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National Oceanic and Atmospheric Administration
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CRUISE REPORT¹

VESSEL: *Townsend Cromwell*, Cruise 01-01 (TC-264)

CRUISE PERIOD: January 30-February 28, 2001

AREA OF OPERATION: U.S. Islands of the Central Equatorial Pacific Ocean (Fig. 1)

TYPE OF OPERATION: Personnel from the Coral Reef Ecosystem Investigation, Honolulu Laboratory, National Marine Fisheries Service, NOAA, conducted reef assessment/monitoring in waters surrounding the U.S. Pacific Remote Island Areas (PRIAs)

ITINERARY:

- 30 January Embarked Russell Brainard, Bruce Mundy, Stephani Holzwarth, James Maragos, Dwayne Minton, Brian Greene, Brian Zgliczynski, Karen Geisler, Dominique Aycock, and LeeAnne Woodward. Departed Snug Harbor at 0930 en route to Howland Island (~1650 nmi).
- 6 February Arrived west side of Baker Island (lat. 0°12'N, long. 176°29'W) at 1800. Launched three small boats to safely land Woodward and Aycock ashore to begin terrestrial surveys and contaminant investigations. Departed Baker at 2000 en route to Howland Island (lat. 0°48'N, long. 176°38'W).
- 7 February Arrived at Howland Island at 0100 to conduct conductivity-temperature-depth (CTD) and acoustic Doppler current profiler (ADCP) survey around the island. Oceanographic surveys were completed by 0800. Ship's SAFE boat, Whaler, and Achilles small boats were launched from 0800 to 0900 to commence coral reef ecosystem assessment activities around Howland Island. Conducted shallow water benthic habitat mapping around entire island using towed divers equipped with digital cameras. A fish team and benthic team conducted three



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rapid ecological assessment (REA) dives for fish, corals, invertebrates, and algae. Deployed four sonobuoys. All small boats were brought aboard by 2000. Conducted CTD/ADCP oceanographic surveys through the night.

- 8 February Launched small boats and continued reef assessment activities from 0800 until 2000. Conducted shallow water benthic habitat mapping, 24 nearshore CTD stations, and three fish and benthic REA stations. Established a second permanent long-term monitoring transect. Recovered four sonobuoys. Departed Howland Island en route to Baker Island.
- 9 February Arrived Baker Island to commence coral reef assessment activities. Launched ship's small boats from 0800 to 0900. Safely landed Ens. Mowitt ashore at Baker to establish a differential Global Positioning System (GPS) station. From 0800 to 2000 conducted towed-diver habitat mapping surveys around entire island. Conducted three fish and benthic REA stations. Deployed four sonobuoys. Safely recovered Ens. Mowitt after successfully establishing GPS station. Conducted shipboard CTD/ADCP surveys around Baker Island throughout the night, but experienced a series of problems with the CTD.
- 10 February Continued coral reef ecosystem assessment activities at Baker Island. Conducted shallow water benthic habitat mapping. Conducted three fish and benthic REAs. Recovered four sonobuoys. Conducted shallow water CTD survey around Baker Island consisting of 17 CTDs. Safely embarked Woodward and Aycock after they successfully completed their terrestrial surveys. Departed Baker Island at 1930 en route to Jarvis Island (lat. 0°12'S, long. 160°00'W).
- 16 February Arrived at Jarvis Island at 1600. Immediately commenced launching boats to begin coral reef assessment activities. Deployed four sonobuoys and conducted four short habitat mapping drift dives. Conducted one fish and benthic REA dive to 22.5 m. Deployed two strings of five lobster traps in deep water. The float line of one of the strings was not properly attached causing the loss of five traps.
- 17 February Conducted oceanographic survey of three 500-m CTDs and ADCP transects between stations around Jarvis Island throughout the night. The CTD block failed en route to the fourth CTD. During daylight hours, conducted coral reef and terrestrial surveys. At 0930, safely landed Woodward, Aycock, Mowitt, and Patana. Conducted four towed-diver habitat mapping surveys/fish counts and three fish and benthic REA stations. The four sonobuoys were recovered. Conducted a shallow water CTD survey around Jarvis consisting of 19 CTDs. The other string of five traps could not be located. Operations were conducted at sunset, and the ship departed Jarvis Island at 2030 en route to Palmyra Atoll.
- 19 February Arrived at Palmyra Atoll at around 1300. Immediately commenced launching boats to begin coral reef assessment activities. Conducted three towed-diver habitat mapping surveys/fish counts and two fish and benthic REAs. Deployed

- four sonobuoys. Disembarked Woodward and Aycock to conduct terrestrial assessments.
- 20 February Conducted oceanographic surveys of ADCP transects and CTDs around Palmyra Atoll throughout the night . Experienced problem with CTD wire requiring retermination. Conducted five towed-diver habitat mapping surveys/fish counts and three fish and benthic REAs. Recovered four sonobuoys. Embarked Woodward and Aycock. Departed for Kingman Atoll at 2300.
- 21 February Arrived at Kingman Atoll at 0700. Commenced launching boats at sunrise to begin coral reef assessment activities. Conducted four towed-diver habitat mapping surveys/fish counts, three fish and benthic REAs, and 17 shallow water CTDs.
- 22 February Conducted oceanographic surveys of ADCP transects and two CTDs around Kingman Atoll throughout the night . Conducted 3 towed-diver habitat mapping surveys/fish counts, 3 fish and benthic REAs, and 15 shallow water CTDs. Deployed four sonobuoys. Safely landed and recovered Woodward and Aycock at both sand islands at Kingman Atoll for terrestrial surveys.
- 23 February Conducted oceanographic surveys of ADCP transects and CTDs around Kingman Atoll throughout the night . Conducted four towed-diver habitat mapping surveys/fish counts and three fish and benthic REAs. Recovered four sonobuoys. Removed small wooden derelict fishing boat from the shallow reef of the east lagoon. Departed Kingman Atoll at 2000 en route to Honolulu.
- 28 February Arrived at Snug Harbor, Honolulu at 1200 to conclude the cruise.

MISSIONS AND RESULTS:

- A. Characterize the species composition, abundance, percent cover, size distribution, and general health of the flora and fauna of the shallow water (<20 m) coral reef ecosystems of the U.S. Line and Phoenix Islands of the central equatorial Pacific.

A total of 32 rapid ecological assessment (REA) stations were conducted to assess the species composition, abundance, and size distributions of reef fishes, corals, algae, and invertebrates at Howland Island (6), Baker Island (6), Jarvis Island (4), Palmyra Atoll (7), and Kingman Atoll (9). A fish assessment team consisting of Bruce Mundy, Brian Zgliczynski, and Brian Greene and a benthic team consisting of Jim Maragos (corals), Dwayne Minton (invertebrates) and Karen Giesler (algae) surveyed most of the same sites to establish a more complete ecological assessment of each area surveyed. Each fish assessment station consisted of three consecutive fish counting transects of 25 meters each and one roving species-diversity survey within the visual field of the transect. Fish counts and size estimations on each transect included fish within 4 m of bottom and 2 m on either side of the transect. Each transect included 8-12 m/min swim-out counts and size estimations of fishes ≥ 20 cm Total Length (TL) and a slower swim-back count and size estimation of fishes ≤ 20 cm TL. After the fish team completed their first 25-m transect or

two, the benthic team commenced the coral, algae, and invertebrate assessments along the same transects. The coral assessments involved visual estimates of the abundance of each species of coral assigned to one of five categories: dominant, abundant, common, occasional, and rare. Video transects of corals along two of the fish team's 25-m long transect lines were also recorded for later quantitative analysis. The permanent transects at Howland, Baker, and Kingman were resurveyed using a combination of video transects and photoquadrats. Invertebrate and algae assessments entailed roving surveys in the vicinity of the two 25-m transect lines. Invertebrates were either field identified or collected for laboratory identification. Algae specimens were collected for laboratory identification.

From the fish and benthic REA stations, many new records of fish, corals, invertebrates and algae were found at each of the five islands/atolls visited and possibly some new species.

- B. A total of 31 towed-diver digital video habitat mapping surveys and fish counts were conducted to provide a spatial glimpse at the large-scale ecological setting of each island and atoll. The towed-diver surveys consisted of using the *Townsend Cromwell's* 15-ft SAFE boat to tow divers on paired towboards equipped with forward and downward digital video cameras (Sony PC-100), SeaBird SBE39 temperature and depth recorders, and paired lasers for projecting a 20-cm scale onto images of the habitat. The forward-looking camera is used to characterize habitat complexity, composition, and abundance and distribution of larger reef fishes. The downward-looking camera is used to quantitatively evaluate habitat types (live coral, dead coral, sand, algae, rock, etc.) and abundance and distribution of some macroinvertebrates. In addition, fish and habitat observers recorded abundances of ecologically and economically important fish taxa (sharks, jacks, snappers, groupers, etc.) and habitat complexity and percent cover of habitat types. The habitat observer also recorded observations of certain macroinvertebrates (lobsters, crown-of-thorns sea stars, urchins, giant clams, and anemones).
- C. Determine the existence of threats to the health of these coral reef resources from anthropogenic sources, including marine debris.

The MOCNESS plankton-net system was initially deployed at 0750 on the first night (May 28) of operations. The system appeared to be working well as it descended. The MOCNESS data acquisition programs supplied by Dave Griffith of the Southwest Fisheries Science Center, La Jolla Laboratory, worked well on the PC Windows operating system. These programs solved an incompatibility problem in which our older programs restricted data acquisition during a previous cruise (TC 99-11). Modifications of the PC computer system and the ship's SCS made by the *Townsend Cromwell's* augmenting electronic technician (ET) John Knox and survey technician Phil White also appeared to operate well. At approximately 11 minutes into the initial MOCNESS deployment at a net depth near 60 m, the signal was lost from the underwater electronics unit. Standard methods of reinitializing the system failed to restore the signal, as did checks of the various shipside cable connections. After retrieval of the MOCNESS, an inspection of the system showed no physical damage to the MOCNESS, cable, or termination. The inside of the underwater electronics cannister was dry with no sign of flooding. Checks of the electrical continuity of the termination, towing cable, slip rings, and cables to the electronics

laboratory showed good signal continuity through those components. ET John Knox inspected the fittings on the underwater electronics unit, discovered water in the external female plug connecting the towing cable to the unit, and found that the fit of this connection was no longer snug due to worn parts. The underwater electronics unit was taken into the electronics laboratory and connected directly to the MOCNESS "blue box," the laboratory unit that feeds the signal into the ship's computers. Tests showed no problems with the blue box and its connections. The electronic circuit boards within the underwater unit were replaced one by one. The system began working again when the underwater power-conversion board was replaced. John Knox's assessment was that the first power board had been damaged by a short circuit due to water entering the towing-cable plug on the outside of the canister. He thought that a second deployment of the net would result in the loss of the replacement board due to the same problem. Based on this assessment, no further MOCNESS operations were conducted during the remainder of this cruise.

A total of 24 night oblique Issacs-Kidd midwater trawls (IKMT) were conducted to capture species members of the mesopelagic boundary community. Eighteen of these trawls provided 26 specimens of shrimps, fishes, and squids from this community large enough to perform acoustic measurements on. Ten organisms that were not the target species were also large enough to be measured acoustically. Each individual animal was sedated and then mounted to a frame within a vertical water tank (dimensions of 4 ft each side and 6 ft tall) fitted with a modified bottom-mounted echosounder. The target strength of each individual was determined at the dorsal axis at five and ten degrees from the dorsal axis and at five and ten degrees tilted forward and tilted backward. These measurements will help refine the estimates of the density of mesopelagic organisms obtained during cruise TC 99-11. Measurements from nontarget species helped rule out confounding variables to these density estimates.

- D. Conduct shallow water CTDs and run shipboard ADCP transects around reef ecosystems to examine the role of oceanographic forcing on maintaining these island/atoll ecosystems.
- E. Conduct deepwater trap sampling to assess species composition and distribution of macroinvertebrates using lobster traps deployed from both the ship and possibly small boats.
- F. Conduct biological inventories of the terrestrial and avian species on the islands of the Pacific Remote Islands National Wildlife Refuges at Howland, Baker, Jarvis Islands, and Palmyra Atoll.
- G. Establish differential GPS monuments -- coordinates for significant landmarks and features to provide correction offsets for satellite and aerial imagery. Also provide accurate locations for possible long-term benthic reef monitoring test sites at Howland, Jarvis, and Baker Islands, should time permit.

DATA COLLECTED:

The following forms, logs, charts, and data records were kept and given to the Honolulu Laboratory upon termination of the cruise. These include all data captured onto computer

storage media during the cruise. All the records are filed there unless indicated otherwise in parentheses.

ADCP DOPPLER ping data files on CD-ROM*
 CTD Station Data Log Sheet
 Seabird CTD data files on CD-ROM*
 Digital camera photos (JPG file format) on CD-ROM*
 Marine Operations Log
 Scientist's Log
 SCS data files (raw & compressed) on CD-ROM*
 Station Number and Activity Log
 XBT (SEAS) data files on CD-ROM*

* All data files together on the same (1) CD-ROM

**SCIENTIFIC
 PERSONNEL:**

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Attachments

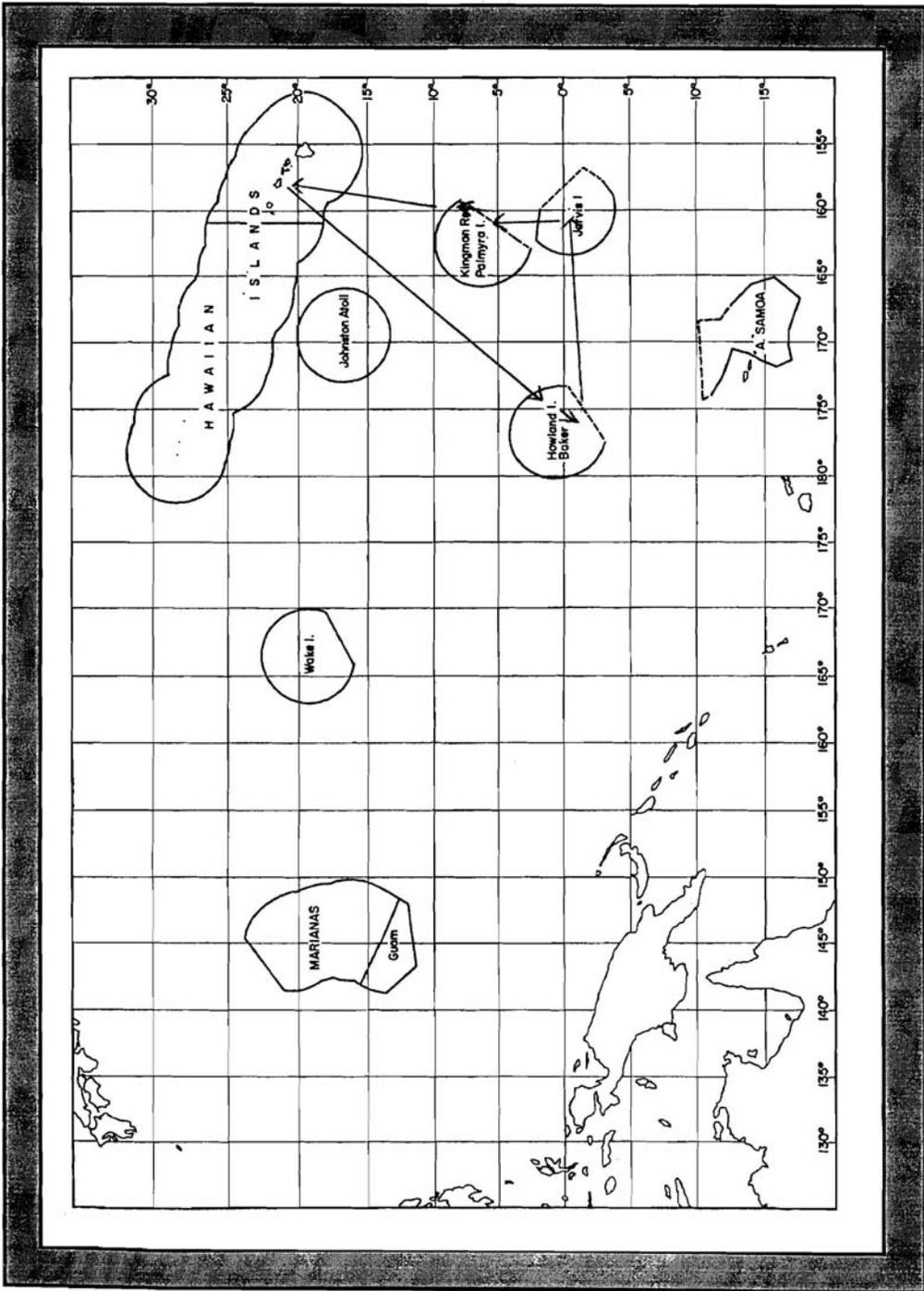


Figure 1. Track of NOAA ship Townsend Cromwell Cruise TC-01-01 (TC-264), January 30-February 28, 2001.