# Mattingan: Mariana Arc Volcanic Exploration (NA171)

May 7 - 28, 2025

21 days at sea Expedition port US EEZ мтмлм 20,504 km<sup>2</sup> of seafloor mapped Seafloor mapping **ROV** dives 9 successful ROV dives AUV dives **115** hours of ROV exploration 84 samples collected 6 AUV dives **68** hours of AUV exploration students sailed on expedition **116** live ship-to-shore interactions **4,050** ship-to-shore participants 158,559 live stream views 63,734 highlight video views 2,900,000 social media views

**Geographic Focus**: US Exclusive Economic Zone around Guam and the Commonwealth of the Northern Mariana Islands **Main Operations**: ROV dives, seafloor mapping using ship-based sonars, and Orpheus AUV dives

**Sponsor**: NOAA Ocean Exploration and the Bureau of Ocean Energy Management via the <u>Ocean Exploration Cooperative</u> <u>Institute</u>, with scientific support from the US Geological Survey **Expedition Webpage**: <u>https://NautilusLive.org/cruise/na171</u>

## **OVERVIEW**

Between May 7-28, the Ocean Exploration Trust and partners conducted a telepresence-enabled expedition to explore offshore areas around the Mariana Islands. This 21-day expedition utilized the <u>remotely operated</u> <u>vehicle (ROV)</u>, <u>mapping</u>, and <u>telepresence systems</u> of E/V *Nautilus* in combination with the <u>Orpheus autonomous underwater vehicle (AUV)</u> to explore priority areas identified by the management and science community, including sites that have evidence of recent volcanism, abyssal plain habitats, bottomfish habitats, and mesophotic coral ecosystems.

## **MAPPING SUMMARY**

Seafloor mapping focused on filling data gaps in the US Exclusive Economic Zone around the Mariana Islands, including over ROV dive sites without public mapping data, and during transits between ROV and AUV surveys. A total of 20,504 square kilometers were mapped over the course of the expedition, including 4,170 square kilometers inside the Mariana Trench Marine National Monument (MTMNM). This included mapping volcanically-active features such as Ahyi Seamount, where major seafloor changes were detected since these features were last surveyed, including a large new summit cone that grew during the latest eruption in 2023. Mapping in these areas also detected bubble plumes being emitted from the seafloor into the water column above the seamounts, and were used to plan ROV surveys on these volcanically-active areas.





#### **AUV SUMMARY**

The expedition completed six <u>Orpheus AUV dives</u> for a total dive time of 68 hours and 16.6 hours of exploring the seafloor at depths between 2,400-5,700 meters. This included two engineering dives at depths of 2,400-2,500 meters, during which various components of the vehicle were tested in the field, as well as four operational dives to depths of 5,600-5,700 meters, during which abyssal plain habitats were maged for the first time in the Mariana region using high-resolution cameras.



#### **EDUCATION & OUTREACH**

Over the course of the expedition, live-stream video feeds received over 158,000 views and highlight videos garnered close to 64,000 views. Expedition content on OET's social media channels attracted over 2.9 million impressions. While at sea, the team created 21 new education and outreach products, and hosted 116 live ship-to-shore interactions with schools, community events, and professional meetings, reaching over 4,000 people across the Commonwealth of the Northern Mariana Islands, Guam, American Samoa, 18 US States, and six other countries. Early expedition results were featured in 39 media stories.

#### ACKNOWLEDGEMENTS

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 and the Bureau of Ocean Energy Management via the Ocean Exploration Cooperative Institute, with scientific support from the US Geological Survey. Expedition activities in the Mariana Trench Marine National Monument were conducted under permit #12540-25001 authorized by the US Fish and Wildlife Service.

#### **ROV SUMMARY**

The expedition completed nine successful ROV dives for a total dive time of 115 hours and 85 hours of seafloor exploration at depths between 450-3,700 meters. These dives explored a wide range of underwater features, including a seamount east of the Mariana Trench on some of the world's oldest seafloor (Vogt), two seamounts in the northern part of the Mariana Arc with shallow summits (Daikoku and Ahyi), two deep sites along the Mariana Backarc (Burke and Hafa Adai hydrothermal vent fields), and two previously unexplored mesophotic coral ecosystems on the Western Mariana Ridge. Noteworthy ROV observations included:

- At <u>Ahyi Seamount the ROVs explored a recently-formed lava cone</u> and found that it was still intensely degassing over a very large area. On shallow areas surrounding the volcano summit, the ROVs documented dense coral reef communities, surprisingly unaffected by the recent volcanic eruptions.
- At <u>Daikoku Seamount the ROVs documented substantial changes</u> since this feature was last surveyed in 2016, including that the molten sulfur pond near the summit was no longer present. Nevertheless, the ROV documented several active hydrothermal vents emitting carbon dioxide bubbles and sulfur-rich particle plumes, as well as thriving biological communities, including numerous flatfish and tubeworms.
- ROV surveys of the Hafa Adai hydrothermal vent field discovered that its large black smoker chimney had toppled over since it was first discovered in 2016, and that a new smaller chimney was re-growing in its place. The ROVs also documented several other chimneys, some of which were up to 35 meters tall.
- Two shallow seamounts on the Western Mariana Ridge were explored for the first time, and <u>discovered to host healthy reefs at</u> <u>depths between 50-100 meters</u>, expanding the known range of coral reef habitats in the region to far offshore seamounts located 240 kilometers west of the Mariana Islands.

A total of 84 primary samples were collected during the ROV dives, including 42 biological and 42 geological and geochemical fluid samples, which will support studies on the biodiversity, biogeography, and geological context of the region.



### DATA ACCESS

Data collected during the expedition will be sent to repositories for archiving and public distribution, links to which are provided below. These datasets are also available from <u>OET upon request</u>.

ARCHIVE	DATA TYPES
NautilusLive.org	Background information, highlight imagery and informational materials
Rolling Deck to Repository	Ship navigation, weather, and mapping data
Marine Geoscience Data System	Mapping and ROV data
YouTube	Full ROV videos
Marine Geological Samples Laboratory at the University of Rhode Island	Geological samples
Museum of Comparative Zoology	Biological samples
BCO-DMO website	AUV data