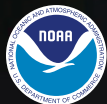


# Mountains in the Deep: Exploring the Central Pacific Basin

NOAA Ship *Okeanos Explorer*, April 27 – May 19, 2017

This expedition is part of the three-year Campaign to Address Pacific monument Science, Technology, and Ocean NEeds (CAPSTONE), an initiative to collect deepwater baseline information to support science and management decisions in and around U.S. marine protected areas in the central and western Pacific.



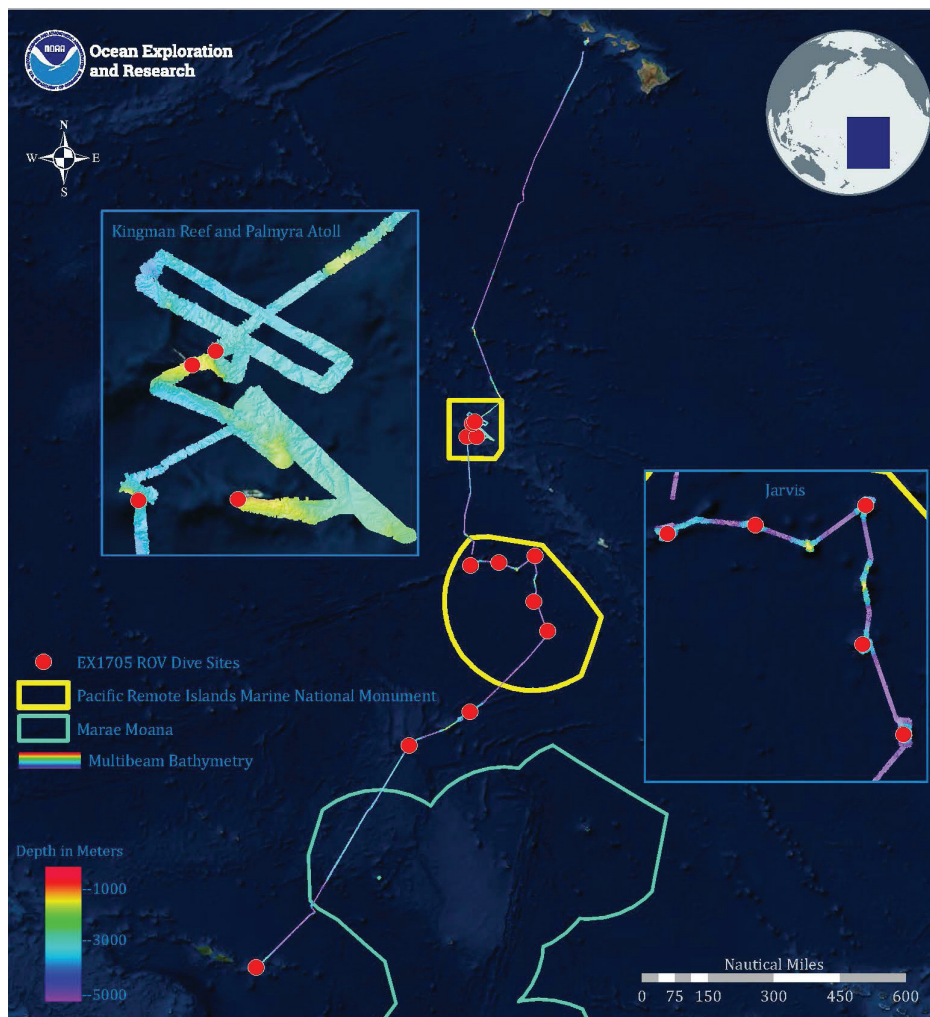
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## Summary Accomplishments

The Mountains in the Deep: Exploring the Central Pacific Basin expedition was a 23-day telepresence-enabled expedition to collect critical baseline information about unknown and poorly known deepwater areas of the Jarvis Island Unit and the Kingman Reef and Palmyra Atoll Unit of the Pacific Remote Islands Marine National Monument (PRIMNM); around Marae Moana (Cook Islands Marine Park); and the high seas. The goal of the expedition was to use remotely operated vehicle (ROV) dives and seafloor mapping operations to increase the understanding of the deep-sea ecosystems in these areas to support management decisions. Major accomplishments from this expedition are summarized below.

**Conducted 12 ROV dives** ranging in depth from 230 to 4,570 meters to learn more about remote areas of the central Pacific Basin. Operations focused on characterizing the morphology and geologic history of seafloor features and surveying midwater and benthic habitats. As the ship moved from the southern to the northern hemisphere, ROV dives explored precious coral and bottomfish habitats; abyssal communities in a deep fracture zone; and manganese-encrusted and carbonate seafloor habitats at seamounts, atolls, and islands.

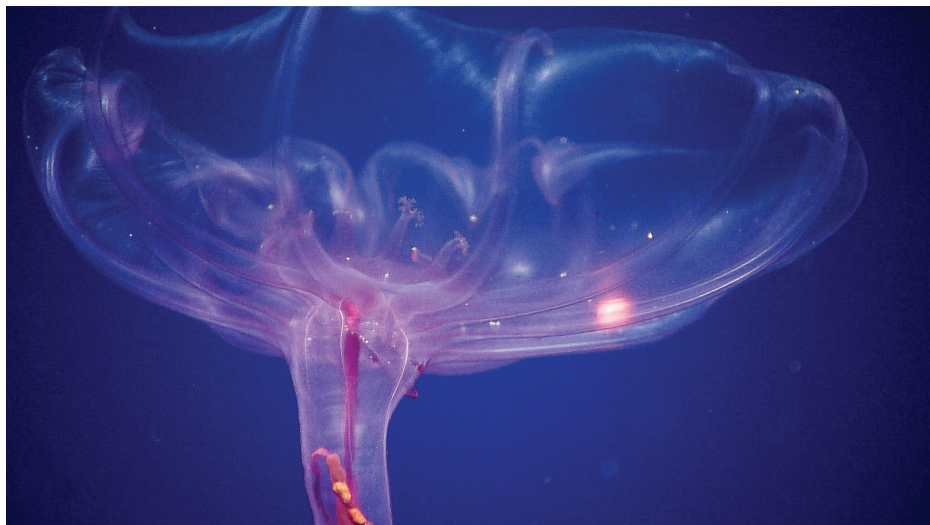
- Conducted dives in never-before explored and/or poorly understood areas, including five dives in the Jarvis Island Unit of the PRIMNM, four dives in the Kingman Reef and Palmyra Atoll Unit of the PRIMNM, two dives north of the Cook Islands, and one dive at the Aunu'u Unit of National Marine Sanctuary of American Samoa.



Overview map showing seafloor bathymetry and ROV dives completed during the *Mountains in the Deep: Exploring the Central Pacific Basin* expedition. Map courtesy of the NOAA Office of Ocean Exploration and Research.



- Surveyed for precious coral habitats and bottomfish/fishery habitats during three dives and identified deep-sea coral habitat on eight dives.
- Conducted the first ever [midwater transects](#) at three sites within the Jarvis and Kingman and Palmyra Units of PRIMNM and in the vicinity of the northern Manihiki Plateau.
- 95 scientists from the U.S., Japan, Russia, New Zealand, Canada, Cook Islands, the Netherlands, and Australia participated as members of the science team through telepresence – the highest number of scientists engaged during any *Okeanos Explorer* expedition and more than can fit on the vessel at one time.
- Discovered 11 high-density communities, seven of which were high-density deep-sea coral and sponge communities.
- Collected 79 biological specimens (25 primary specimens and 54 associates). The samples were primarily species that the expedition team could not identify and could be new species or new records for the region.
- Significant dive highlights included:
  - Discovery of an expansive large-scale deep-sea coral community, only the twelfth of its type known in the world
  - A snail predated upon a crinoid in the Kingman Reef and Palmyra Atoll Unit, which has only previously been known from the Paleozoic (541 to 252 million years ago) fossil record
  - Midwater transects that documented a diversity of organisms, including dozens of observations of a pelagic holothurian that was previously thought to be rare and a doliolid, which is the third observation of this order in the Central Pacific
  - A benthic jellyfish that is only known from the poles and is the first observation for the Central Pacific
  - A rare observation of a chitinous anemone at the Clipperton Fracture Zone in Jarvis that is primarily known from deep trench environments
  - A trio of brittle stars capturing a squid in the Jarvis Island Unit – the first known deepwater observation of this behavior



Several pelagic holothurians, or deep-sea swimming cucumbers, were observed during midwater transects and transits to the seafloor while in the Southern Hemisphere. These are the only truly pelagic sea cucumbers and were previously thought to be an uncommon organism. *Image courtesy of the NOAA Office of Ocean Exploration and Research, Mountains in the Deep: Exploring the Central Pacific Basin.*



A rare sighting of a snail predated upon a crinoid in the Kingman Reef and Palmyra Atoll Unit – notice the snail's extended proboscis reaching into the upper surface of the crinoid calyx. Multiple snails were observed laying eggs on the crinoid stalk they were occupying. *Image courtesy of the NOAA Office of Ocean Exploration and Research, Mountains in the Deep: Exploring the Central Pacific Basin.*

## Mapped more than 36,800 square kilometers of seafloor, an area larger than the state of Maryland.

- Collected over 4,300 square kilometers of mapping data over seafloor in Marae Moana. Additional mapping was conducted over [priority areas north of the Cook Islands](#). Newly acquired multibeam data, along with the ROV sampling, could indicate a potential connection between ridge features and the Manihiki Plateau.
- Mapped over 7,900 square kilometers in the Jarvis Island Unit of the Pacific Remote Island Marine National Monument. With this expedition, *Okeanos Explorer* has now mapped all or part of every major seamount in Jarvis.
- Multibeam bathymetry over several features differed significantly from that suggested by satellite altimetry data; some summits were over 1,000 meters shallower than anticipated.



An unusual umbrella-shaped pedestal that was covered with corals and sponges during the dive near Jarvis Island. A closer look revealed numerous shrimp, crabs, brittle stars, and fish living within this structure. *Image courtesy of the NOAA Office of Ocean Exploration and Research, Mountains in the Deep: Exploring the Central Pacific Basin.*

## Investigated a variety of different geological features including seamounts, atolls, ridges, and plateaus.

- Collected data on eight dives that will help increase our understanding of the [geologic history of the Central Pacific Basin](#).
- Collected 16 rock samples for use in geochemical composition analysis and age dating to increase the understanding of the formation of these features.

**Collected more than 7.2 TB of data**, including multibeam, single beam, subbottom, ADCP, XBT, CTD and dissolved oxygen profiles, surface oceanographic and meteorological sensors, video, imagery, and associated dive and video products. All of the data from this expedition will be made publically available through national archives.

## Engaged with audiences around the world, opening a window to the deep sea in some of the planet's most remote locations.

- Shared the live video feeds of the expedition with the public worldwide via the Internet, with the live video receiving more than 2.5 million views via multiple platforms, including YouTube and Facebook. Expedition content on the NOAA Office of Ocean Exploration and Research website received over 71,000 views.
- Conducted a successful Reddit "Ask Me Anything" which reached millions and was one of the most successful ever hosted by NOAA.
- Nearly 400 students, teachers, media outlets, and VIPs toured the *Okeanos Explorer* while at the port of Pago Pago, American Samoa. Additionally, approximately 1,000 cruise ship passengers attended the Festival of Sites and presentations hosted by the expedition team.
- Received news and media coverage by various sources including New Scientist, MSN.com, RadioNZ, New Zealand's Sunday Star-times, UK's Express, 20 Minutes Mexico, Live Science, Motherboard, as well as others.
- Conducted six live telepresence interactions with various groups and hosted two Facebook Live interactions, a first for NOAA's Office of Ocean Exploration and Research.

## For More Information

<http://oceanexplorer.noaa.gov/okeanos/explorations/ex1705/welcome.html>



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