

EXPLORING DEEP-SEA HABITATS NEAR KINGMAN REEF & PALMYRA ATOLL (NA149)

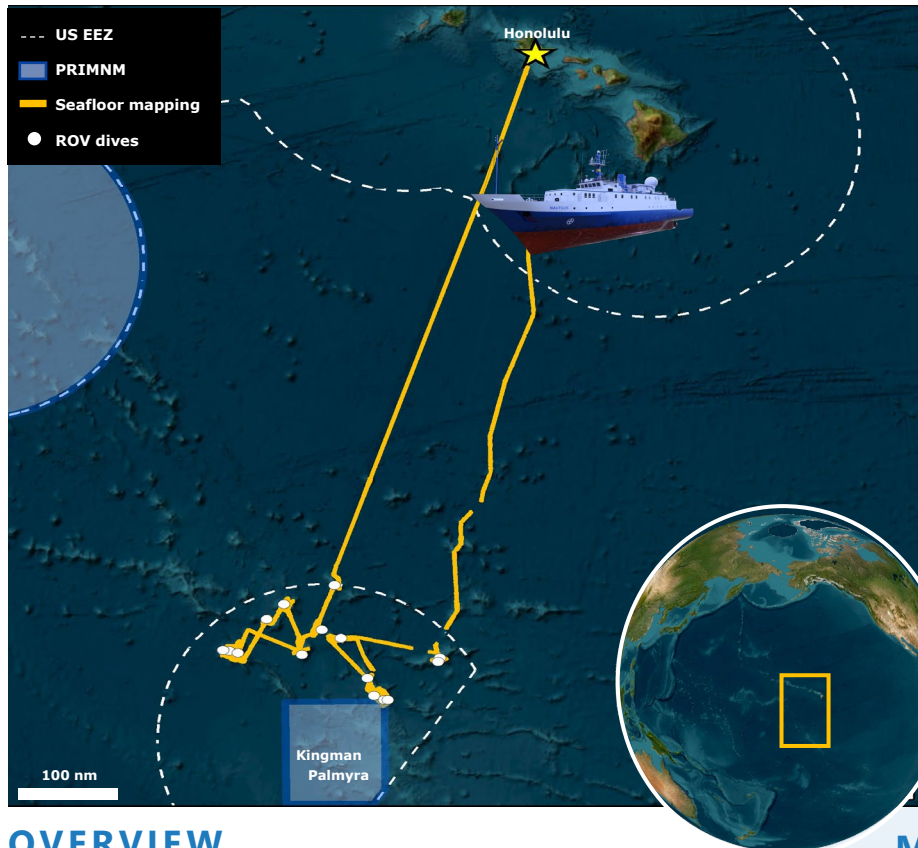
May 16 – June 13, 2023












Geographic Focus: US waters around Kingman Reef and Palmyra Atoll

Main Operations: Remotely operated vehicle dives and seafloor mapping

Sponsor: NOAA Ocean Exploration via the [Ocean Exploration Cooperative Institute](https://oceanexploration.noaa.gov/)

Expedition webpage: www.nautiluslive.org/cruise/NA149



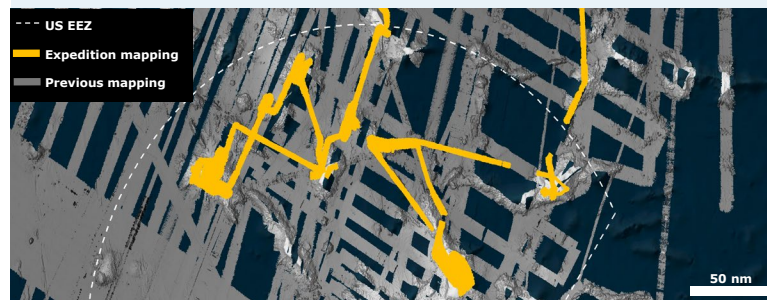
-  **29** days at sea
-  **24,095** km² of seafloor mapped
-  **16** successful ROV dives
-  **192** samples collected
-  **8** students sailed on expedition
-  **52** scientists participated remotely
-  **105** live ship-to-shore interactions
-  **>3,600** ship-to-shore participants
-  **>248,000** highlight video views
-  **>453,000** live stream views
-  **>8,200,000** social media views

OVERVIEW

From May 16-June 13, 2023, the [Ocean Exploration Trust](https://oceanexploration.noaa.gov/) and partners conducted a telepresence-enabled expedition to explore the deep-sea biology and geology in US waters surrounding Kingman Reef and Palmyra Atoll. The expedition used the E/V *Nautilus'* [remotely operated vehicles](https://oceanexploration.noaa.gov/) (ROVs) and [acoustic sonars](https://oceanexploration.noaa.gov/) to survey unexplored areas located mostly north of the Kingman/Palmyra Unit of the Pacific Remote Islands Marine National Monument (PRIMNM). A total of 31 scientists, engineers and students sailed on the expedition, who were supported by 52 professionals from 39 institutions that participated remotely via telepresence technology. Throughout the planning and execution of the mission, the team worked closely with the science and resource management community to ensure that expedition activities addressed priority needs, including the [Monument Management Plan](https://www.fishbase.org/monuments/primnm/) that is currently being developed and the [proposed designation of the area](https://www.fishbase.org/monuments/primnm/) as a National Marine Sanctuary.

MAPPING SUMMARY

Over 24,095 km² of seafloor were mapped over the course of the expedition, including 13,124 km² inside the US exclusive economic zone. Seafloor mapping focused on filling data gaps north of the Kingman/Palmyra Unit of PRIMNM. Ten different seamounts were partially mapped, including the remaining mapping gaps over two larger flat-topped seamounts (also known as guyots).

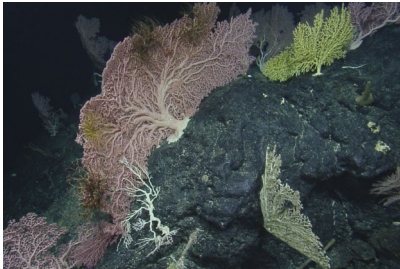


ROV SUMMARY

The expedition completed 16 successful ROV dives at depths ranging from 1,087-3,111 meters, which focused on exploring previously unsurveyed seamounts. [Noteworthy observations](#) included [high-density coral gardens](#), [new species of jellyfish](#), [fossilized whale bones](#), among others. Overall, hundreds of species were documented, including several potentially undescribed species, and several range extensions. A total of 95 biological, 59 geological, and 38 eDNA water samples were collected, which will support ongoing studies on the deep-sea biodiversity, geological age, and volcanic history of the region. In addition to exploring previously unsurveyed areas, six ROV dives included the first-time integration of the "[Laser Divebot](#)" [Raman and fluorescence spectrometer](#). *In situ* data collected by the spectrometer will be compared to lab-based analyses of collected samples, and thereby help develop important new tools for ocean exploration.

BIOLOGY HIGHLIGHTS

Two individuals of an undescribed species of *Bathycorus* jellyfish were documented, along with the only second-ever collection of an undescribed corallivorous jellyfish species that has been documented throughout the Central Pacific but has thus far been extremely difficult to collect hampering efforts to formally describe it. Another notable collection included what are believed to be *Osedax* bone-eating worms. If this field identification is correct, this would represent a significant range extension and likely a new species of bone-eating worms. The expedition also documented three high-density coral communities, two dominated by bamboo corals and one by a high diversity of different coral groups. These observations mark the first ever high-density coral communities documented in the region outside the Monument.



GEOLOGY HIGHLIGHTS

A diversity of rock types were recovered from across ten seamounts, nearly all of which were coated with ferromanganese oxyhydroxide crusts. Basalt samples ranged from highly altered to unaltered, and displayed a range of vesicularity that may reveal their original depth of eruption. Sedimentary rocks, including volcanoclastic deposits and cemented breccias of basalt and carbonate, were recovered on the lower slopes of seamounts. On the seamount summits, uplift exposed sedimentary rocks that formed in the lagoons of the former atolls. The team also documented four fossilized skull fragments of beaked whales that were heavily encrusted by ferromanganese crust indicating their significant age. One melon-sized pumice sample was recovered, which presumably completed a long transit at the sea surface from its site of eruption before settling to the seafloor in this remote region.

EDUCATION & OUTREACH

Over the course of the expedition, live video feeds received over 453,000 views and highlight videos garnered nearly 249,000 views. Expedition content on OET's TikTok account gained over 8.2 million views, whereas posts on Instagram, Twitter, Facebook, and LinkedIn attracted over 77,000 impressions. While at sea, the team created 21 [new education and outreach products](#) and hosted 105 [live ship-to-shore interactions](#) with schools, community events and professional meetings, reaching over 3,600 people in 26 US States, two US territories, and six countries. Three [Science Communication Fellows](#), five [Science and Engineering Interns](#), and three additional students participated in the expedition, gaining valuable at-sea experience. Early expedition results were featured in 142 media stories published in 27 countries and 15 different languages, including coverage on BBC News and The Weather Channel.

BROADER IMPACTS

Expedition operations were conducted in unexplored priority areas identified by the science and management community, thus contributing directly to the [US National Strategy for Ocean Mapping, Exploration, and Characterization](#), [Seabed 2030](#), and the [UN Decade of Ocean Science for Sustainable Development](#). Data collected on this mission will also support decision making relating to the [PRIMNM Management Plan](#) that is currently being developed and the [proposed designation of the area as a National Marine Sanctuary](#). The ROV integration of the Laser Divebot will support the development of important new exploration tools.

Expedition activities also advanced [NOAA priorities](#), particularly in terms of understanding ocean changes, sharing that knowledge with others and conserving marine ecosystems. This work also advanced priorities on diversity and inclusion by providing opportunities for individuals from underrepresented minority groups to participate in expedition activities.

DATA ACCESS

Data collected during the expedition, including imagery, environmental, and physical samples collected on ROV dives, as well as mapping and environmental data collected by ship-based sensors, have been sent to repositories for archiving and public distribution.

Links to these data repositories are provided here. These data sets are also available from OET [upon request](#).

ARCHIVE

NautilusLive.org

[Rolling Deck to Repository](#)

[Marine Geoscience Data System](#)

[YouTube](#)

[Marine Geological Samples Lab at the University of Rhode Island](#)

[Harvard University's Museum of Comparative Zoology](#)

DATA TYPES

Background information, highlight imagery and informational materials

Ship navigation, weather and mapping data

Mapping and ROV data

Full ROV videos and highlights

Geological samples

Biological samples

ACKNOWLEDGMENTS

Special thanks to the captain and crew of E/V *Nautilus*, the Nautilus Corps of Exploration, the Ocean Exploration Trust, and all that supported the expedition from shore. The expedition was funded by NOAA Ocean Exploration via the Ocean Exploration Cooperative Institute. Activities inside the Monument were conducted under permit 12543-23002 authorized by the US Fish and Wildlife Service.