

E Mamana Ou Gataifale I - Exploring Deep Waters of American Samoa (NA165)

September 1-24, 2024

- 23 days at sea
- 8,458 km² of seafloor mapped
- 17 successful ROV dives
- 10 successful *Sentry* dives
- 598 samples collected
- 102 live ship-to-shore interactions
- 3,125 ship-to-shore participants
- 126,600 highlight video views
- 199,000 live stream views
- >1,590,000 social media views



Geographic Focus: American Samoa, including within the National Marine Sanctuary of American Samoa

Main Operations: ROV dives, AUV *Sentry* dives, and seafloor mapping using ship-based sonars

Sponsor: NOAA Ocean Exploration, NOAA Uncrewed Systems Operation Center, and Bureau of Ocean Energy Management via the Ocean Exploration Cooperative Institute

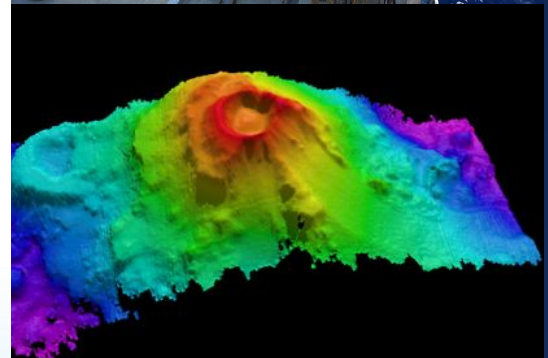
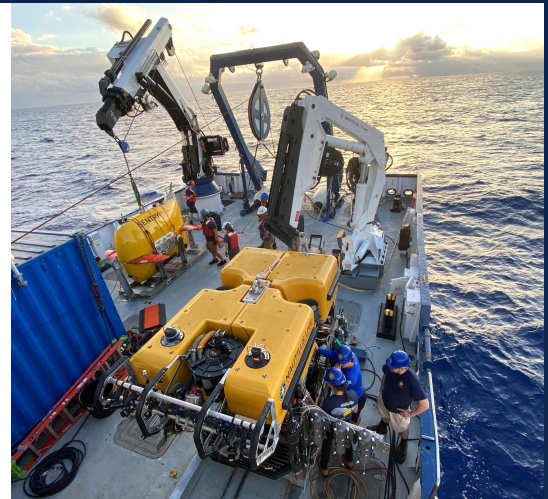
Expedition Webpage: <https://nautiluslive.org/cruise/na165>

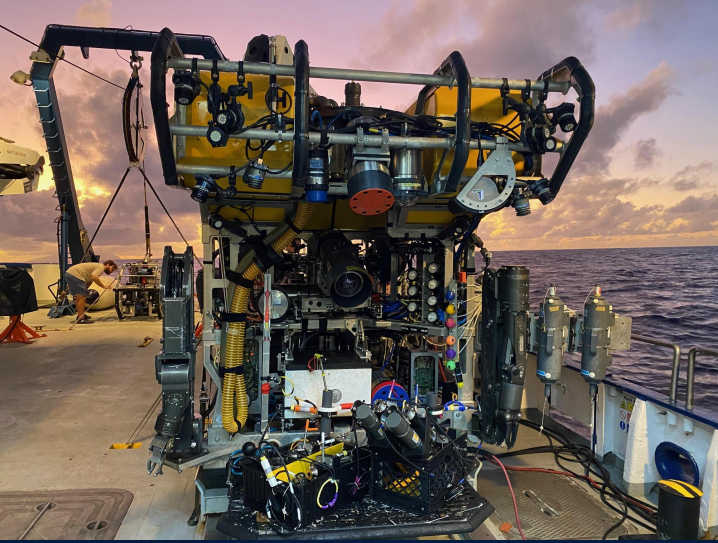
OVERVIEW

Between September 1-24, 2024, E/V *Nautilus* completed a telepresence-enabled expedition to explore deep-sea habitats of American Samoa. The expedition used the [remotely operated vehicle \(ROV\)](#), [mapping](#), and [telepresence](#) capabilities of E/V *Nautilus* in combination with [AUV *Sentry*](#) to explore priority areas identified by the science and management community, including Vailulu'u Seamount, unexplored seamounts, bottomfish habitats, areas of historic volcanic eruptions, and abyssal plains. Throughout the planning and execution of the mission, the team worked closely with the National Marine Sanctuary of American Samoa and other local stakeholders to ensure that expedition activities addressed local priority needs, including incorporating Samoan language, worldview, and cultural protocols into expedition activities.

E/V NAUTILUS MAPPING SUMMARY

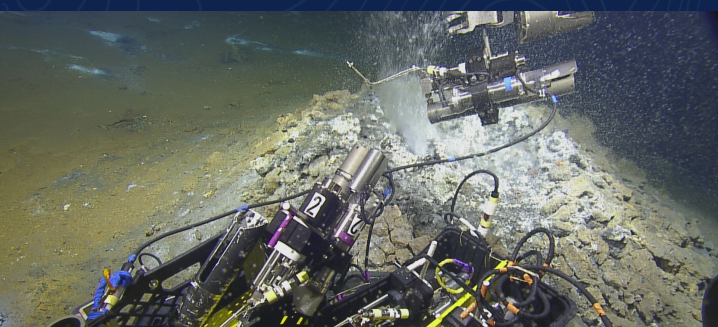
Seafloor mapping focused on filling data gaps in the Muliava Unit of the National Marine Sanctuary of American Samoa and the southeastern corner of the US Exclusive Economic Zone around American Samoa. A total of 8,458 square kilometers of seafloor were mapped over the course of the expedition, including 2,249 square kilometers inside the Sanctuary. This included filling mapping gaps over 7 different seamounts, information from which was critical to plan ROV surveys on these previously unexplored features.





ROV SUMMARY

The expedition completed 17 successful ROV dives to depths of 294-3,007 meters for a total dive time of over 187 hours. This included 7 dives focused on surveying Vailulu'u Seamount, the only hydrothermally active seamount in American Samoa, and 10 dives that explored other seamounts, ridges, and submerged banks. ROV surveys at Vailulu'u recorded continuous data using a miniature autonomous plume recorder, discovered new areas of diffuse venting fluids, collected 4 active vent fluid samples using isobaric gas tight samplers, measured vent temperatures of up to 213 °C (415 °F), and mapped active vents on the eastern rim of the seamount using a multibeam sonar mounted on ROV *Hercules*. Major ROV achievements included successfully integrating two instruments that were recently developed at Woods Hole Oceanographic Institution. This included the Sensor for Aqueous Gases in the Environment that was used to gather *in situ* methane and carbon dioxide data, and an autonomous eDNA multisampler that was used to filter over 16,000 liters of seawater at depth and collect 248 environmental DNA samples. This included one sample that was filtered at 2,907 meters, a new record for the system. An additional 350 biological and rock samples were collected during ROV dives to support studies on the biodiversity, biogeography, and geological context of the region.



ACKNOWLEDGEMENTS

Thanks to the captain and crew of *E/V Nautilus*, Nautilus Corps of Exploration, Ocean Exploration Trust, and all who supported the expedition ashore. Expedition activities in the Sanctuary were executed under permit NMSAS-2024-003 authorized by the NOAA Office of National Marine Sanctuaries, and in territorial waters under permit 2024-003 authorized by the American Samoa Department of Marine and Wildlife Resources. The expedition was funded by NOAA Ocean Exploration, NOAA Uncrewed Systems Operation Center, and Bureau of Ocean Energy Management via the Ocean Exploration Cooperative Institute.

AUV SUMMARY

The expedition completed 10 successful AUV *Sentry* dives for a total dive time of over 142 hours. AUV dives surveyed a cumulative trackline of over 309 kilometers, which focused on continuing the search for the Samoan Clipper underwater cultural heritage site, characterizing abyssal plain habitats, and detecting hydrothermal venting signals in the water column above Vailulu'u Seamount. In the search for the Samoan Clipper, AUV *Sentry* mapped the seafloor in the primary search areas at <20 centimeter resolution, which revealed detailed geologic features, but no evidence of the downed craft. Abyssal plain characterization surveys focused on 5,500-5,800 meter depths, which were near the operational limits of the vehicle causing issues with the communication system and release of weights. Despite these challenges, three successful surveys were conducted, which collected high-resolution bathymetry, sidescan sonar, and video data in abyssal plain habitats identified as high priorities for the Bureau of Ocean Energy Management. AUV *Sentry* dives at Vailulu'u completed a comprehensive mapping survey at the summit crater, which provided the most detailed view to date of the geology associated with the 2006-2019 eruption of the Nafanua Cone. Additionally, AUV *Sentry* conducted multiple dives to test new algorithms for locating plumes and new sensor modalities for characterizing plumes. These dives required data to be transmitted to shore-side participants in near real time, a unique feat for an untethered autonomous system.



EDUCATION & OUTREACH

Prior to the the expedition, the team welcomed community members onboard *E/V Nautilus* for a ship tour event. Over the course of the expedition, live-stream video feeds received 199,000 views, highlight videos garnered 126,600 views, and content on OET's social media accounts attracted 1,590,000 impressions. While at sea, the team created 25 new education and outreach products, and hosted 102 live ship-to-shore interactions in English and Samoan language, reaching over 3,125 people across 30 US States, American Samoa, Guam, the Commonwealth of the Northern Mariana Islands, Virgin Islands, Canada, and Brazil. Three professional educators and seven university students sailed on the expedition. Early expedition results were featured in 46 media stories published in five different countries.

DATA ACCESS

Data collected during the expedition has been sent to repositories for archiving and public distribution, links to which are provided below.

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 Lab at the University of Rhode Island	Geological samples
Harvard University's Museum of Comparative Zoology	Biological samples
National Center for Biotechnology Information Sequence Read Archive (NCBI SRA)	eDNA sequence information
Marine Geoscience Data System and Woods Hole Open Access Server	AUV <i>Sentry</i> data