

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

**VESSEL:** *Hi'ialakai*, Cruise HI-07-01

**CRUISE PERIOD:** 19 April–9 May 2007

**AREA OF OPERATION:** Wake Atoll

**TYPE OF OPERATION:** Personnel from the Coral Reef Ecosystem Division (CRED), Pacific Island Fisheries Science Center (PIFSC), National Marine Fisheries Service (NMFS), NOAA, conducted coral reef assessment/monitoring and mapping studies in waters surrounding Wake Atoll.

### ITINERARY:

19 April Start of cruise. Embarked Scott Ferguson (Chief Scientist), Brian Zgliczynski (REA- Fish), Marc Nadon, (REA – Fish), Paul Brown (REA – Fish), Jean Kenyon (REA – Corals), Bernardo Vargas Angel (REA – Corals), Elizabeth Keenan (REA – Invertebrates), Robert Tomasetti (REA – Algae), Bonnie DeJoseph (REA – Algae), Jason Helyer (REA – permanent transects), Benjamin Richards (Tow team – fish), Stephane Charette (Tow team – fish), Amy Hall (Tow team – benthic), Jacob Asher (Tow team – benthic), Noah Pomeroy (Oceanography), Frank Mancini (Oceanography), Oliver Vetter (Oceanography), James Bostick (Divemaster/Chamber Operator), Haiying Wang (Data Manager), Joyce Miller (Mapping). Departed Pearl Harbor at 0900. Conducted shipboard orientation meeting for all scientists. Conducted ship's fire and abandon ship drills. Conducted multibeam patch tests. After several unexplained power outages on the bridge, the uninterruptible power supply (UPS) supplying the bridge with power was determined to need new batteries. The ship remained in the vicinity of O'ahu overnight.

---

<sup>1</sup>PIFSC Cruise Report CR-07-008  
Issued 25 June 2007

- 20 - 28 April After new batteries were procured and installed in the UPS, the ship got underway for Wake Atoll at 1300. Conducted O2 administration and CPR training, baseline neurological examinations, survival at-sea training, diver emergency, and nighttime abandon ship drills. Scientists set up computer work stations and network and prepared field survey gear and equipment. Fish and benthic rapid ecological assessment (REA) teams met to discuss site selections, and tow and mooring teams met to discuss operations.
- 29 April Arrived at Wake Atoll at 1500 to begin field operations. Divers conducted an emergency dive drill, moving a disabled diver from the small boat (HI-1) to the recompression chamber. At 1700 shipboard mapping operations began with a conductivity-temperature-depth (CTD) cast to a depth of 250 m.
- 30 April Continued working at Wake Atoll. The ship continued mapping operations throughout the night collecting data around the atoll and in deeper water to the west and south. Small boat operations began at 0730 with a morning safety briefing, after which boats were deployed. The REA teams occupied three established sites on the western side of the atoll (WAK-12, WAK-8, and WAK-4). The towed-diver survey team conducted six tows. Ship's personnel transferred one 17-ft Avon inflatable into the lagoon with the invaluable assistance of shore personnel, truck, and trailer. Outside the lagoon the oceanography team conducted 11 shallow-water (30 m) CTD casts and 2 water quality profiles at a 30-m cast site during which 8 water samples were taken to be later analyzed for chlorophyll (4 samples) and nutrient (4 samples) content. Once the Avon was deployed in the lagoon, the oceanography team transferred to that boat and recovered and redeployed one sea surface temperature (SST) mooring, recovered and redeployed one subsurface temperature recorder (STR) and deployed two new STRs, and deployed one ecological acoustic recorder (EAR). The *Acoustic Habitat Investigator (AHI)* mapped from 10- to 300-m depths around the south, west, and north sides of the atoll. Shipboard oceanographic operations, consisting of 250-m CTD casts in a line west of the atoll, began after all small boats were onboard.
- 1 May Continued working at Wake Atoll. The ship continued oceanographic operations during the night. Small boat operations began at 0730 with a morning safety briefing, after which boats were deployed. The REA teams occupied three established sites on the western side of the atoll (WAK-13, WAK-9, and WAK-6). The towed-diver survey team conducted six tows. Outside the lagoon, the oceanography team recovered 1 STR, deployed 2 STRs, and conducted 15 shallow-water (30 m) CTD casts and 2 water quality profiles at a 30-m cast site during which 8 water samples were taken to be later analyzed for chlorophyll (four samples) and nutrient (four samples) content. In the lagoon the oceanography team recovered and redeployed one STR. The *AHI* mapped from 10- to 300-m depths around all sides of the atoll, completing the shallow water mapping operations at Wake. After all small boats were onboard, shipboard mapping operations began with a conductivity-

temperature-depth (CTD) cast to a depth of 250 m and continued throughout the night.

- 2 May Continued working at Wake Atoll. The ship continued mapping operations during the night. Small boat operations began at 0730 with a morning safety briefing, after which boats were deployed. The REA teams occupied three established sites on the western side of the atoll (WAK-14, WAK-1, and WAK-2). WAK-14 had strong currents, and not all divers were able to productively work under those conditions. The towed diver survey team conducted four tows. Outside the lagoon, the oceanography team recovered and redeployed two STRs and conducted two series of free dives using a portable EAR to monitor feeding bumphead parrotfish (*Bolbometopon muricatum*). Shipboard oceanographic operations, consisting of 250 m CTD casts in a line east of the atoll, began after all small boats were onboard.
- 3 May Continued working at Wake Atoll. The ship continued oceanographic and mapping operations during the night. Small boat operations began at 0730 with a morning safety briefing, after which boats were deployed. The REA teams occupied three established sites on the western side of the atoll (WAK-7, WAK-5, and WAK-3). The towed- diver survey team conducted three tows. Outside the lagoon, the oceanography team conducted six series of free dives using a portable EAR to monitor feeding bumphead parrotfish (*Bolbometopon muricatum*). After all small boats were onboard, the ship departed Wake at 1700 bound for Santa Rosa Bank, south of Guam.
- 4 - 8 May Continued transit to Santa Rosa Bank. Arrived near Santa Rosa Bank at 2300. Began nighttime mapping operations with a CTD cast.
- 9 May Continued mapping operations until 0600. Deployed the 19-ft Safeboat with the oceanography team and recovered an Ocean Data Platform (ODP) in 20 m of water, leaving the anchor in place. Departed Santa Rosa Bank at 0745 and began transit to Guam. Conducted post-cruise meeting. Arrived Apra Harbor in Guam. End of cruise.

Table 1: Cruise statistics for HI-07-01

	<b>Wake Atoll</b>	<b>Santa Rosa Bank, Guam</b>
Towed-diver Habitat/Fish Surveys	19	0
Combined tow lengths (km)	42.7	0
Fish Rapid Ecological Assessments	12	0
Benthic Rapid Ecological Assessments	12	0
Permanent Coral Transects Installed	23	0
Invertebrate collection dives	2	0
Wave and Tide Recorders (WTR) recovered	0	0
Wave and Tide Recorders (WTR) deployed	0	0
Ocean Data Platforms (ODP) recovered	0	1
Ocean Data Platforms (ODP) deployed	0	0
SST buoys recovered	1	0
SST buoys deployed	1	0
STRs recovered	5	0
STRs deployed	8	0
EARs deployed	1	0
Portable EAR dives	8	0
Shallow water sample profiles collected	4	0
Deepwater sample profiles collected	12	0
Deepwater CTDs (from <i>Hi`ialakai</i> )	14	1
Shallow water CTDs (oceanography team)	26	0
Shallow water CTDs (AHI)	2	0
Multibeam mapping (sq. km)	668	164
SCUBA dives	164	4

**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 Wake Island.
- B. Conduct benthic habitat mapping of the reefs and submerged banks surrounding Wake Island using ship-based and launch-based multibeam echosounders and underwater towed cameras.
- C. Deploy an array of SST buoys, subsurface temperature recorders, and ecological acoustic recorders to allow remote long-term monitoring of oceanographic and environmental conditions affecting the coral reef ecosystem of Wake Island. Recover an ODP from Santa Rosa Bank south of Guam.

- D. Collect water samples for analysis of nutrients and chlorophyll levels.
- E. 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 the atoll ecosystem.
- F. Determine the existence of threats to the health of these coral reef resources from anthropogenic sources, including marine debris.
- G. Collect ADCP data during all transits.

## **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 at Wake Island was completed at 12 REA sites and 42.7 km of towed-diver survey transects.
- B. Mapping from the *Hi'ialakai* and the survey launch R/V *AHI* resulted in the collection of high resolution multibeam bathymetry and backscatter imagery at Wake Atoll and Santa Rosa Bank. The waters surrounding Wake were completely mapped in depths ranging from 12 to 3000 m.
- C. One SST buoy, one EAR, and eight STRs were deployed to allow remote long-term monitoring of oceanographic and environmental conditions affecting coral reef ecosystems of the Wake Atoll. One SST buoy and five STRs were recovered at Wake, and one ODP was recovered at Santa Rosa Bank.
- D. Four shallow water and 12 deepwater stations were visited to collect water samples for analysis of nutrient and chlorophyll levels.
- E. Fourteen shipboard CTDs to a depth of 500 m and 26 shallow water CTDs from small boats to a depth of ~30 m were completed.
- F. The existence of threats to the health of these coral reef resources from anthropogenic sources, including marine debris were noted.
- G. ADCP data were collected during all transits.

## **SCIENTIFIC PERSONNEL:**

Scott Ferguson, Chief Scientist, Pacific Islands Fisheries Science Center (PIFSC), National Marine Fisheries Service (NMFS), Coral Reef Ecosystem Division (CRED)  
Brian Zgliczynski, Research Biologist, PIFSC, NMFS, CRED  
Marc Nadon, Marine Ecosystem Specialist, Joint Institute for Marine and Atmospheric Research (JIMAR), University of Hawaii (UH), Coral Reef Ecosystem Division (CRED)  
Paul Brown, Marine Ecologist, NPSA, American Samoa  
Jean Kenyon, Marine Ecologist, JIMAR, UH, CRED  
Bernardo Vargas Angel, Coral Biologist, JIMAR, UH, CRED  
Elizabeth Keenan, Marine Ecosystem Specialist, JIMAR, UH, CRED  
Robert Tomasetti, Biologist, University of Guam  
Bonnie DeJoseph, Marine Ecosystem Specialist, JIMAR, UH, CRED  
Jason Helyer, Marine Ecosystem Specialist, JIMAR, UH, CRED  
Benjamin Richards, Research Associate, JIMAR, UH, CRED  
Stephane Charette, Marine Ecosystem Specialist, JIMAR, UH, CRED  
Amy Hall, Marine Ecosystem Specialist, JIMAR, UH, CRED  
Jacob Asher, Marine Ecosystem Specialist, JIMAR, UH, CRED  
Noah Pomeroy, Marine Ecosystem Specialist, JIMAR, UH, CRED  
Frank Mancini, Marine Ecosystem Specialist, JIMAR, UH, CRED  
Oliver Vetter, Research Associate, JIMAR, UH, CRED  
James Bostick, Divemaster/Chamber Operator, NMAO/NDC  
Haiying Wang, Data Manager, JIMAR, UH, CRED  
Joyce Miller, JIMAR, UH, CRED

## **DATA COLLECTED:**

Fish REA numerical and biomass densities by species  
Digital images of fish-habitat associations  
Target REA macroinvertebrate counts  
Macroinvertebrate voucher specimens  
Algal voucher specimens  
Coral voucher specimens  
Coral REA numerical abundance and size class by genus  
Digital still images of REA site characteristics  
Digital still images of coral species  
Digital video along transects at REA sites  
Invertebrate voucher specimens  
Algal REA field notes of species diversity and relative abundance  
Digital images from algal photoquadrats  
Quantitative towed diver surveys of large fish species (>50 cm TL)  
Digital video surveys of habitat from towed-diver transects  
Benthic composition estimations from towed-diver surveys  
Macroinvertebrate counts from towed-diver surveys

Digital images of the benthic habitat from towed-diver surveys  
Habitat lineation from towed-diver surveys  
Shallow-deep conductivity, temperature and depth (CTD) profiles  
Water samples to be tested for chlorophyll and nutrient content  
Dissolved inorganic carbon from deepwater CTDs  
Raw and processed multibeam digital data

Submitted by: (/s/Scott Ferguson)  
Scott Ferguson  
Chief Scientist

Approved by: (/s/David Kennedy)  
David Kennedy  
Program Manager  
Coral Reef Conservation Program

Attachments

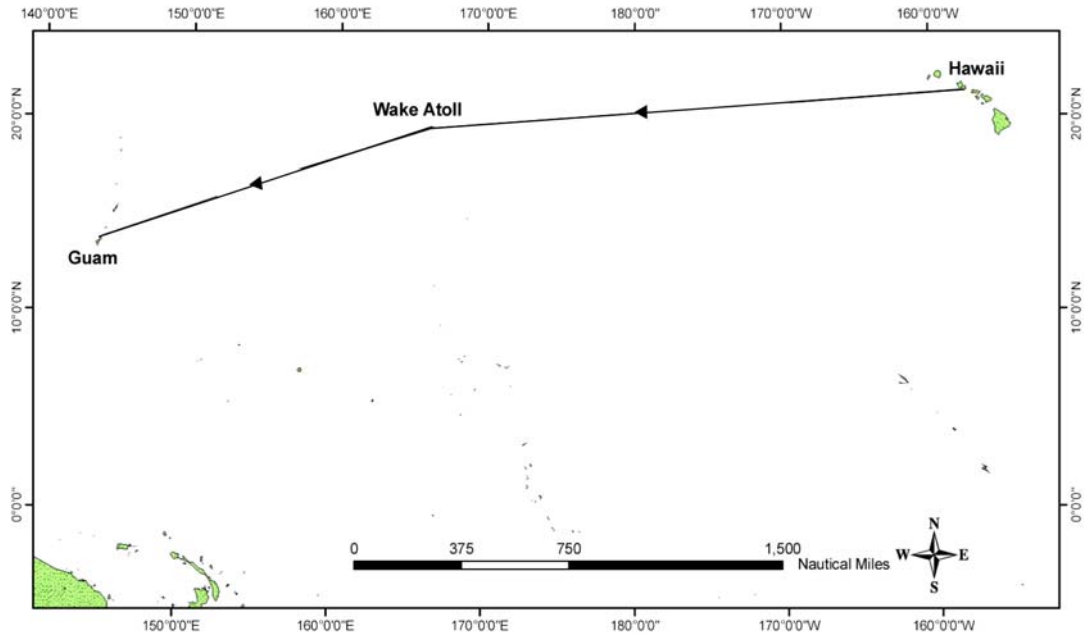


Figure 1.--NOAA ship *Hi'ialakai* cruise track to Wake Atoll, 19 April–9 May 2007.