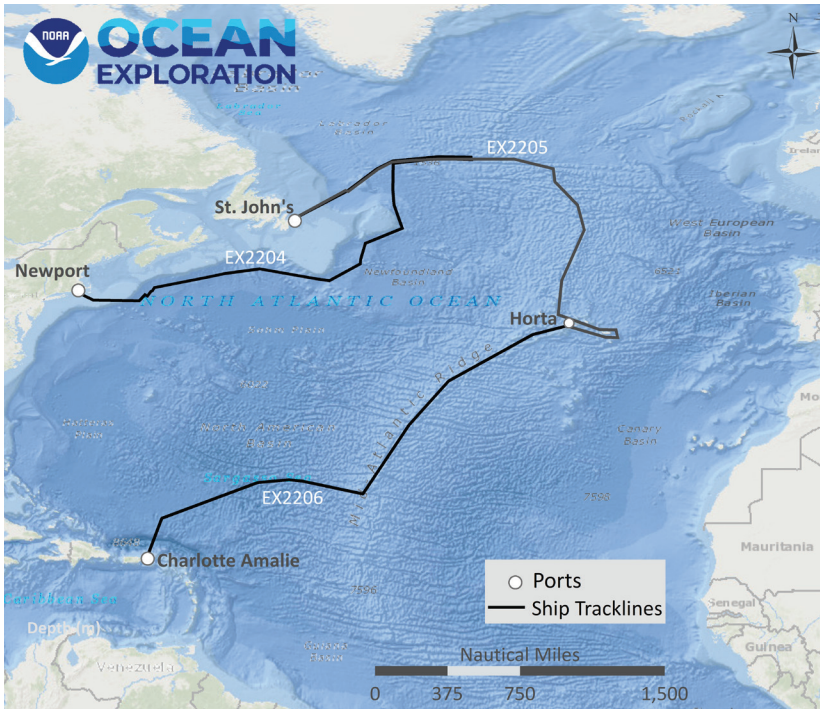
Voyage to the Ridge 2022 (EX2204, EX2205, EX2206)

OVERVIEW

From May 11 through August 18, 2022, NOAA and partners will conduct a series of three telepresence-enabled ocean exploration expeditions on NOAA Ship *Okeanos Explorer* to collect critical baseline information and improve knowledge about unexplored and poorly understood deepwater areas of the Charlie-Gibbs Fracture Zone, Mid-Atlantic Ridge, and the Azores Plateau in the North Atlantic Ocean.

For decades, the Mid-Atlantic Ridge has captivated scientists and the public. Geologically, it features a divergent plate boundary, volcanism, and hydrothermal vents. Biologically, it contains a variety of marine life supported by hydrothermal vents and an abundance of hard seafloor. In addition, migration corridors that run through the region connect the eastern and western sides of the Atlantic Basin.



The North Atlantic Ocean seafloor is largely unexplored. Shown here is the anticipated ship track of the three expeditions (EX2204, EX2205, EX2206) that comprise Voyage to the Ridge 2022. This series of expeditions will provide high-resolution information about seafloor features and an opportunity for scientists, students, and managers to engage in exploration of this largely unknown area in real time.

Much research has been done about the iconic hydrothermal vent systems of the Mid-Atlantic Ridge, but we still have so much to learn about these systems. Little is known about the habitats that lie beyond the vent systems as they remain largely unexplored. Questions about these habitats include, but are not limited to: Are the steep walls and topographic highs of the seafloor spreading center suitable habitat for deep-sea corals and sponges? What role does the Mid-Atlantic Ridge play in trans-Atlantic biological connectivity? What communities exist in the water column above these habitats?

As we increasingly look to the high seas for resources, additional data are needed to inform management decisions. Exploration of areas beyond national jurisdiction contributes to our understanding of similar habitats that exist within a country's waters as well as the biodiversity and ecological processes they support. It also contributes to our understanding of the geological history and processes of the planet as a whole. Operations during this series of expeditions

will seek to fill data gaps and provide new insights into this region in areas where there has been little previous exploration.

Voyage to the Ridge 2022 will contribute to NOAA's Atlantic Seafloor Partnership for Integrated Research and Exploration (ASPIRE), a major multiyear, multinational collaborative field program focused on raising collective knowledge and understanding of the North Atlantic. This campaign provides timely, actionable information to support decision-making based on reliable and authoritative science. It also serves as an opportunity for the nation to highlight the uniqueness and importance of deepwater environments. ASPIRE builds on the momentum of past U.S. campaigns and international initiatives to support ecosystem-based management of marine resources. It also leverages international partnerships and is a major contribution to the Galway Statement on Atlantic Ocean Cooperation and the Atlantic Ocean Research Alliance's deep-sea mapping and exploration efforts.

Map showing geographic priorities along the Mid-Atlantic Ridge identified during the ASPIRE workshop. White dots mark the general location of areas associated with white paper submissions. Orange polygons indicate priority areas for exploration identified during the workshop discussions that laid the groundwork for expedition planning.

Like previous expeditions, NOAA will work with the scientific and resource management communities to characterize high-priority exploration targets. This series of expeditions will use the ship's deepwater acoustic systems (Kongsberg EM 304 multibeam sonar, Simrad EK60 and EK80 split-beam fisheries sonars, Knudsen 3260 chirp sub-bottom profiler sonar, and Teledyne acoustic Doppler current profiler), NOAA's two-body deepwater remotely operated vehicle (ROV), and a high-bandwidth satellite connection for real-time ship-to-shore communications. ROV dives will include high-resolution visual surveys of water column and seafloor habitats as well as biological and geological sampling. Voyage to the Ridge 2022 will establish a baseline of information in several deepwater regions to catalyze further exploration, research, and management activities.

EXPEDITION OUTLINE

Voyage to the Ridge 2022 is a three-part series of expeditions (EX2204, EX2205, and EX2206) comprising 84 days of telepresence-enabled ocean exploration. Live video and data from ROV dives and multibeam sonar mapping operations will be shared in real time with shore-based participants and the public. Cruise numbers, dates, ports of call, and operational modes are as follows:

- **EX2204:** May 11-June 7, Newport, Rhode Island, USA, to St. John's, Newfoundland, Canada — Mapping expedition to collect acoustic data of seafloor and sub-seafloor geomorphology and water column habitats of the Charlie-Gibbs Fracture Zone on the Mid-Atlantic Ridge.
- **EX2205:** June 16 - July 13, St. John's, Newfoundland, Canada, to Horta, Faial, Azores, Portugal — ROV and mapping expedition to explore the Charlie-Gibbs Fracture Zone, Mid-Atlantic Ridge (north of the Azores), and the Azores Plateau.

Hydrothermal vents exploration via mapping, ROV dives, and CTD casts is anticipated during Voyage to the Ridge 2022.

- **EX2206:** July 22 - August 18, Horta, Faial, Azores, Portugal, to Charlotte Amalie, U.S. Virgin Islands — ROV and mapping expedition to explore the Azores Plateau and the Mid-Atlantic Ridge (south of the Azores).

Mapping data collected during Voyage to the Ridge 2022 will help improve fundamental understanding of this region and facilitate ROV dive planning. ROV dives may span depth ranges from 250 to 6,000 meters deep. ROV dives for EX2205 and EX2206 are expected to explore deep-sea coral and sponge habitats, potential hydrothermal vent and extinct polymetallic sulfide systems, fracture and rift zones, and the water column. Conductivity, temperature, and depth (CTD) rosette operations are also expected.

NOAA incorporated the 2020 and 2021 Calls for Input, results from the 2018 ASPIRE Workshop, and priorities from resource managers to establish expedition objectives and refine the operating areas. In the months leading up to Voyage to the Ridge 2022, collaborative dive planning calls will be held to further refine these operating areas into specific ROV dive targets.

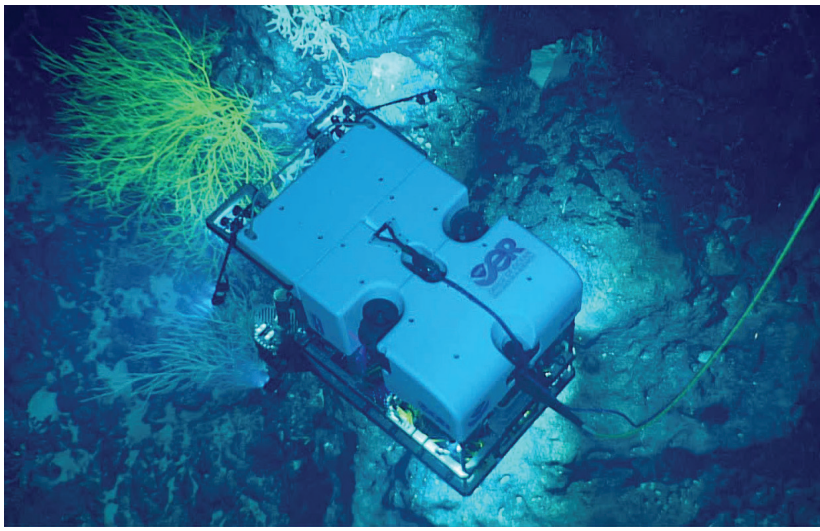
GOALS

NOAA priorities for Voyage to the Ridge 2022 combine science, education, outreach, and open data to provide a better understanding of this important marine region. Specific goals include:

- Improve knowledge of unexplored areas along the Mid-Atlantic Ridge, Azores Plateau, and Charlie-Gibbs Fracture Zone to inform management needs for sensitive habitats, geological features, and potential resources.
- Locate and characterize deep-sea coral, sponge, and hydrothermal communities.
- Collect high-resolution bathymetry in areas with no or low-quality sonar data to extend

bathymetric mapping coverage in support of Seabed 2030.

- Ground truth existing bathymetric data, habitat suitability models, seafloor composition models, and inferred hydrothermal vent sites.
- Characterize water column habitats along the Mid-Atlantic Ridge using acoustics, visual observations, and emerging technologies.
- Collect data to enhance predictive capabilities for vulnerable marine habitats, seafloor composition, island formation, plate tectonics, hydrothermal vents, critical minerals, and submarine geohazards.



During Voyage to the Ridge 2022, NOAA's ROV *Deep Discoverer* will be used to acquire high-definition visual data and collect limited samples in poorly explored areas along the Mid-Atlantic Ridge, Azores Plateau, and Charlie-Gibbs Fracture Zone.

- Investigate biogeographic patterns of deep-sea ecosystems and connectivity across the Mid-Atlantic Ridge, Azores Plateau, and Charlie-Gibbs Fracture Zone for use in broader comparisons of deepwater habitats throughout the Atlantic Basin.
- Map, survey, and sample geological features, including ocean spreading centers, hydrothermal vents, extinct polymetallic sulfide systems, fracture zones, and rift zones to better understand the geological context of the region and improve knowledge of past and potential future geohazards (e.g., large magnitude, repeating earthquakes along the Charlie-Gibbs Fracture Zone and earthquakes on the Azores Plateau).
- Engage a broad spectrum of the scientific community and public in telepresence-based exploration and provide publicly accessible data and information products to spur further exploration, research, and management activities.

HOW TO GET INVOLVED

NOAA Ocean Exploration is currently identifying a team of scientists interested in actively participating in Voyage to the Ridge 2022. These scientists may work at shore-side exploration command centers (ECCs) or from their home institutions as full members of the science team. Shore-side team members participate in the expedition by standing watch during ROV dives, reviewing the latest data coming off the ship, and providing input into a standard suite of products and the day-to-day operations of the ship. Participating scientists are expected to 1) represent the broad interests of the marine science community, 2) contribute to real-time annotation and data logging, and 3) help identify and engage a community of explorers to contribute to the expedition

from shore.

Anyone with an internet connection and a phone line can participate in Voyage to the Ridge 2022. Scientists can view the live high-resolution, low-latency video feeds over any computer and internet connection. Scientists can join the ongoing ship-to-shore science conversation from anywhere by dialing into a teleconference, chatting using instant messaging, and contributing annotations to the video data with SeaTube.

Additional information about how to participate in expeditions and ocean exploration capabilities on *Okeanos Explorer* is available on the NOAA Ocean Exploration website. To actively participate in and receive updates about Voyage to the Ridge 2022, you will need a collaboration tools account. Note, the collaboration tools account request must be filled out once every year to identify interest in specific expeditions.

If you are interested in discussing specific details or have questions about Voyage to the Ridge 2022, please contact:

Derek Sowers
Voyage to the Ridge 2022 Expedition Manager and EX2205 Expedition Coordinator
derek.sowers@noaa.gov

Scott France
NOAA Ocean Exploration Science Advisor and EX2205 Biology Lead
scott.france@louisiana.edu

Samuel Candio
EX2204 Expedition Coordinator
samuel.candio@noaa.gov

Ashton Flinders
EX2205 Geology Lead
aflinders@usgs.gov

Kasey Cantwell
EX2206 Expedition Coordinator
kasey.cantwell@noaa.gov

Joana Xavier
EX2206 Biology Lead
joanarxavier@gmail.com

Deb Glickson
EX2206 Geology Lead
dglickson@nas.edu

By leading national efforts to explore our ocean and making ocean exploration more accessible, NOAA Ocean Exploration is filling gaps in the basic understanding of U.S. deep waters and seafloor. This work provides critical deep-ocean data, information, and awareness needed to maintain the health of our ocean, sustainably manage our marine resources, accelerate economies, and build a better appreciation of the value and importance of the ocean in our everyday lives.

NOAA OCEAN EXPLORATION

ASPIRE
Atlantic Seafloor Partnership for Integrated Research and Exploration