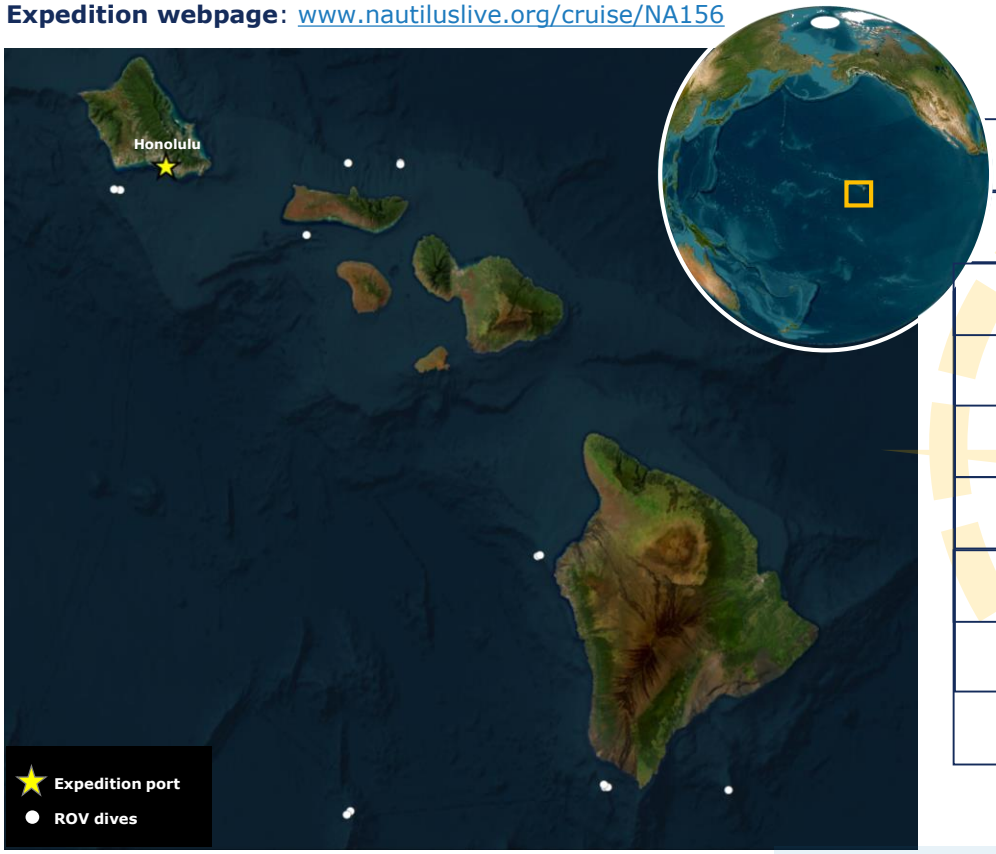
NAUTILUS LIVE
OCEAN EXPLORATION TRUST

OCEAN EXPLORATION THROUGH ADVANCED IMAGING (NA156)

October 22 – November 5, 2023

Geographic Focus: Main Hawaiian Islands
Main Operations: Remotely operated vehicle dives
Sponsor: Office of Naval Research
Expedition webpage: www.nautiluslive.org/cruise/NA156



14 days at sea
14 successful ROV dives
101 hours of ROV dive time
76 hours of seafloor exploration
6 students sailed on expedition
106 live ship-to-shore interactions
>6,100 ship-to-shore participants
>56,000 live stream views
>123,000 highlight video views
>553,000 social media views

OVERVIEW

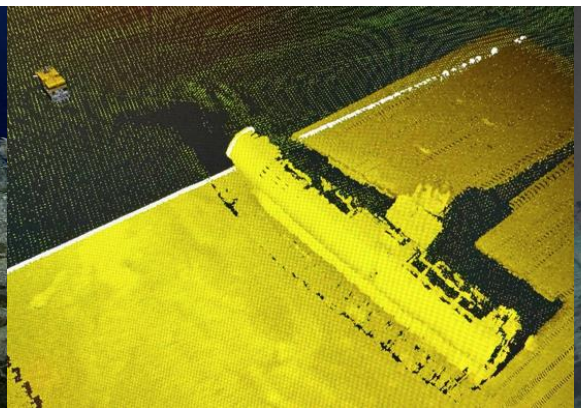
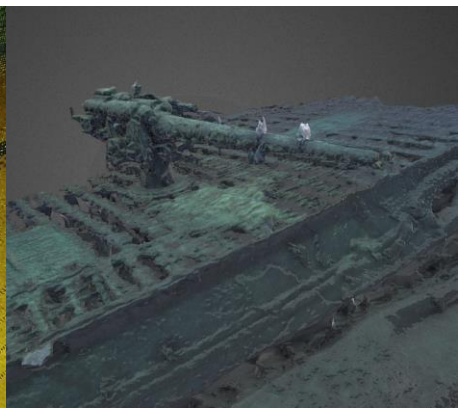
From October 22-November 5, 2023, E/V *Nautilus* conducted a telepresence-enabled expedition that surveyed some of the most complex deep-sea terrain around the Hawaiian Islands using a new wide-field camera array system and high-resolution multibeam sonar mounted on remotely operated vehicle *Hercules*. During 14 days at sea, these technologies were used to gather ultra high-resolution video and sonar data across a wide variety of complex topographical features and develop photorealistic three-dimensional models of the seafloor. A total of 35 scientists, engineers, educators and students representing 14 different institutions sailed on the expedition, who were supported by 20 professionals that participated remotely via telepresence technology.

ROV SUMMARY

The expedition completed 14 successful ROV dives for a total dive time of over 101 hours and over 76 hours exploring the seafloor at depths between 375-1,865 meters. ROV dives focused on exploring some of the most complex terrain in of the Central Pacific, including steep ridges, pinnacles, submarine canyons, hydrothermal vents, and submarine wrecks from World War II. During the 14 ROV dives, the team successfully integrated the new widefield camera and developed protocols that increased the efficiency of seafloor surveys. Specifically, multibeam data collected during the ROV approach to the seafloor was used to develop detailed seafloor maps, and then precisely move the ROV towards targets of interest without wasting time searching for targets.

MODELLING SUMMARY

Using the new wide field camera array the team collected thousands of ultra-high-resolution images that were stitched together using Reality Capture, the modeling software behind many popular video games. Using new workflows developed during the expedition, the team was able to quickly create photorealistic three-dimensional models of the seafloor, often within an hour of data collection. Post dive the team fused the photogrammetric-derived models with ultra-high resolution multibeam data. In concert with new workflows to develop these models, the team also tested avenues for sharing models with the public, including via Sketchfab and Cesium Ion, the latter of which included georeferenced versions of the models. In addition to providing avenues for public distribution, these platforms reduced the need to share large video files with project collaborators, thereby providing important savings in bandwidth.

EDUCATION & OUTREACH

Live video feeds were viewed 56,188 times and highlight videos garnered another 123,844 views over the course of the expedition. Content posted on OET's TikTok, Instagram, Twitter, Facebook, and LinkedIn social media accounts attracted over 553,000 impressions. While at sea, the team created seven new education and outreach products and hosted 106 live ship-to-shore interactions with schools, community events, and professional meetings, reaching over 6,100 people in 25 US states, Puerto Rico, Greece, Norway and Japan. Three Science Communication Fellows, three Science and Engineering Interns, and 3 additional students participated in the expedition, gaining valuable at-sea experience. Early expedition results were featured in 39 media stories published in 6 countries for a combined press reach of over 100 million.

BROADER IMPACTS

Expedition activities were conducted in some of the most complex underwater terrain in the Central Pacific, and successfully integrated various emerging exploration technologies into at sea operations. Specifically, a new wide-field camera array and widefield multibeam sonar were successfully integrated into ROV dive operations. Besides advancing new technologies for ocean exploration and research, expedition activities also supported other US government priorities, particularly in terms of understanding ocean changes and sharing that knowledge with others. This work also advanced priorities on education, diversity and inclusion by providing opportunities for students and educators from underrepresented minority groups to participate in expedition activities.

DATA ACCESS

Data collected on this expedition will be sent to repositories for archiving and public distribution. ROV dive videos will be uploaded to the Nautilus Live YouTube Channel, whereas other data collected by E/V *Nautilus* data systems will be sent to the Marine Geoscience Data System and Rolling Deck to Repository. Three-dimensional digital models created with data collected on this mission have been uploaded to SketchFab. Highlight images, background information, and educational materials developed during the expedition are available via the expedition website.

ACKNOWLEDGMENTS

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