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NATIONAL MARINE FISHERIES SERVICE
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CRUISE REPORT[1]

VESSEL: *Oscar Elton Sette*, Cruise OES-06-09 (OES-45)

CRUISE PERIOD: August 10–September 6, 2006

AREA OF OPERATION: Northwestern Hawaiian Islands (NWHI)

TYPE OF OPERATION: Marine Debris Removal Operations

ITININERARY:

Aug 10 Embarked scientists: Kyle Koyanagi, Amy Hall, Kevin Lino, Susan Cooper-Alletto, Noah Pomeroy, Oliver Dameron, Elizabeth Keenan, Sanja Du Plessis, Tadamichi Morisaka, Amarisa Marie, Denby Fern, Melanie Hutchinson, Marie Ferguson, Joshua M. Uebelherr, and Christopher Kontoes. Departed Snug Harbor, Honolulu, at 0800 to refuel at Pearl Harbor. Refueled and departed Pearl Harbor, Honolulu, at 1500 en route to Nawiliwili Harbor, Kauai.

Aug 11 Arrived outside Nawiliwili Harbor, Kauai, at 1400 awaiting the arrival of Seema Balwani. Embarked Seema Balwani by means of small boat operation from Nawiliwili at 1515. Departed Kauai en route to Kure.

Aug 12 Transit day. During the OES-06-08 cruise, all conductivity-temperature-depth casts (CTD) casts were unsuccessful because of hardware problems. Before departing Honolulu, the *Oscar Elton Sette*'s Electronics Technician prepared a new wire/cable termination hoping this would eliminate any further technical problems. A CTD test cast was conducted at CTD station "Nihoa." The cast was not successful. A new wire/cable termination was

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prepared and all CTD cable connections were streamlined in an effort to prevent water turbulence effects on the electrical wiring. A second test cast was conducted at CTD station "Necker." That cast was not successful either, and the remainder of the CTD casts were cancelled until more extensive troubleshooting could be done.

Aug 13 Transit day.

Aug 14 Transit day. At 0900, the scientific party conducted a planning and safety meeting to discuss operations at Kure. Operational and safety gear was prepped for the next day's operations. Elizabeth Keenan gave a pearl oyster and crown-of-thorns presentation to discuss the project's background and protocols.

Aug 16 After reterminating the cable, CTD casts were successfully conducted at station "Midway" and "Kure." Arrived Kure Atoll at 0700. Safety briefings were given on the winch deck every morning at 0745 to address current weather conditions and any safety concerns. Thunder and lightning storms were on the horizon, but conditions were not bad enough to cancel operations. Three Avon teams were launched and they conducted marine debris tow surveys and removals in Kure Atoll's shallow coral reef environment in northern accumulation rate study sites. A total of 370 kg of derelict fishing gear were removed and two accumulation rate and one high density areas were surveyed. The *Sette*'s safeboat was launched and it successfully transported Hawaii State Division of Fish and Wildlife (DOFAW) personnel and equipment to Kure's Green Island, disembarking Amarisa Marie and Tadamichi Morisaka.

Aug 17 Three Avon teams were launched at 0800 to continue conducting marine debris tow surveys and removals in Kure's shallow coral reef environment in the northern accumulation rate study and high density sites. A total of 554 kg of derelict fishing gear were removed.

Aug 18 Three Avon teams conducted marine debris tow surveys and removals in Kure's shallow coral reef environments high density marine debris area recorded in 2001. A total of 720 kg of derelict fishing gear were removed.

Aug 19 With the limited operational days at Kure, we decided to modify the survey of the High Entanglement Risk Zone (HERZ) near Green Island. The portion of the zone that does not contain fouling substrate was not surveyed because in the past, little if any debris was located in that area. Three Avon teams conducted tow surveys in the modified HERZ and removed 526 kg of derelict fishing gear from shallow coral reef environment around Kure's Green Island. Despite the fact that this area did not yield high weights, much of the derelict fishing gear in the area

had large loops that extended to the surface thus, posing more of an entanglement risk to curious Hawaiian monk seals.

Aug 20 The winds and surf dropped so operations were shifted to the west side of Kure Atoll just north of the pass. The weather and seas presented an excellent opportunity to survey an area that is usually unreachable. Three Avons were launched to conduct tow surveys in this area and 1542 kg of derelict fishing gear were removed. Avon #2 helm broke down and lost steering on its return to the *Sette*. Repairs were needed before the Avon could be ready for any further marine debris operations. Upon arriving back on the *Sette*, a preliminary inspection of Avon #2 revealed that the helm gears sheared off as a result of steering cable failure.

Aug 21 Weather conditions had deterioriated somewhat overnight but it was decided to proceed with operations while closely monitoring the weather conditions. Two Avon Teams led by Amy Hall were launched to conduct land debris pickups from Kure's Green Island. Kyle Koyanagi, Oliver Dameron, and Suzy Cooper Alletto remained onboard to repair Avon #2. The starboard engine had to be removed to replace broken steering cable and helm. The *Sette*'s safeboat was also launched with Elizabeth Keenan and Sanja Du Plessis to conduct pearl oyster mock surveys to test survey procedures.

After completing five land debris transfers to the ship, small boat operations were suspended at 1400. All small boats were recalled back to the *Sette*. Before that time, 2450 kg of land debris had been transferred to the ship and the team that remained aboard the *Sette* completed the required repairs to Avon #2. The pearl oyster mock survey was successful because it identified problems in the survey techniques that needed to be modified and refined before the actual surveys at Pearl and Hermes.

Aug 22 Weather condition improved from the previous day and three Avon teams conducted marine debris tow surveys and removals in Kure's shallow coral reef environment's high density marine debris area. The pass conditions had improved drastically from the previous day and Avon #3 had not found very much marine debris. The decision was then made to allow Avon team #3 to pick up the remainder of Kure's land debris before returning to the *Sette*. A total of 684 kg of debris were removed from Kure Atoll's shallow coral reef environment and 482 kg of land debris were removed from Green Island.

Aug 23 Winds were blowing steady at high twenties with gusts up to 37 knots. Launch was postponed until 1000, but weather conditions had not improved. Because small boat operations could not be conducted, the decision was made to proceed to Midway to transfer the *Sette*'s Operations Officer, Kurt Dreflak, ashore by small boat in the protected waters near

Midway. The vessel then continued to Pearl and Hermes where we thought weather conditions might be better.

Aug 24 Arrived at Pearl and Hermes near Southeast Island and launched three Avon teams and the *Sette's* safeboat at Big Boat Pass to conduct marine debris and pearl oyster surveys at Pearl and Hermes. Large swells were present at Big Boat Pass, but they were predictable enough to allow the boats to safely transit into the atoll. Two tow teams and one swim team removed 453 kg of derelict fishing gear from Pearl and Hermes shallow coral reef environment. The first day of pearl oyster surveys yielded no pearl oysters along the transect. Accordingly, those survey methods were modified to cover more area and to focus on areas that are expected to contain higher densities of pearl oysters.

Aug 25 After making one boat transit through the Big Boat Pass on the south side of Pearl and Hermes, we decided it would be safer to relocate operations to the northwest corner of the atoll, where boats would enter through the west pass. Although this would increase the transit to the work sites, it made launch and recovery and small boat operations outside the atoll much safer. Three Avon teams surveyed two tow survey and three swim accumulation rate survey sites. A total of 333 kg of debris were removed from Pearl and Hermes shallow coral reef environment. In addition, the *Sette*'s safeboat was launched to support the pearl oyster project. The pearl pyster project headed by Elizabeth Keenan found 10 pearl oysters after targeting three high density pearl oyster sites.

Aug 26 To reduce the transit distance to the work sites, three Avon teams and the *Sette* safeboat were launched on the north side of Pearl and Hermes and entered the Atoll through Engine Block Pass. Two tow sites and one swim accumulation rate site were completed and 620 kg of derelict fishing gear were removed. The Pearl Oyster Survey Team completed four sites in the northern maze and found 10 pearl oysters. CTD cast #5 was successful at station "Pearl and Hermes."

Aug 27 Three Avon teams and the *Sette*'s safeboat were launched near Engine Block and all Marine Debris Teams conducted swim surveys in the maze. The wind had dropped so land debris was collected while the weather permitted carrying large loads in the small boats. A total of 368 kg of debris were collected in the swim accumulation rate sites and 1064 kg were removed from Southeast Island. The Pearl Oyster Survey Team completed three survey sites and found nine pearl oysters, but that team returned to the ship after lunch when one of the surveyors felt ill.

Aug 28 The Marine Debris Team completed all remaining accumulation rate tow and swim sites and removed the remainder of the land debris from Southeast Island. The weight of the debris collected today totaled 770 kg.

The Pearl Oyster Team completed 5 sites finding 13 pearl oysters. Because most of the work was being completed at Pearl and Hermes and because Kure Atoll had been identified as the highest priority, we decided to return to Kure in the hopes that the weather would improve enough to continue work there. The *Sette* departed Pearl and Hermes at 1800 en route to Kure.

Aug 29 Arrived Kure Atoll at 0700. Weather conditions had improved enough to allow three Avon teams and the *Sette*'s safeboat to be launched at 0800. Marine Debris Team completed another high density area and removed 576 kg from Kure's shallow coral reef environment. The Pearl Oyster Team also launched to explore the rumors of pearl oysters in the inner lagoon of Kure. No pearl oysters were found.

Aug 30 Three Avon teams launched and completed the Marine Debris Maintenance Surveys at Kure removing 926 kg on the last day of operation. Although not all of Kure's shallow coral reefs could be surveyed, we are confident that all areas that were likely to contain debris were thoroughly surveyed and all identified debris were removed. Departed Kure en route to Pearl and Hermes Atoll.

Aug 31 Arrived at Pearl and Hermes Atoll at 0700. Conducted marine debris water operations in the maze where 707 kg of derelict fishing gear were recovered. The Pearl Oyster Survey Tteam completed three more survey sites. Departed Pearl and Hermes en route for Laysan to pick up the U.S. Fish and Wildlife Service (USFWS) volunteer, Mark MacDonald, who needed to be returned to Honolulu for medical attention.

Sept 1 Arrived Laysan at 1600. Embarked USFWS volunteer Mark MacDonald. Departed Laysan en route to French Frigate Shoals. Conducted a CTD cast at station "Laysan."

Sept 2 Transit day. Conducted CTD casts at stations "Maro" and "Gardner."

Sept 3 Arrived at French Frigate Shoals at 0700. Two Avons and the *Sette*'s safeboat were launched to transfer 200 gallons of fuel to Tern Island for use by the upcoming Census of Marine Life cruise. Land debris was also picked up at Tern Island and six pallet tubs of trash were loaded onboard the *Sette* for return to Honolulu. Disembarked Oliver Dameron to stay overnight at Tern Island before joining the NOAA Ship *Hi'ialakai*. Conducted a CTD cast at station "French Frigate Shoals."

Sept 4 Transit day. Conducted CTD casts at stations "Necker" and "Nihoa."

Sept 5 Arrived Snug Harbor, Honolulu, at 1900. Disembarked Kyle Koyanagi, Amy Hall, Kevin Lino, Susan Cooper-Alletto, Noah Pomeroy,

Elizabeth Keenan, Sanja Du Plessis, Denby Fern, Melanie Hutchinson, Marie Ferguson, Joshua M. Uebelherr, Christopher Kontoes, and Mark MacDonald.

MISSIONS AND RESULTS

A. Conduct marine debris tow and swim surveys and removal operations at Kure Atoll and Pearl and Hermes.

During the OES-06-09 cruise all marine debris objectives were met or exceeded. All tow and swim accumulation rate (AR) and high density debris sites were surveyed and cleared of derelict fishing gear in waters less than 10 m.

Kure Atoll

Area Covered	Standard Tow Sites	2.35 km
	HERZ sites	0.71 km
	Accumulation Sites	0.28 km
	Total	3.34 km
Waypoints	Standard Tow	161
	HERZ	14
	Accumulation rate	12
	Non Survey	8
	Total	195
Weights	Standard Tow	5,060 kg
	HERZ	277 kg
	Accumulation Sites	185 kg
	Non Survey	688 kg
	Total	6,210 kg

Pearl and Hermes Atoll

Area Covered	Standard Tow Sites	1.00 km
	Swim Accumulation Site	0.79 km
	Standard Swim	0.19 km
	Total	1.98 km
Waypoints	Tow Accumulation Rate	15
	Swim Accumulation Rate	24
	Swim Standard	22
	Non Survey	8
	Total	69

Weights	Tow Accumulation Rate	195 kg
	Swim Accumulation Rate	1,032 kg
	Swim Standard	486 kg
	Non Survey	818 kg
		2,531 kg

B. Conduct land debris removals from Kure Atoll, Pearl and Hermes, and French Frigate Shoals.

Land debris removal efforts at Kure Atoll, Pearl and Hermes Atoll, and French Frigate Shoals were conducted successfully.

Land debris weights of derelict fishing gear removed from each atoll:

Kure Atoll	2,932 kg
Pearl and Hermes Atoll	1,697 kg
French Frigate Shoals	1,028 kg
Total	5,657 kg

The total weight of debris removed from Kure, Pearl and Hermes, and French Frigate Shoals including both tow and swim surveys and land debris removal was 14,360 kg.

C. Conduct Pearl Oyster Depth Survey

Surveys to record the depth distribution of Black-lipped pearl oysters, *Pintada margaritifera*, were conducted during 6 field days at Pearl and Hermes Reef. A total of 20 surveys were conducted within the inner patch and reticulated reef at Pearl and Hermes Atoll. Sites were chosen using ArcView and were conducted in previously designated high density pearl oyster habitat. Chosen sites were sampled at a depth of 1, 4, and 7 m. Surveys were carried out by free diving. The initial 1–m transects were measured by timing the swim for 5 minutes, and marked with floats. The survey lengths averaged about 100 m to 120 m. Each transect followed the appropriate depth isobath, while searching for pearl oysters within a 3–m swath. Divers carried a 3–m long measuring tool to ensure they were surveying the appropriate area. A Global Positioning System (GPS) unit was attached to a float and followed the divers so that the survey path could be replicated with ArcView for future analysis. When oysters were sighted, their position was marked with a GPS point, they were measured, and the habitat type was noted. Initial results shows that the majority of the oysters were found on the 1–m transect. Out of the 48 oysters measured, 34 were found at 1 m, 10 were found at 4 m, and 4 were found at 7 m.

D. Support the State of Hawaii Department of Forestry and Wildlife (DOFAW) camp at Kure Atoll, providing transport of supplies and personnel, if space is available.

DOFAW cooperative scientists, Amarisa Marie and Tadamichi Morisaka, were successfully transported to Kure Atoll with supplies and equipment on 8/16/06. In addition to personnel and gear dropoff, the *Oscar Elton Sette* also transported DOFAW gear back to Honolulu.

E. Conduct conductivity-temperature-depth (CTD) casts opportunistically.

Nine CTD casts were successfully conducted and water samples were taken, filtered, and stored for subsequent biochemical analysis.

Date	Cast #	Station Name	Notes
8/12/06	OES060901	Nihoa	Failed
8/12/06	OES060902	Necker	Failed
8/16/06	OES060603	Midway	Successful
8/16/06	OES060904	Kure	Successful
8/27/06	OES060905	Pearl and Hermes	Successful
9/01/06	OES060906	Laysan	Successful
9/02/06	OES060907	Maro	Successful
9/02/06	OES060908	Gardner	Successful
9/03/06	OES060909	French Frigate Shoals	Successful
9/04/06	OES060910	Necker	Successful
9/04/06	OES060911	Nihoa	Successful

F. Assist in medevac of USFWS volunteer, Mark MacDonald, from Laysan Island.

On 9/01/06 Mark MacDonald was picked up from Laysan Island and put in the care of the *Oscar Elton Sette*'s medical officer, Jane Powers. He remained in her care for the duration of the cruise (9/05/06) and was released to USFWS personnel at Snug Harbor, Honolulu.

SCIENTIFIC PERSONNEL:

Kyle Koyanagi, Marine Debris Operations Manager, Joint Institute for Marine and Atmospheric Research (JIMAR), University of Hawaii (UH)
Amy Hall, Marine Ecosystem Specialist, JIMAR, UH
Oliver Dameron, Marine Ecosystem Specialist, JIMAR
Noah Pomeroy, Marine Ecosystem Specialist, JIMAR, UH
Susan Cooper-Alletto, Marine Ecosystem Specialist, JIMAR, UH
Kevin Lino, Marine Ecosystem Specialist, JIMAR, UH

Elizabeth Keenan, Marine Ecosystem Specialist, JIMAR, UH
Sanja Du Plessis, Volunteer, JIMAR, UH
Tadamichi Morisaka, Cooperative Scientist, Department of Forestry and Wildlife (DOFAW)
Amarisa Marie, Volunteer, DOFAW
Seema Balwani, Principal Investigator, Pacific Islands Fisheries Science Center, National Marine Fisheries Service, Coral Reef Ecosystem Division
Melanie Hutchinson, Marine Debris Field Technician, Aquatic Farms
Marie Ferguson, Marine Debris Field Technician, Aquatic Farms
Denby Fern, Marine Debris Field Technician, Aquatic Farms
Chris Kontoes, Marine Debris Field Technician, Aquatic Farms
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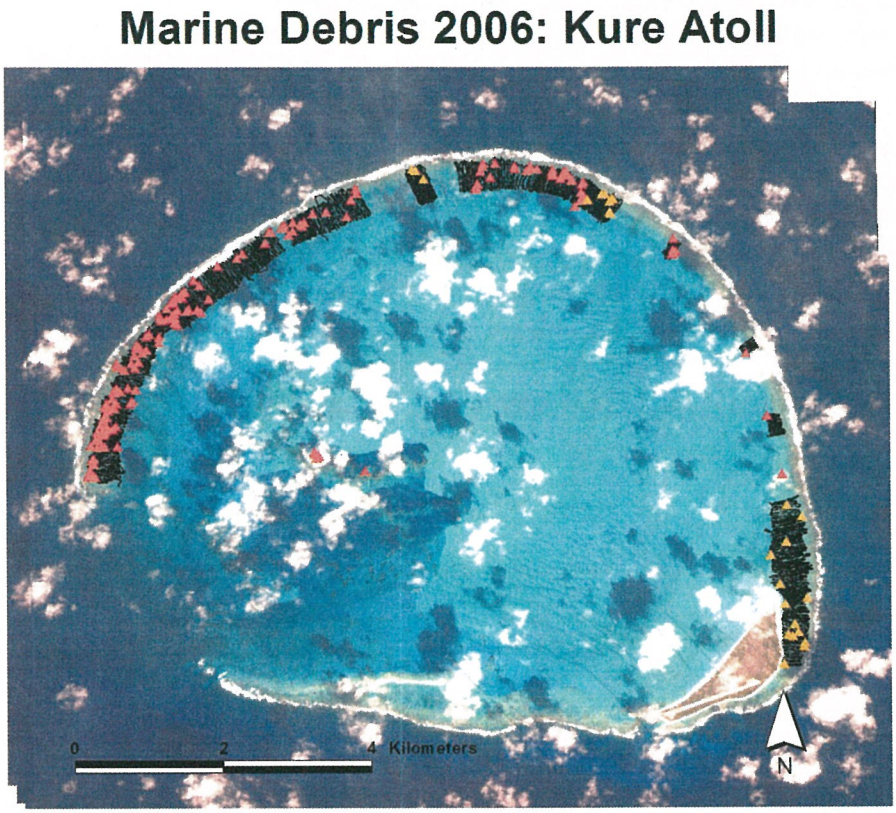

Figure 1.--Marine debris survey sites at Kure Atoll.

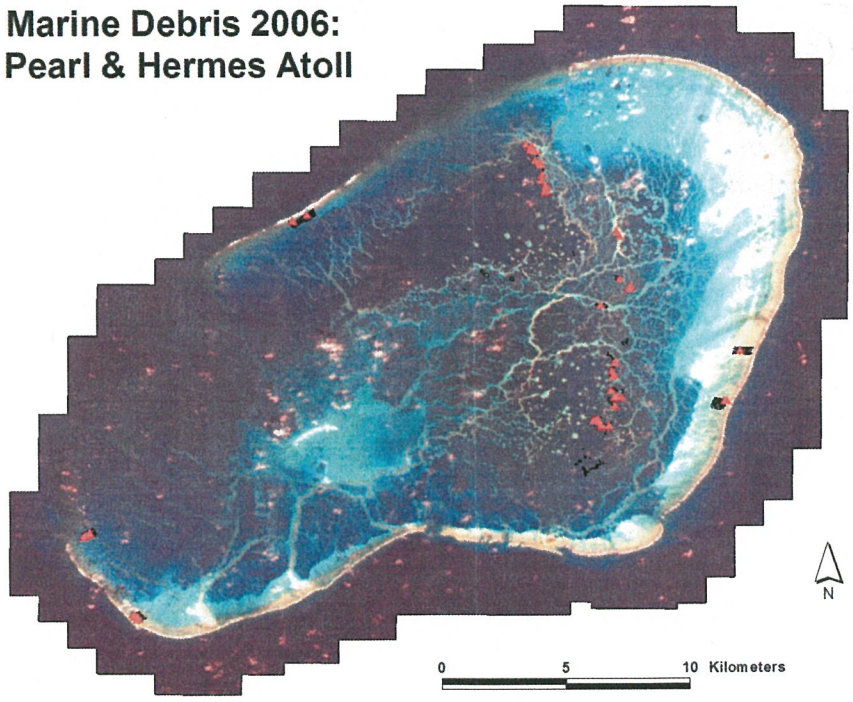

Figure 2.--Marine debris survey sites at Pearl and Hermes Atoll.