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

OVERVIEW
From May 16-June 13, 2023, the Ocean Exploration Trust 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 (ROVs) and acoustic sonars 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 that is currently being developed and the proposed designation of the area 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 *Bathykorus* 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 hammering 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 volcanioclastic 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.

**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**
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