray Boland and Brian Zgliczynski) continued their reef fish surveys along the shallow backreefs of PHR.

Aug 6 Yesterday, Avon Team 1 remained on the ship to put together a new hull. The repairs and maintenance were successful and we became fully operational. The Marine Debris Team today surveyed 0.69 square km of PHR's shallow backreefs habitat on the north side. Two accumulation rate tow survey sites were also completed and 1293 kg of derelict fishing gear were removed from the surveyed areas of the day. Current total of derelict fishing gear removed on this cruise was 20308.5 kg .

CTD casts to capture oceanographic conditions before high tide, peak tide and after the tide recedes began yesterday at 1900. The first cast was aborted and the next cast did not begin until 2100. There were six casts scheduled but only five casts were completed ending around 0400. Marine Debris and Fish Team members all took shifts aiding in the CTD casts and filtering the samples.

Aug 7 A small boat safety briefing was conducted at 0730 and all four marine debris boat teams were launched by 0740. The marine debris teams removed 1384 kg of derelict fishing gear from PHR's shallow coral reef environment. The marine debris team's surveys covered 0.82 square km.

The Fish Team (Ray Boland and Brian Zgliczynski) continued their reef fish surveys along the shallow backreefs of PHR.

Aug 8 A small boat safety briefing was conducted at 0730 and all four marine debris boat teams were launched by 0740. The marine debris teams removed 404 kg of derelict fishing gear from PHR's shallow coral reef environment. The marine debris team's surveys covered 0.25 square km.

The Fish Team (Ray Boland and Brian Zgliczynski) continued their reef fish surveys along the shallow backreefs of PHR.

Aug 9 Last day of marine debris operations at PHR. A small boat safety briefing was conducted at 0730 and all four marine debris boat teams were launched by 0740. The marine debris teams removed 1700 kg of derelict fishing gear from PHR's shallow coral reef environment. The marine debris team's surveys covered 0.38 square km.

The Fish Team (Ray Boland and Brian Zgliczynski) continued their reef fish surveys along the shallow backreefs of PHR. The total weight of derelict fishing gear removed on *Oscar Elton Sette* cruise OES-07-06 was 23,751.95 kg, and a total of 9.01 square km were surveyed. Departed PHR at 1700 en route to Pearl Harbor, Oahu.

Aug 10 In transit.

Aug 11 In transit.

Aug 12 In transit. Scientists rinsed gear and stored them in preparation for off-load. Computer, Wet and Hydro labs were cleaned and organized for the next cruise.

Aug 13 In transit. Scientists cleaned their staterooms and made last minute preparation for off-load in Honolulu.

Aug 14 Arrived Pearl Harbor, Oahu 1400. Disembarked scientific personnel, Kyle Koyanagi, Stephane Charette, Edmund Coccagna, Susan Cooper Alletto, Kevin Lino, Noah Pomeroy, Max Sudnovsky, Kevin O'Brien, Derek Levault, Heather Sandison, Amy Long, Samuel Kahng, Jonathan Blodgett, Jubilee Watkins, Brian Zgliczynski, Raymond Boland, Frank Mancini, and Bonnie DeJoseph.

MISSIONS AND RESULTS:

A. Conduct a maintenance level marine debris operation to remove derelict fishing gear in shallow water coral reef environments. Resurvey accumulation rate study sites.

During the OES-07-06, cruise all marine debris objectives were met. All accumulation rate sites at Kure were resurveyed and cleared of derelict fishing gear in waters less than 10 m. A total of 23,751.95 kg of derelict fishing gear were removed from Kure and PHR's shallow coral reef environment and shorelines. See Figure 1 for a map including waypoints and tracks for Kure. See Figure 2–4 for maps including waypoints and tracks for PHR.

Location	Land/Water Debris	Weight (kg)
Kure Atoll	Water debris	2,859.50
Kure Atoll	Land debris	1,431.00
Laysan Island	Land debris	2,073.00
Pearl and Hermes Reef	Water debris	15,858.45
Pearl and Hermes Reef	Land debris	1,530.00
Total	Water and land debris	23,751.95

B. Remove previously collected debris onshore at various locations throughout the Northwestern Hawaiian Islands National Monument (NWHINM) in collaboration with the PIFSC, Protected Species Division, and U.S. Fish and Wildlife Service.

Location	Weight of Debris Removed From Shoreline (kg)
Laysan Island	2,073
Kure Atoll	1,431
Pearl and Hermes Reef	1,530

C. Conduct pearl oyster and crown-of-thorn starfish surveys.

While conducting marine debris surveys, we continue to obtain current and accurate documentation of population, spatial distribution and aspects of demography of the pearl oyster (*Pinctada margaritifera*) and crown-of-thorns seastar (*Acanthaster planci*). Specimens of corallivore, *Acanthaster planci*, were collected to aid in the study of better understanding their gene flow and connectivity across the Hawaiian Archipelago. During the duration of the marine debris cruise OES-07-06, a total of 46 specimens of *Acanthaster planci* were collected.

Location	Total # of Specimens Collected	Forereefs	Backreefs	Mazes
Kure Atoll	2	0	2	NA
Pearl and Hermes Reef	44	13	14	17

D. Conduct fish surveys to compare fish recruitment densities between the windward and leeward backreef areas at Kure Atoll and PHR.

The Fish Team, lead by Ray Boland and Brian Zgliczynski, has completed 57 recruit reef density estimate surveys at PHR during 11 days of operation (Fig. 1). Surveys targeted shallow backreef habitats in order to estimate: (1) densities of recruit reef fishes along the windward and leeward sides of the reef, (2) estimate densities of resident piscivore fishes that prey upon recruit-size fishes, (3) characterize the percent area of major types of benthic cover in the transect area surveyed for fishes.

A total of 8872 individual fishes representing 53 species and 15 families were identified and enumerated during the backreef surveys at PHR. The surveys targeted recruit sized (< 5 cm TL) fishes as well as the piscivores (> 5cm TL) that prey upon the recruit sized fishes. A total of 2028 piscivores and 6844 recruit sized fishes were observed. The belted wrasse (*Stethojulis balteata*) and the saddle wrasse (*Thalassoma duperrey*) were the most abundant fish species observed accounting for over 77% of all enumerations.

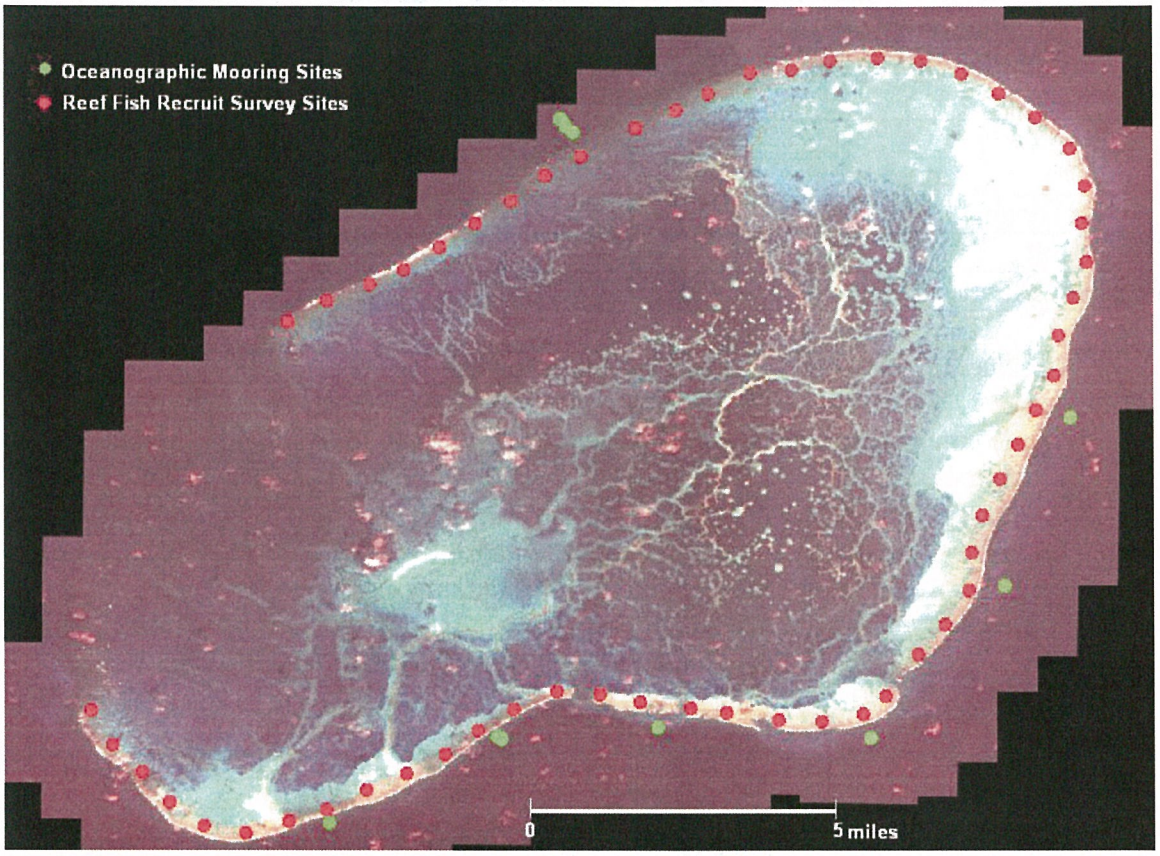

Figure A.--Pearl and Hermes Reef.

E. Replace oceanographic equipment (Subsurface Temperature Recorders (STRs) and Ocean Data Platform (ODP)) at Kure Atoll and PHR.

A combination of fish team personnel, marine debris divers, and *Oscar Elton Sette* divers was responsible for collaborating with the CRED Oceanography Team to deploy and replace oceanographic instruments at PHR. The Fish Team and *Oscar Elton Sette* diver changed out the ODP at the permanent monitoring site on the south side of PHR as well as the six STRs set up in a vertical transect on the northwestern and southern sides of the atoll. Additionally, with the aid of a few marine debris divers, the Fish Team also deployed five STRs on the southern and eastern sides of the atoll at 75 fsw to monitor internal tide events taking place. The specific sites of the mooring sites are shown in Figure 1 and listed in Table 1. With the cooperation and teamwork of the Fish Team, marine debris, and the *Oscar Elton Sette* divers, all oceanographic equipment were successfully and safely removed and installed.

Table1.--Oceanographic instrumentation deployed and recovered during OES-07-06 at PHR.

Instrument	Depth (m)	Depth (ft)	Latitude	Longitude	Notes
STR	38.00	125.00	27-46.901	175-52.8528	Recover and Redeploy
STR	23.00	75.00	27-46.9221	175-52.8672	Recover and Redeploy
STR	12.50	41.00	27-46.9506	175-52.9294	Recover and Redeploy
ODP	21.30	70.00	27-46.9226	175-52.867	Recover and Redeploy
STR	13.70	45.00	27-56.445	175-51.6987	Recover and Redeploy
STR	35.00	115.00	27-56.6608	175-51.8953	Recover and Redeploy
STR	30.00	98.40	27-56.5431	175-51.8065	Recover and Redeploy
STR	23.00	75.44	27-47.1534	175-50.3697	New Deployment
STR	23.00	75.44	27-47.0132	175-47.046	New Deployment
STR	23.00	75.44	27-49.3157	175-45.1239	New Deployment
STR	23.00	75.44	27-51.8986	175-44.0828	New Deployment
STR	23.00	75.44	27-45.5516	175-55.5553	New Deployment

F. Conduct CTD casts opportunistically at permanent CTD cast locations listed in cruise instructions and night CTDs cast at various locations around PHR.

A total of 27 shipboard CTD casts were conducted during OES-07-06. All 10 NWHI permanent CTD stations, from Nihoa to Kure Atoll, were performed while the rest of the CTDs were conducted during night operations at the southern portion of PHR. Concurrent with each CTD cast, water sample profiles (at 1-m, 80-m, 100-m, 125-m, and 150-m depths) were performed for a total of 90 samples measuring chlorophyll and nutrients levels.

Preliminary Results

The south shore of PHR was observed to have significant temperature fluctuations at shallow depths. During a previous Reef Assessment and Monitoring Program (RAMP) research cruise, fish surveys showed large numbers of planktivorous fish in this area suggesting that these cold water pulses may be injecting nutrient rich waters to this region. A 2-year temperature time series from a single STR at 23 m (Fig. B upper graph) shows the expected annual fluctuation of approximately 10°C with seasonal variation; however, during the months of June through November, higher frequency fluctuation (Fig. B, lower graph) shows excursions of up to 7 °C over time scales of 6 to 12 hours.

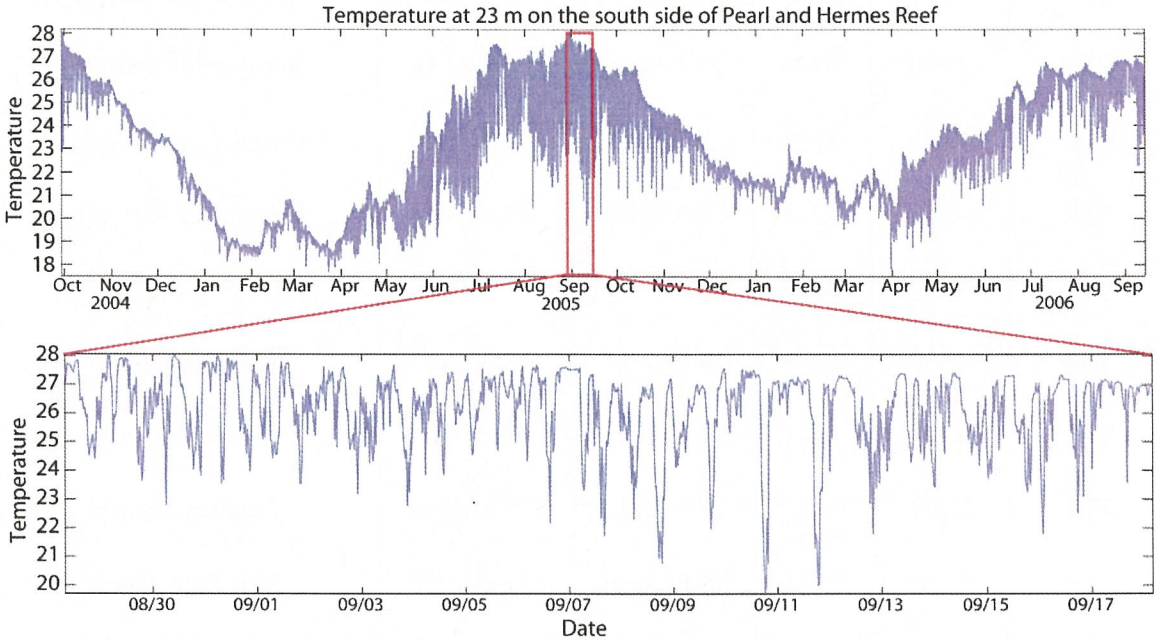

Figure B.--Two-year timeseries from permanent STR deployment in 23 m of water, on south side of PHR (Fig. 1). A 3-week expansion shows substantial temperature fluctuations (3-8 °C) occurring on diurnal and semidiurnal periods.

SCIENTIFIC PERSONNEL:

Kyle Koyanagi, CRED Marine Debris Operations Manager, Joint Institute for Marine and Atmospheric Research (JIMAR), University of Hawaii (UH)
Stephane Charette, CRED Marine Ecosystem Specialist, JIMAR, UH
Edmund Coccagna, CRED Marine Ecosystem Specialist, JIMAR, UH
Susan Cooper Alletto, CRED Marine Ecosystem Specialist, JIMAR, UH
Kevin Lino, CRED Marine Ecosystem Specialist, JIMAR, UH
Noah Pomeroy, CRED Marine Ecosystem Specialist, JIMAR, UH
Frank Mancini, CRED Marine Ecosystem Specialist, JIMAR, UH
Bonnie DeJoseph, CRED Marine Ecosystem Specialist, JIMAR, UH
Max Sudnovsky, Coral Reef Marine Debris Specialist, Aquatic Farms (AF)
Kevin O'Brien, Coral Reef Marine Debris Specialist, AF

Derek Levault, Coral Reef Marine Debris Specialist, AF
Heather Sandison, Coral Reef Marine Debris Specialist, AF
Amy Long, Coral Reef Marine Debris Specialist, AF
Samuel Kahng, Coral Reef Marine Debris Specialist, AF
Jonathan Blodgett, Coral Reef Marine Debris Specialist, AF
Jubilee Watkins, Coral Reef Marine Debris Specialist, AF
Brian Zgliczynski, CRED Fishery Biologist, Pacific Islands Fisheries Science Center (PIFSC), National Marine Fisheries Service (NMFS), CRED
Raymond Boland, PIFSC Unit Dive Supervisor, PIFSC, NMFS, Ecosystem and Oceanography Division
Christina McGuire, Cooperative Scientist, Department of Land and Natural Resources (DLNR)
Ryan Smith, Cooperative Scientist, DLNR
Micah Ryder, Cooperative Scientist, DLNR

Submitted by: _____
Kyle Koyanagi
Chief Scientist

Approved by: _____
Samuel G. Pooley
Science Director
Pacific Islands Fisheries Science Center

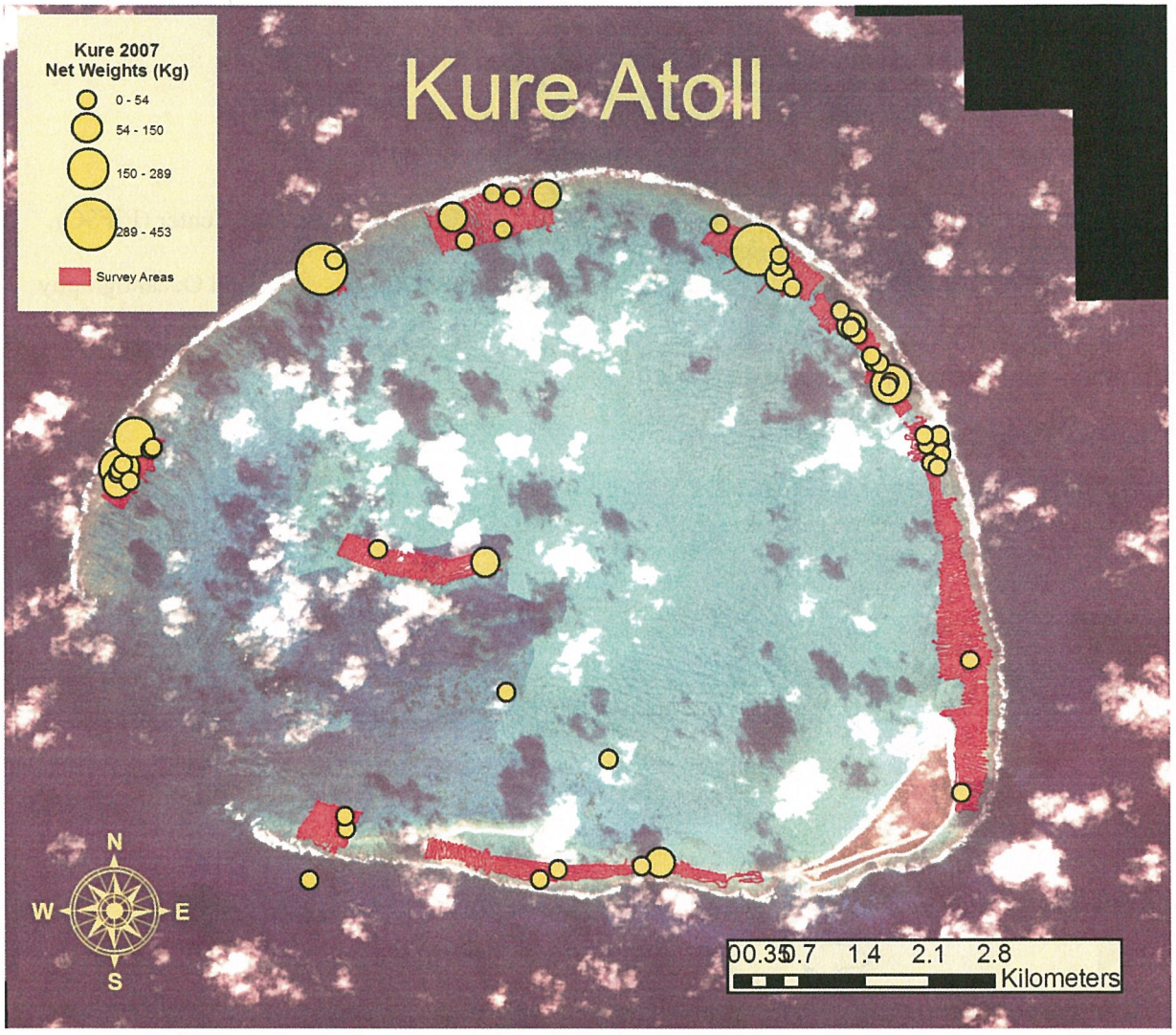

Figure 1.--Kure Atoll marine debris survey sites.

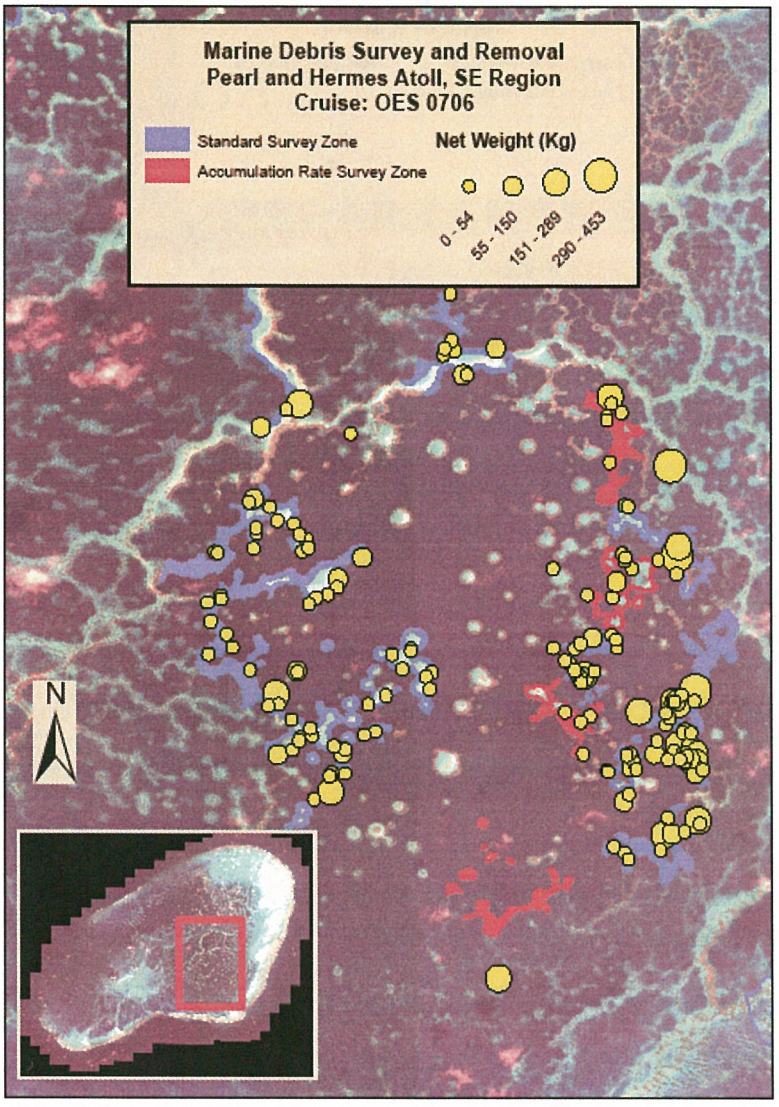

Figure 2.--Pearl and Hermes Reef marine debris survey sites (southeast region).

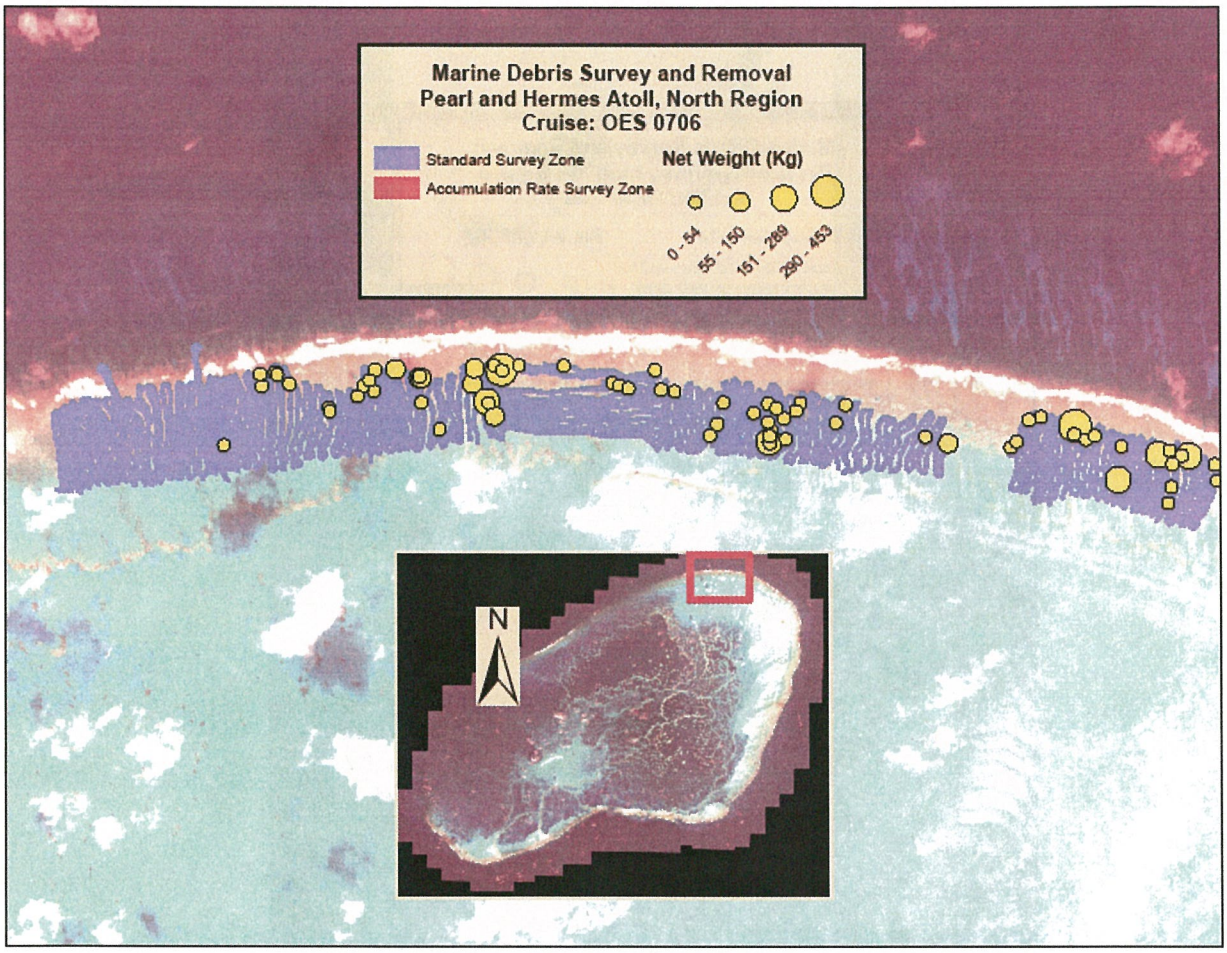

Figure 3.--Pearl and Hermes Reef marine debris survey sites (north region).

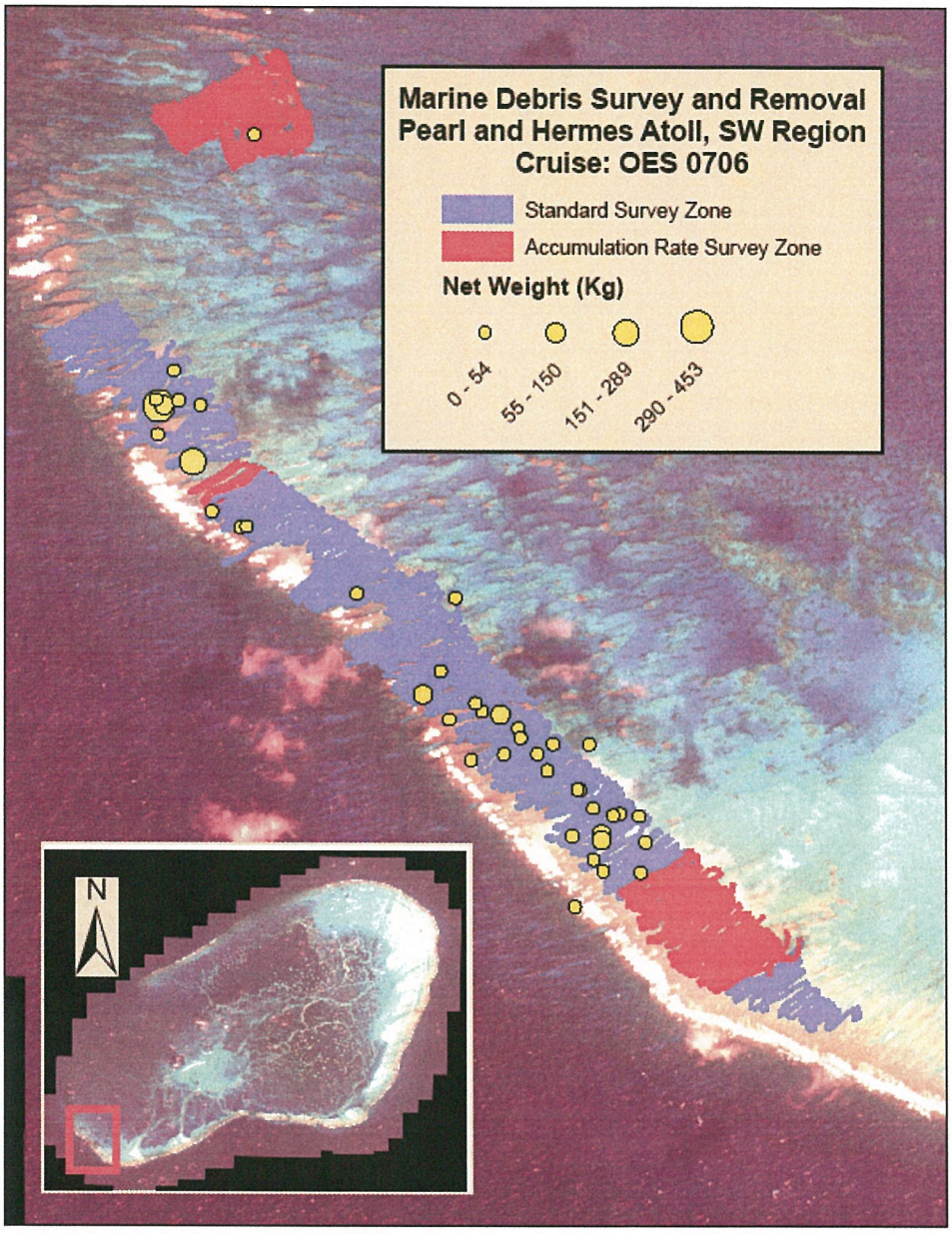

Figure 4.--Pearl and Hermes Reef marine debris survey site (southwest region).