

## CRUISE REPORT<sup>1</sup>

- VESSEL:** *Hi`ialakai*, Cruise HI-06-11 (Fig. 1)
- CRUISE PERIOD:** 1 September–4 October 2006
- AREA OF OPERATION:** Northwestern Hawaiian Islands (NWHI)
- TYPE OF OPERATION:** Personnel from the Coral Reef Ecosystem Division (CRED), Pacific Islands Fisheries Science Center, National Marine Fisheries Service (NMFS), NOAA, and their partner agencies conducted reef assessment/monitoring studies in waters surrounding the Northwestern Hawaiian Islands. All activities described in this report were covered by the following permits: DLNR.NWHI06R017, DLNR.NWHI06R019, NWHIMNM-2006-011, NWHIMNM-2006-012, USFWS 12521-06043, USFWS 12521-06044, USFWS 12521-06045, USFWS 12521-06046, USFWS 12521-06047, USFWS 12521-06048.
- ITINERARY:**
- 1 September Start of cruise. Embarked Bernardo Vargas Angel (corals), Jean Kenyon (corals), Peter Vroom (algae), Bonnie De Joseph (algae), Jason Leonard (permanent stake pounder), Jill Zamzow (fish), Paul Murakawa (fish), John Mitchell (fish), Brian Zgliczynski (fish towboard), Stephane Charette (fish towboard), Edmund Coccagna (benthic towboard), Jake Asher (benthic towboard), Jamison Gove (oceanography), Oliver Vetter (oceanography), Danny Merritt (oceanography), Michele Newlin (data manager), Andrea Rivera (data manager), James Maragos (permanent coral transects), Carl Meyer (sharks), Yannis Papastamatiou (sharks). Departed Snug Harbor at 0830 and transited to Pearl Harbor for fueling. Departed Pearl Harbor at 1830 and began transit to Necker Island (~400 nmi). An introductory meeting was held for all scientific personnel and new crew members at 1300, followed by a planning meeting for scientific personnel.

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<sup>1</sup> PIFSC Cruise Report CR-07-004  
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- 2 September Transit day. Jim Bostik (Dive Safety Officer) checked all scientist's dive gear and ran scientific personnel through injured diver drills. The Rapid Ecological Assessment (REA) team met with Keith Lyons (Coxswain) to discuss issues of working off HI-2. At 1200, Brian Zgliczynski held a dive safety meeting where medical and oxygen kits were discussed, and all dive gear was rinsed in a bleach solution. "Escape from Quarters" and abandon ship drills were held in the afternoon.
- 3 September Arrived at Necker at 1200 and launched small boats for afternoon operations. The oceanography team recovered the Ocean Data Platform (ODP) plate and anchor, a Sea Surface Temperature (SST) buoy anchor, a subsurface temperature recorder (STR), and four coral recruitment plates (plus associated PVC pipes). The tow team completed four tows, circumnavigating the island at a 12.2-m isobath and a 15.2-m isobath, and getting halfway around the island at an 18.3-m isobath. The REA Team completed two complete REA surveys and installed permanent transect pins at sites NEC-2 and NEC-4. Jim Maragos revisited a permanent coral transect (NEC-R6), and Carl Meyer searched for his shark receiver and ground tackle, but found them missing. All dive gear and field equipment were soaked in bleach solution after daily field operations. Began transit to French Frigate Shoals (FFS) at 1700 (with a dogleg to pump black water).
- 4 September Conducted deepwater conductivity-temperature-depth (CTD) south of FFS at 0300. Arrived FFS in early morning and launched towed-diver team in the SafeBoat to retrieve Oliver Dameron from Tern Island ~0745. The tow team completed five tows: two around the northern forereef, one along the northern backreef, and two inside the lagoon. The oceanography team retrieved and deployed a coral reef early warning system (CREWS) buoy plus anchor and one STR. The REA team completed full surveys at sites FFS-30, FFS-21, and FFS-H6. Permanent transects were installed at FFS-30 and FFS-H6. A permanent transect installed by Greta Aeby was used at FFS-21. Jim Maragos revisited two of his permanent coral transects (11P and 16P). Carl Meyer recovered, downloaded, and redeployed two shark receivers. All dive gear and field equipment were soaked in bleach solution after daily field operations.
- 5 September Continued work at FFS. The towed-diver team completed five full tows and one partial tow: two southeast forereef, two southeast backreef, two lagoon (one full and one partial). The oceanography team retrieved and replaced four STRs, and placed one new STR at REA site FFS-12. Two Ecological Acoustic Recorders (EARs) were also deployed: one at REA site FFS-12 and one close to Jim Maragos's permanent transect 16P (near CREWS buoy). The REA team

completed three full REA surveys at sites FFS-12, FFS-34, and FFS-R29. Permanent transects were installed at FFS-34 and FFS-R29; a transect created by Greta Aeby was used at FFS-12. Jim Maragos revisited one of his permanent coral transects (2P). Carl Meyer recovered, downloaded, and redeployed one shark receiver. All dive gear and field equipment were soaked in bleach solution after daily field operations. A fish aggregating device (FAD) with a large “Z” on it was found ensnared on a patch reef at N23 43.3919, W166 03.9502, but no action was taken to remove it. Began transit to Maro Reef via Gardner Pinnacles.

6 September Arrived at Gardner Pinnacles ~0830. Deployed HI-2 with Vetter, Dameron, Meyer, Papastamatiou, Rivera, Newlin, and Woods (medical officer). Members of the oceanography team retrieved and deployed an STR; members of the shark team deployed a shark receiver, and data managers snorkeled. All dive gear and field equipment were soaked in bleach solution after daily field operations. Departed for Maro Reef. Members of the towed-diver team spent much of the transit trying to repair a crack that formed in the SafeBoat.

7 September The *Hi`ialakai* conducted a deepwater CTD south of Maro Reef ~0300. Arrived Maro Reef in early morning for day operations. The tow team completed four full tows and one partial tow towards the northern portion of the reef system. The repaired SafeBoat leaked less than during operation on September 5, but additional repairs will be made during evening hours. The oceanography team retrieved and deployed a CREWS buoy and associated anchor, swapped a Seabird-39 STR, conducted four shallow water CTDs and one water sample profile. The REA team completed three full surveys at sites MAR-R1, MAR-R3, and MAR-R12. Greta Aeby’s permanent transect was used at MAR-12, and a new permanent transect was installed at MAR-R3. Because MAR-R1 was a replacement site for MAR-R9 (the current at MAR-R9 was too strong to work); it was not included in initial permit requests, and no permanent transect was installed. Jim Maragos revisited two of his permanent coral transects (Rrm4 and 15P), and Carl Meyer recovered, downloaded, and redeployed a shark receiver at the northern tip of Maro. All dive gear and field equipment were soaked in bleach solution after daily field operations.

8 September Continued work at Maro Reef. The towed diver team only completed three tows (two forereef and one lagoonal area) because of problems with the hydraulic steering unit in the SafeBoat. The SafeBoat was brought on board the *Hi`ialakai* in the early afternoon to begin repair. The oceanography team retrieved and replaced two STRs, and put in an additional STR at REA site R12. They also conducted seven shallow water CTDS and two water sampling profiles. The REA team

completed three full surveys at sites MAR-22, MAR-6, and MAR-8. A permanent transect was installed at MAR-6. Greta Aeby's transects at MAR-22 and MAR-8 were found and used. Carl Meyer fixed the ground tackle at the shark receiver deployed on September 7 and recovered the ground tackle from a missing receiver located towards the southern end of Maro. A new receiver and accompanying ground tackle were redeployed at this site. All dive gear and field equipment were soaked in bleach solution after daily field operations.

- 9 September Continued work at Maro Reef. Conducted a deepwater CTD at 0300. The oceanography team completed four shallow water CTDs and two water sample profiles. The tow team completed five tows in the southeastern section of the reef. The REA team completed three full surveys at MAR-R5, MAR-31, and MAR-32. REAs were attempted at sites MAR-R6 and MAR-R8, but confused seas and currents kept divers out of the water at these locations. A permanent transect was installed at MAR-R5, but no permanent transects were installed at MAR-31 or MAR-32 since they were not listed on our permits. Jim Maragos surveyed a permanent coral transect at Rrm4, and Carl Meyer scouted out a site on the southwestern side of Maro for a possible future shark receiver. All dive gear and field equipment were soaked in bleach solution after daily field operations. Began transit to Laysan Island. The oceanography team cleaned the wet lab with bleach solution.
- 10 September Conducted a deepwater CTD south of Laysan Island ~0100. Arrived Laysan Island for day operations. The oceanography team retrieved and replaced three STRs and one SST, conducted six shallow water CTDs and one water sample profile. The tow team completed six tows, fully circumnavigating the island. The REA team completed three full surveys at LAY-5, LAY-R12, and LAY-R9. Permanent transects were installed at all three sites. Carl Meyer deployed two new shark receivers, and Jim Maragos resurveyed two permanent coral transects. All dive gear and field equipment were soaked in bleach solution after daily field operations. Departed for Pearl and Hermes Atoll.
- 11 September Transit day. The benthic REA team cleaned the web lab with bleach solution. A man overboard drill occurred in the afternoon.
- 12 September Conducted two deepwater CTDs south of Pearl and Hermes Atoll. Arrived at Pearl and Hermes Atoll in early morning to begin field operations. The oceanography team swapped out one CREWS buoy and associated anchor and one STR. They also conducted five shallow water CTDs. The towed-diver team completed six tows in the southeastern section of the atoll: two backreef sites, and four forereef

sites. Full REA surveys were completed at PHR-R32, PHR-R31, and PHR-R26. Greta Aeby's permanent transect was used at PHR-R32. New permanent transects were installed at PHR-R31 and PHR-R26. Carl Meyer retrieved three shark receivers, and Jim Maragos surveyed three U.S. Fish and Wildlife Service (USFWS) permanent coral transects: 6P, 9P, and 12P. All dive gear and field equipment were soaked in bleach solution after daily field operations.

- 13 September Conducted a deepwater CTD south of the atoll at 0500. Continued day operations at Pearl and Hermes Atoll. The oceanography team swapped out three STRs, deployed two new STRs, and deployed five temporary STRs to assess possible upwelling events on the south side of the atoll that will be recollected before departing Pearl and Hermes. The oceanography team also deployed a temporary acoustic Doppler current profiler (ADCP), one EAR, and conducted five shallow water CTDs. The towed-diver team completed six tows on the southwest corner of the atoll: three forereef and three backreef. The REA team conducted three full surveys at PHR-R42, PHR-31, and PHR-30. Permanent transects were installed at PHR-R42 and PHR-30. A transect installed by Greta Aeby was surveyed at PHR-31. Carl Meyer retrieved three shark receivers, and Jim Maragos resurveyed a permanent USFWS coral transect at 7P. All dive gear and field equipment were soaked in bleach solution after daily field operations.
- 14 September North shore sites were originally selected as our area of operation today, but 12-foot swells from the northeast blocked out the entire northern portion of the atoll. Operations shifted to other areas. The oceanography team swapped three STRs, conducted eight shallow water CTDs, and collected four water sample profiles. The towed-diver team completed five tows on the eastern forereef. The REA team conducted full surveys at PHR-33 and PHR-32 and complete fish and coral surveys with a qualitative algal survey at PHR-22. Permanent transects were installed at PHR-33 and PHR-22. A transect installed by Greta Aeby was located and used at PHR-32. Carl Meyer and Jim Maragos conducted reconnaissance dives and located colonies of *Acropora* on the southwestern forereef. This is the first report of *Acropora* from Pearl and Hermes Atoll. All dive gear and field equipment were soaked in bleach solution after daily field operations. The towed-diver team cleaned the web lab with bleach solution. Departed for Midway Atoll.
- 15 September Conducted one deepwater CTD south of Midway Atoll at ~0300. Arrived at Midway Atoll in early morning. The oceanography team collected coral recruitment plates from around the SST anchor and then swapped both the SST and its anchor with new equipment. The oceanography team also swapped out five STRs. The towed-diver

team completed six tows from the southeastern to southwestern corners of the atoll: five forereef tows and one backreef tow. The REA team completed full surveys at MID-2 and MID-R7. Complete fish and coral surveys were completed at MID-R3, but only a qualitative algal survey was conducted. Permanent transects were installed at all three sites. Carl Meyer retrieved two shark receivers from the south side of the atoll, and Jim Maragos resurveyed three USFWS coral transects: Rrm7, Rrm14, and 19P. All dive gear and field equipment were soaked in bleach solution after daily field operations.

- 16 September Conducted one deepwater CTD south of Midway Atoll at ~0230. Continued work at Midway Atoll. The oceanography team swapped an ODP plate and placed an STR at REA site MID-R7. The towed-diver team completed five tows: one forereef, one lagoonal reef, and three backreefs. The REA team completed full surveys at MID-3 and MID-R25 and partial surveys at MID-R20 because of extremely high current from the northeastern swell washing over the backreef areas. Existing permanent transects were found and used at all three sites. The shark team redeployed the two southern shark receivers they retrieved on September 15 and fixed the accompanying ground tackle and retrieved the northern shark receiver. Jim Maragos resurveyed three permanent USFWS coral transects: 16P, 18P, and 20P. All dive gear and field equipment were soaked in bleach solution after daily field operations. The fish REA team cleaned the web lab with bleach solution. Departed for Kure Atoll.
- 17 September Conducted one deepwater CTD south of Kure Atoll at ~0300. Arrived at Kure Atoll for morning operations. The oceanography team swapped out one CREWS buoy and associated anchor, one SST buoy and associated anchor, and two STRs. The towed-diver team completed six tows: three southern fore reef, one channel, one southern backreef, and one central lagoon. The REA team surveyed KUR-12, KUR-2, and KUR-14. Permanent transects were installed at KUR-12 and KUR-2. A transect previously installed by Greta Aeby was located and surveyed at KUR-14. Carl Meyer retrieved three shark receivers. Retrieved outboard motors from Green Island field party and transferred to *Hi`ialakai*. All dive gear and field equipment were soaked in bleach solution after daily field operations.
- 18 September Continued work at Kure Atoll. The oceanography team swapped out one STR and two wave and tide recorders (WTRs). Two additional STRs were placed at the WTR sites. One EAR was also deployed. The tow-diver team completed four tows along the northern forereef and two tows along the northern backreef. The REA team completed full surveys at KUR-R33, KUR-R36, and KUR-17. Permanent

transects were installed at KUR-R33 and KUR-R36. A transect previously installed by Greta Aeby was located at KUR-17. Carl Meyer redeployed three shark receivers and fixed associated ground tackle. All dive gear and field equipment were soaked in bleach solution after daily field operations.

19 September

Continued work at Kure Atoll. The oceanography team circumnavigated the exterior of the atoll conducting 13 shallow water CTDs and 5 water sample profiles. The towed-diver team completed a single tow along the eastern backreef and conducted a series of drop dives on the southern forereef. The REA team completed full surveys at KUR-18 and KUR-9 and completed fish and coral surveys with a qualitative algal survey at KUR-R35. Permanent transects were installed at all three sites. Field equipment from Green Island was transported to the *Hi`ialakai* throughout the day, and the Department of Land and Natural Resources (DLNR) Green Island shore party (Vanderlip, McGuire, Marie, Karczmariski, and Morisaka) was picked up and brought to the *Hi`ialakai* at 1700. All dive gear and field equipment were soaked in bleach solution after daily field operations. The data management team cleaned the web lab with bleach solution. Departed for Midway Atoll.

20 September

Arrived Midway Atoll ~0300. At 0800, the *Hi`ialakai* pulled into the main channel and launched the two 19-ft SafeBoats. The *Hi`ialakai* docked by the fuel pier. Barry Christensen, the USFWS Refuge Manager, gave an introduction to Midway, and the scientific party was given the day ashore. Personal gear from the Kure Atoll party was brought ashore. Disembarked Vanderlip, McGuire, Marie, Karczmariski, and Morisaka. All ship and scientific personnel were required to be back on board by 1930 unless accompanied by the Refuge Manager. No alcohol consumption by the scientific crew was permitted, although the ship's crew was able to drink. The commanding officer, medical officer, chief scientist, and USFWS representative were invited to dine with the Refuge Manager and his wife in the evening.

21 September

Continued work at Midway Atoll. The oceanography team moved the ODP about 3 meters into a better location, then completed 12 CTDs and 4 shallow water sample profiles. The towed-diver team finished four tows: two eastern backreef and two southern forereef tows. The REA site completed full fish and coral surveys and partial algal surveys (no photographs taken, but algal rankings completed) at MID-1, MID-H21, and MID-H11. Greta Aeby's transect was relocated and used at MID-1; permanent transects were installed at MID-H21 and MID-H11. Carl Meyer redeployed his northern shark receiver, and Jim Maragos surveyed USFWS coral transects 1A, 1C, 2, and 17P.

All dive gear and field equipment were soaked in bleach solution after daily field operations. The shark/USFWS coral team cleaned the web lab with bleach solution. Departed for Pearl and Hermes Atoll.

22 September

Arrived at Pearl and Hermes Atoll and continued work. A heavy northeast swell prevented boat launching and work north of the atoll in the morning. The oceanography team recovered five temporary STRs and a temporary ADCP from the south side of the atoll. An ODP was deployed at this same spot. Three STRs were deployed on the north side of the atoll in the afternoon, one at REA site R39. Three shallow water CTDs and one water sample profile were also conducted on the north side. The towed-diver team completed five tows: two on eastern backreefs, two in the northern channel, and one on the northern forereef. The towed-diver team also recovered a shark receiver located on the north side of the atoll for Carl Meyer. The REA team completed a full survey at PHR-34, but did not install a permanent transect. The fish team conducted a fish assemblage characterization at the site where the ODP was deployed, while the benthic team revisited PHR-31 to photodocument a possible new coral species and then visited a *Halophila hawaiiiana* seagrass meadow on the southeast side of the backreef. Carl Meyer and Jim Maragos conducted reconnaissance dives on the southwest side of the forereef and documented a second species of *Acropora* at Pearl and Hermes Atoll. All dive gear and field equipment were soaked in bleach solution after daily field operations.

23 September

Continued work at Pearl and Hermes Atoll. The oceanography team completed four shallow water CTDs and two water sample profiles (two duplicates at the same location). They also conducted a dive on the *Casitas* grounding site to check out the feasibility of an REA survey, but reported heavy swell and breaking waves. The towed-diver team completed one northern backreef tow, one lagoonal tow, and two north to northeast forereef tows. The REA team surveyed PHR-R39, PHR-R44, and PHR-24. Permanent transects were installed at PHR-R39 and PHR-24. An Aeby transect was located and used at PHR-R44. Carl Meyer redeployed a receiver at his northern site. All dive gear and field equipment were soaked in bleach solution after daily field operations. Began transit to Lisianski Island/Neva Shoals.

24 September

Transit day. The oceanography team cleaned the web lab with bleach solution. Arrived south of Lisianski Island/Neva Shoals in late afternoon. Conducted two deepwater CTDs and water sample profiles.

25 September

Began work at Lisianski Island/Neva Shoals. The oceanography team swapped out one SST buoy plus associated anchor and two STRs. One additional STR was deployed at REA site LIS-16, and coral



recruitment plates were retrieved from the old CREWS buoy anchor. The towed-diver team completed five tows moving counterclockwise around the island from the northeast to the northwest to the west. The REA team surveyed LIS-R14, LIS-12, and LIS-R9. Permanent transects were installed at all three sites. Carl Meyer deployed one shark receiver at the northern end of the shoal system, and Jim Maragos repaired and surveyed permanent USFWS coral transects 1P, 6P, and 9P. All dive gear and field equipment were soaked in bleach solution after daily field operations.

- 26 September Continued work at Lisianski Island/Neva Shoals. The oceanography swapped out instrumentation on two WTRs and deployed new STRs at both WTR sites. They also conducted 19 shallow water CTDs and 4 water sample profiles. The towed-diver team completed five tows: two on the east side, one on the southeast corner, one on the southwest corner, and one on the west side. Species of *Acropora* were observed at Lisianski Island for the first time. The REA team surveyed LIS-16, LIS-17, and LIS-18 and installed permanent transects at each site. Carl Meyer deployed one new shark receiver at the southern end of Neva Shoals. All dive gear and field equipment were soaked in bleach solution after daily field operations.
- 27 September Continued work at Lisianski Island/Neva Shoals. The oceanography team retrieved a CREWS buoy anchor from the southern end of Neva Shoals. The towed-diver team completed two tows: one on the western bank and one on the leeward side of Lisianski Island. The REA team surveyed LIS-R7, LIS-R10, and LIS-10, and installed permanent transects at each site. Carl Meyer and Jim Maragos conducted a 30-meter dive on the southern end of Neva Shoals and found four new records of corals. They then conducted an additional dive on the southeast side of the forereef and documented two new records of *Acropora*, one of which may be an endemic undescribed species to the NWHI. All dive gear and field equipment were soaked in bleach solution after daily field operations. Began transit to FFS.
- 28 September Continued transit to FFS. The benthic REA team cleaned the web lab with bleach solution.
- 29 September Continued transit to FFS.
- 30 September Arrived at FFS and continued field work. The oceanography team completed 25 CTDs and 5 water sample profiles. The towed-diver team completed five tows: one in the central lagoon, one on the east backreef, and three on northeast forereefs. The REA team completed full surveys at FFS-R46, FFS-32, and FFS-33. A permanent transect installed by Jim Maragos was relocated at FFS-R46, repaired, and

resurveyed. New permanent transects were installed at FFS-32 and FFS-33. Carl Meyer retrieved two shark receivers, one from near La Persouse Pinnacle and one from near East Island. Jim Maragos resurveyed one USFWS coral transect (P3). All dive gear and field equipment were soaked in bleach solution after daily field operations.

- 1 October Continued work at FFS. A large north swell coupled with strong winds from the south hindered operations. The oceanography team moved the EAR deployed on September 5 at REA site FFS-12 to Rapture Reef. The towed-diver team completed tows at three lagoonal sites. The REA team was not able to survey northern backreef and patch reef sites because of weather conditions. Full surveys were instead conducted at FFS-35. No permanent transect was installed. Carl Meyer redeployed two shark receivers, one near La Perouse Pinnacle and the other near East Island. All dive gear and field equipment were soaked in bleach solution after daily field operations. Began transit to Honolulu.
- 2 October Continued transit to Honolulu.
- 3 October Continued transit to Honolulu. The towed-diver team cleaned the web lab with bleach solution.
- 4 October Arrived in Honolulu. Disembarked Vargas Angel, Kenyon, Vroom, De Joseph, Leonard, Zamzow, Murakawa, Mitchell, Zgliczynski, Charette, Coccagna, Asher, Gove, Vetter, Damerson, Merritt, Newlin, Rivera, Maragos, Meyer, and Papastamatiou.

Table 1: Cruise statistics for NOWRAMP 2006.

	Necker Island	French Frigate Shoals	Gardner Pinnacles	Maro Reef	Laysan Island	Pearl and Hermes Atoll	Midway Atoll	Kure Atoll	Lisianski Island/ Neva Shoals
Towed-diver Habitat/Fish Surveys	4	19	0	13	6	26	15	13	12
Combined tow lengths (km)	7.48	45.37	0	28.49	13.33	67.25	37.49	29.29	30.47
Fish Rapid Ecological Assessments	2	10	0	9	3	13	9	9	9
Benthic Rapid Ecological Assessments	2	10	0	9	3	13	9	9	9
Permanent Coral Transects Monitored (Maragos)	1	4	0	3	2	4	10	0	3
Wave and Tide Recorders (WTR) recovered	0	0	0	0	0	0	0	2	2

	Necker Island	French Frigate Shoals	Gardner Pinnacles	Maro Reef	Laysan Island	Pearl and Hermes Atoll	Midway Atoll	Kure Atoll	Lisianski Island/ Nevea Shoals
Wave and Tide Recorders (WTR) deployed	0	0	0	0	0	0	0	2	2
Ocean Data Platforms (ODP) recovered	1	0	0	0	0	0	1	0	0
Ocean Data Platforms (ODP) deployed	0	0	0	0	0	1	1	0	0
SST buoys recovered *anchor recovered without SST buoy	0*	0	0	0	1	0	1	1	1
SST buoys deployed	0	0	0	0	1	0	1	1	1
STRs recovered	1	6	1	3	3	12	5	3	2
STRs deployed	0	7	1	4	3	17	6	5	5
CREWS buoys recovered *anchor recovered without CREWS buoy	0	1	0	1	0	1	0	1	0*
CREWS buoys deployed	0	1	0	1	0	1	0	1	0
Shallow water sample profiles taken (1 profile consists of chlorophyll and nutrient samples at 1 to 4 depths as depth allows, and a microbiota sample at the shallowest depth)	0	5	0	5	1	7	4	5	4
Deepwater sample profiles collected (5 samples per profile)	1	4	0	2	1	7	3	2	4
Deepwater CTDs (from <i>Hi`ialakai</i> )	1	4	0	2	1	7	3	2	4
Shallow water CTDs	0	25	0	15	6	25	12	13	19
Multibeam mapping (sq. km)	0	0	0	0	0	0	0	0	0
Shark receivers recovered *ground tackle recovered but shark receiver missing	0	5	0	1+0*	0	4	3	3	0
Shark receivers deployed	0	3	1	2	2	4	3	3	2
SCUBA dives	39	176	4	135	47	206	107	134	131

## **MISSIONS:**

- A. Conduct ecosystem monitoring of the species composition, abundance, percent cover, size distribution, and general health of the fish, corals, other invertebrates, and algae of the shallow water (<35 m) coral reef ecosystems of the NWHI.
- B. Deploy an array of CREWS buoys, SST buoys, subsurface ODPs, subsurface WTRs, and STRs to allow remote long-term monitoring of oceanographic and environmental conditions affecting coral reef ecosystems of the NWHI.
- C. Collect water samples for analysis of nutrient and chlorophyll levels.
- D. Conduct shipboard CTDs to a depth of 500 m, shallow water CTDs from small boats to a depth of ~30 m, and shipboard ADCP surveys around reef ecosystems to examine physical and biological linkages supporting and maintaining these island and atoll ecosystems.
- E. Determine the existence of threats to the health of these coral reef resources from anthropogenic sources, including marine debris.
- F. Collect ADCP data during all transits. The ADCP unit shall be configured to collect narrow-band data in 16 meter bins (deepwater mode).

## **RESULTS:**

- A. Ecosystem monitoring of the species composition, abundance, percent cover, size distribution, and general health of the fish, corals, other invertebrates, and algae of the shallow water (<35 m) coral reef ecosystems of the NWHI was completed at 64 sites.
- B. Four CREWS buoys, 4 SST buoys, 2 subsurface ODPs, 4 subsurface WTRs, and 48 STRs were deployed to allow remote long-term monitoring of oceanographic and environmental conditions affecting coral reef ecosystems of the NWHI. Four CREWS buoys, 4 SST buoys, 2 subsurface ODPs, 4 subsurface WTRs, and 36 STRs were recovered.
- C. Thirty-one shallow water and 24 deep water stations were visited to collect water samples for analysis of nutrient and chlorophyll levels.
- D. Twenty four shipboard CTDs to a depth of 500 m, and 115 shallow water CTDs from small boats to a depth of ~30 m, were completed.
- E. The existence of threats to the health of these coral reef resources from anthropogenic sources, including marine debris were noted.
- F. ADCP data was collected during all transits.

**SCIENTIFIC  
PERSONNEL:**

Peter Vroom, PhD, Chief Scientist, Benthic Team – Algae, University of Hawaii (UH)-  
Joint Institute for Marine and Atmospheric Research (JIMAR), Pacific Islands  
Fisheries Science Center (PIFSC)-Coral Reef Ecosystems Division (CRED)  
Jill Zamzow, PhD, Fish Team, State of Hawaii Department of Land and Natural Resources,  
Division of Aquatic Resources (DLNR-DAR)  
Paul Murakawa, Fish Team, DLNR-DAR  
John Mitchell, PhD, Fish Team, DLNR-DAR  
Jason Leonard, Fish Team, DLNR-DAR  
Bernardo Vargas Angel, PhD, Benthic Team – Coral Disease, UH-JIMAR, PIFSC-CRED

Jean Kenyon, PhD, Benthic Team - Corals, UH-JIMAR, PIFSC-CRED  
James Maragos, PhD, top predator/coral team – Corals, United States Fish and Wildlife  
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Andrea Rivera, Data Manager, UH Manoa  
Bonnie De Joseph, Benthic Team – Algae, UH-JIMAR, PIFSC-CRED  
Brian Zgliczynski, Towed diver – fish, UH-JIMAR, PIFSC-CRED  
Stephane Charette, Towed diver – fish, UH-JIMAR, PIFSC-CRED  
Jacob Asher, Towed diver – habitat, UH-JIMAR, PIFSC-CRED  
Edmund Coccagna, Towed diver – habitat, UH-JIMAR, PIFSC-CRED  
Daniel Merritt, Oceanography, UH-JIMAR, PIFSC-CRED  
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Oliver Vetter, Oceanography, UH-JIMAR, PIFSC-CRED  
Oliver Dameron, Oceanography, UH-JIMAR, PIFSC-CRED  
Michele Newlin, Data Manager, NOAA Coral Reef Information System (NOAA-CoRIS)  
Carl Meyer, PhD, top predator/coral team - sharks, UH Manoa-Hawaii Institute of Marine  
Biology (HIMB)  
Yannis Papastamatiou, top predator/coral team - sharks, UH Manoa-HIMB

**DATA COLLECTED:**

Digital “before and after” pictures of individual stakes installed for permanent REA transects  
Digital images from algal photoquadrats  
Algal voucher specimens necessary for algal species identification  
Algal field notes of species diversity and relative abundance  
Videotransects of benthos and overall site character at each site  
Number of coral colonies, by species, within belt transects of known  
area, and overall coral colony density at each site  
Qualitative assessment (DACOR) of coral species' relative abundance at  
each site  
Size class distributions of corals (by species and overall) at each site  
Digital images of diseased coral  
Field notes on signs of coral bleaching or disease  
Samples of diseased coral for histopathological analysis

Digital still photos of overall site character and typical benthos at each site  
Transect surveys of all fish 2 cm or larger in 600 m<sup>2</sup> – ID to species and estimate size  
Stationary point count surveys of fish 25 cm and larger – ID to species and estimate size  
Fish species presence checklists for community diversity estimates at each site  
Digital images of rare or interesting fish species  
Digital images of the benthic habitat from towboard surveys  
Macroinvertebrate counts from towboard surveys  
Quantitative surveys of reef fishes (larger than 50 cm TL) to species level from towboards  
Habitat lineation from towboard surveys  
Benthic composition estimations from towboard surveys  
Acoustic Doppler current profile (ADCP) data  
Conductivity, temperature and depth (CTD) profiles to 500 m  
Water Samples to 500 m: Chlorophyll and Nutrient - 5 depths per cast  
Conductivity, Temperature, Depth (CTD) casts: 30 m  
Shallow Water Samples (30 m): Chlorophyll and Nutrient - 4 depths per cast  
Sea surface and subsurface temperature at variable depths  
Sea surface and subsurface salinity at variable depths  
Spectral wave energy and tidal elevation  
Directional ocean currents  
Solar radiation, air temperature, wind speed and direction, turbidity, and photosynthetic active radiation  
Acoustic Doppler current profiler (ADCP) transects

(/s/Peter S. Vroom)

Submitted by: \_\_\_\_\_  
Peter S. Vroom, Ph.D.  
Chief Scientist

(/s/David Kennedy)

Approved by: \_\_\_\_\_  
David Kennedy  
Program Manager  
Coral Reef Conservation Program

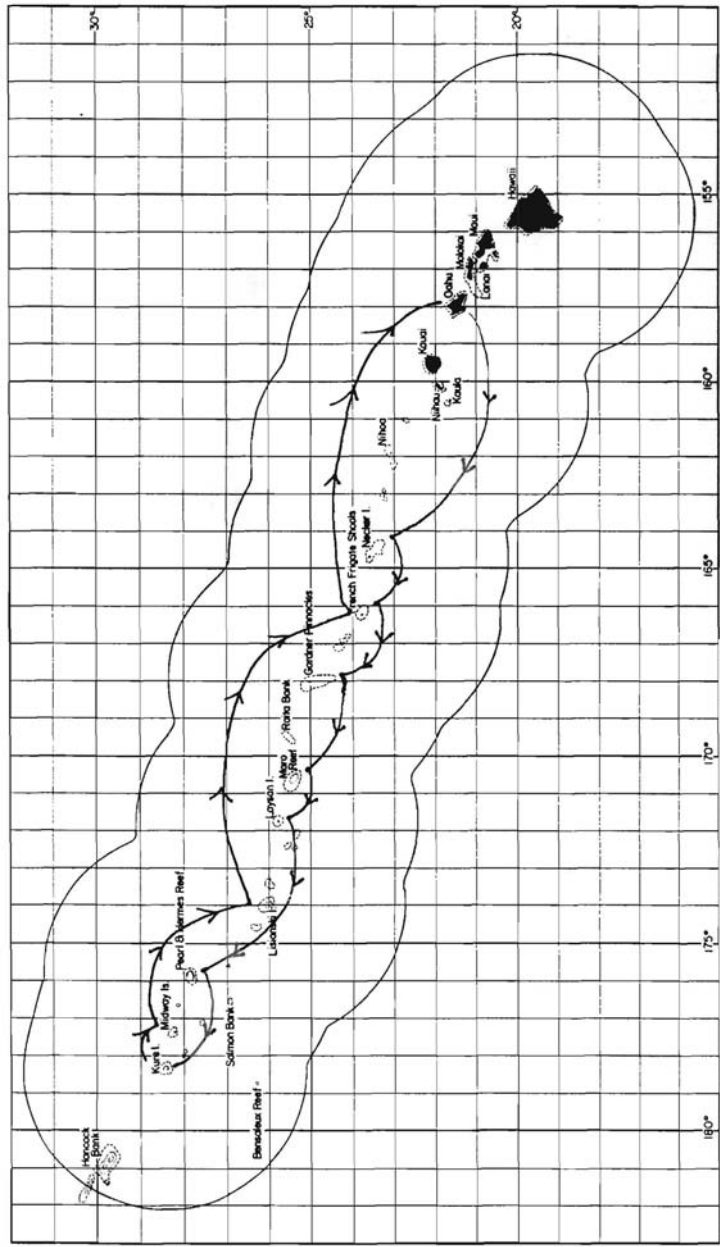


Figure 1.--Track of the NOAA Ship Hi'ialakai cruise HI-06-11, September 1 to October 4, 2006.