

# DEEP-SEA BIODIVERSITY & ANCIENT SEAMOUNT EXPLORATION NEAR JOHNSTON ATOLL (NA153)

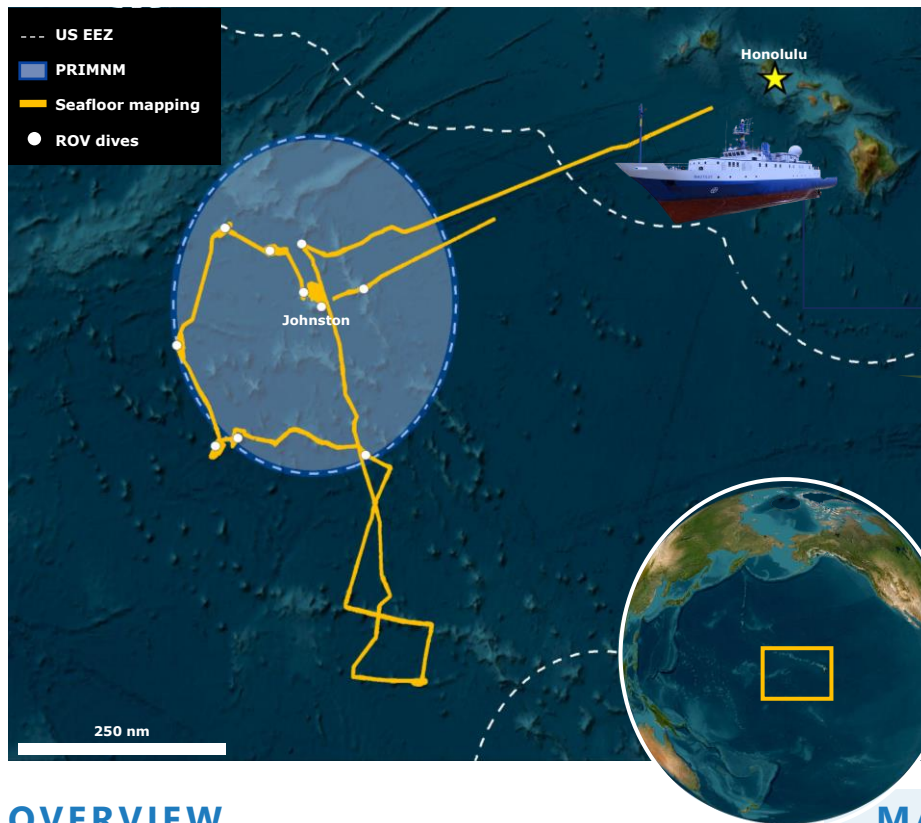
August 2– 29, 2023












**Geographic Focus:** Deep sea surrounding Johnston Atoll, including within the Pacific Remote Islands Marine National Monument

**Main Operations:** Remotely operated vehicle dives and seafloor mapping

**Sponsor:** NOAA Ocean Exploration via the [Ocean Exploration Cooperative Institute](https://oeci.org)

**Expedition webpage:** [www.nautiluslive.org/cruise/NA153](http://www.nautiluslive.org/cruise/NA153)



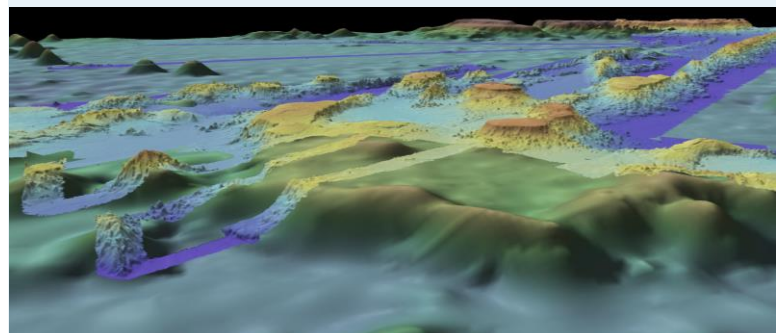
-  **27** days at sea
-  **32,259** km<sup>2</sup> of seafloor mapped
-  **11** successful ROV dives
-  **283** samples collected
-  **9** students or recent alumni sailed
-  **73** scientists participated remotely
-  **69** live ship-to-shore interactions
-  **1,917** ship-to-shore participants
-  **>139,000** highlight video views
-  **>188,000** live stream views
-  **>4,000,000** social media views

## OVERVIEW

From August 2-29, 2023, the Ocean Exploration Trust and partners conducted a telepresence-enabled expedition to explore the deep-sea biology and geology surrounding Johnston Atoll. The expedition used the E/V Nautilus' [remotely operated vehicles \(ROVs\)](#) and [acoustic sonars](#) to survey unexplored areas located mostly in the Johnston Unit of the Pacific Remote Islands Marine National Monument (PRIMNM). A total of 30 scientists, engineers and students sailed on the expedition, who were supported by 73 professionals from 52 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](#) that is currently being developed and the [proposed designation of the area as a National Marine Sanctuary](#).

## MAPPING SUMMARY

Seafloor mapping focused on filling data gaps inside the Johnston Unit of the Monument and during transits to and from Honolulu, with additional mapping occurring south of the Monument, where the ship had to move to avoid Hurricane Dora. A total of 32,259 km<sup>2</sup> of seafloor were mapped over the course of the expedition, including 19,488 km<sup>2</sup> in the US exclusive economic zone, and 17,318 km<sup>2</sup> inside the Monument.

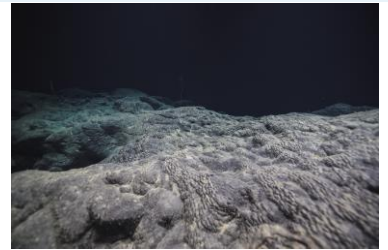
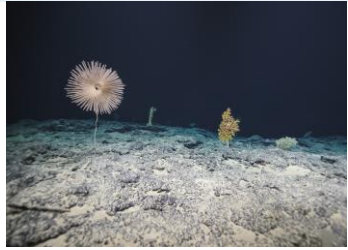
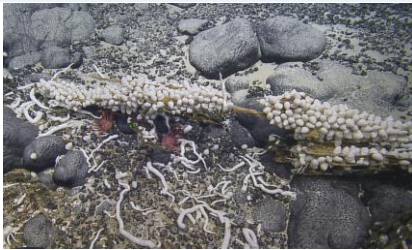


## ROV SUMMARY

Despite logistical challenges as a result of Hurricane Dora, the expedition completed 11 successful ROV dives at depths ranging from 975-3,163 meters for a total dive time of over 170 hours. [Noteworthy observations](#) included high-density coral gardens, evidence of extensive past lava flows at the summits of seamounts, and deep-sea observations of in-place coral reef outcrops. Overall, hundreds of species were documented, including several potentially undescribed species. A total of 166 discrete biological, 92 geological, and 26 eDNA water samples were collected, which will support ongoing studies on the deep-sea biodiversity, geological age, and volcanic history of the region.

## BIOLOGY HIGHLIGHTS

High-density communities were observed on 9 of the 11 ROV dives and were mostly associated with iron-manganese crust substrates or steep terrain. On softer substrate or small nodule beds, assemblages dominated by glass sponges, black corals, cup corals, and tunicates were seen. Noteworthy on this expedition was the encounter of a large wood-fall community and recovery of at least six wood-fall specialist species, neither of which have been previously reported from the deep sea in the US Pacific Remote Islands. Environmental DNA samples were obtained at 26 high-density coral communities and were associated with 36 octocoral vouchers for the development of genetic reference libraries. Other highlights included the sampling of three species of rare gelatinous tunicates, numerous habitat-forming organisms (55 corals and 16 sponges), and their associated fauna. Preliminary observations indicate that 14 biological samples collected on this expedition represent either new species or new records for the region.



## GEOLOGY HIGHLIGHTS

A total of 89 rock samples and 3 sediment push cores were collected during the expedition. Most rock samples were ferromanganese-encrusted basalts with variable degrees of alteration, but a significant number of hyaloclastite flow breccias and carbonate-rich rocks were also collected. Each of the surveyed seamount summits was covered in basalts with various lava morphologies (e.g., pillows, flows and tubes), which suggests a need for an update to the conventional model of flat-topped seamount formation. Only one dive (H1997) provides significant evidence of carbonate reefs near the summits, but these carbonates were topped by lava flow morphologies and basalts. A sample of possible carbonate reef limestone was sampled in the talus near the beginning of another dive (H1993). A series of terraces were observed in the bathymetry across the summit of a flat-topped seamount explored during dive H2001. The ROV reached the deepest terrace above the main scarp, which consisted of a flow front of lava morphologies.

## EDUCATION & OUTREACH

Over the course of the expedition, live video feeds received 188,133 views and highlight videos garnered another 139,468 views. Expedition content on OET's [TikTok](#) account gained over 3.5 million views during the expedition, plus posts on [Instagram](#), [Twitter](#), [Facebook](#), and [LinkedIn](#) attracted over 500,000 impressions. While at sea, the team created seven new [education and outreach products](#) and hosted 69 [live ship-to-shore interactions](#) with schools and community events reaching 1,917 people in 18 US states, and four countries. Three [Science Communication Fellows](#), three [Science and Engineering Interns](#), and six additional students or recent alumni participated in the expedition, gaining valuable at-sea experience. Early expedition results were featured in 11 media stories, including coverage on participating Science Communication Fellows and our new [partnership with Ocean Census](#).

## 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 [Monument Management Plan](#) that is currently being developed and the [proposed designation of the area as a National Marine Sanctuary](#).

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

## 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](https://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.