

2021 NORTH ATLANTIC STEPPING STONES: New England and Corner Rise Seamounts (EX-21-04)



2021 North Atlantic Stepping Stones: New England and Corner Rise Seamounts (EX-21-04) expedition map with dive sites.

NOAA Ship *Okeanos Explorer* June 30 – July 29, 2021

2021 North Atlantic Stepping Stones: New England and Corner Rise Seamounts was one of several expeditions led by NOAA Ocean Exploration on NOAA Ship *Okeanos Explorer* as part of the [Atlantic Seafloor Partnership for Integrated Research and Exploration](#) (ASPIRE) campaign. ASPIRE is a major multi-year, multi-national collaborative field program focused on raising collective knowledge and understanding of the North Atlantic Ocean.



EXPEDITION SUMMARY

2021 North Atlantic Stepping Stones: New England and Corner Rise Seamounts was a 30-day, telepresence-enabled expedition to collect critical information and acquire data on priority exploration areas identified by the ocean management and scientific communities. This expedition involved exploration of diverse features across the New England and Corner Rise Seamounts with mapping and remotely operated vehicle (ROV) operations targeting areas with potential to host deep-sea coral and sponge communities, geologic features, and water column organisms near the seamounts off the U.S. continental margin. Mapping data collected during this expedition filled major data gaps in the region and will contribute to [Seabed 2030](#) goals for mapping unexplored regions of Earth's ocean basins. Major accomplishments of this expedition are summarized below.

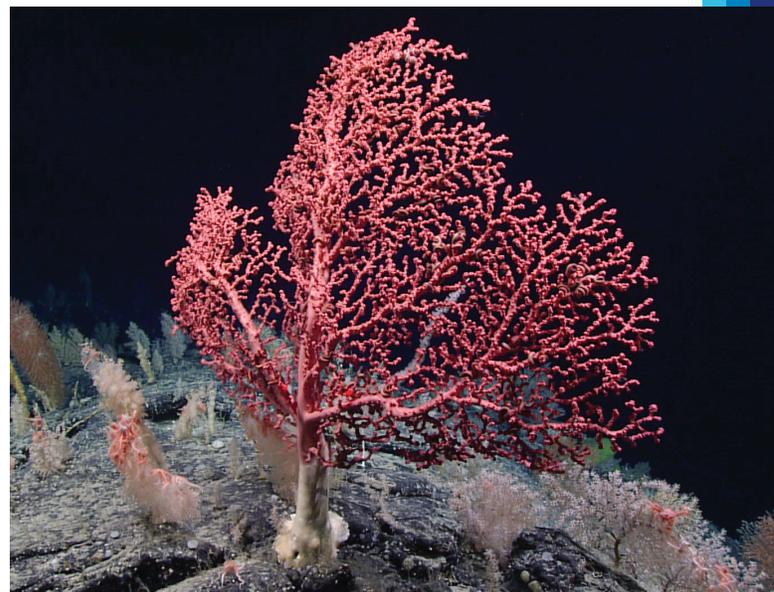


ACHIEVING ASPIRE GOALS

Each ASPIRE expedition has its own objectives that support the goals of the larger campaign. Some of these goals are highlighted here, with relevant accomplishments from the 2021 North Atlantic Stepping Stones expedition.



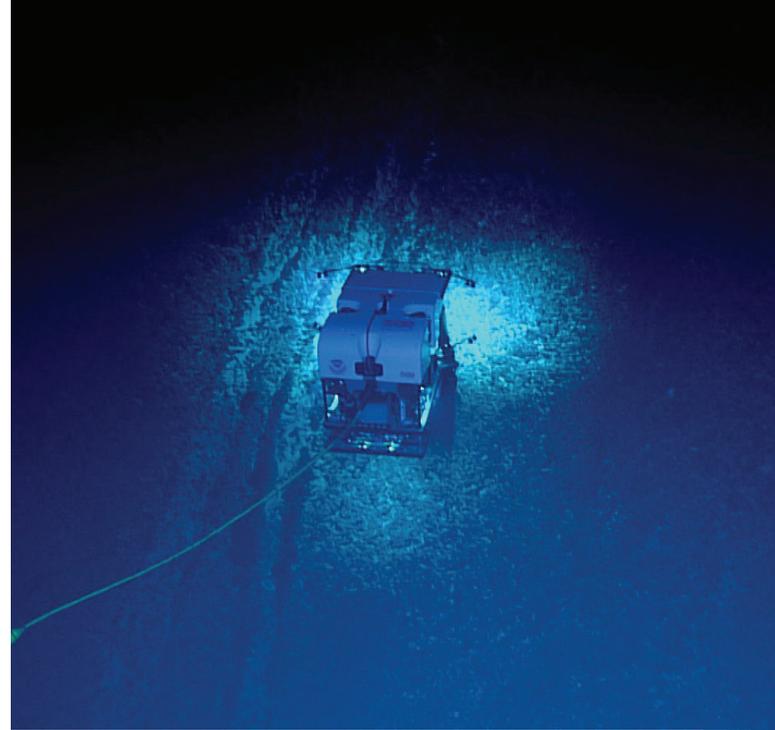
The third dive of the 2021 North Atlantic Stepping Stones expedition was dominated by these impressive pillow lavas with extensively developed botryoidal (or bubbly, grape-shaped) ferromanganese crust textures. These crusts precipitate slowly out of the water column over time at a rate of one millimeter per million years.



A large bubblegum coral (*Paragorgia arborea*) was observed during Dive 19 of the 2021 North Atlantic Stepping Stones expedition. Based on published radial growth rates for this species, this colony is approximately 100 years old.

GOAL: Improve knowledge of unexplored areas within the U.S. Exclusive Economic Zone (EEZ) and high seas to inform management needs for sensitive habitats, geological features, and potential resources.

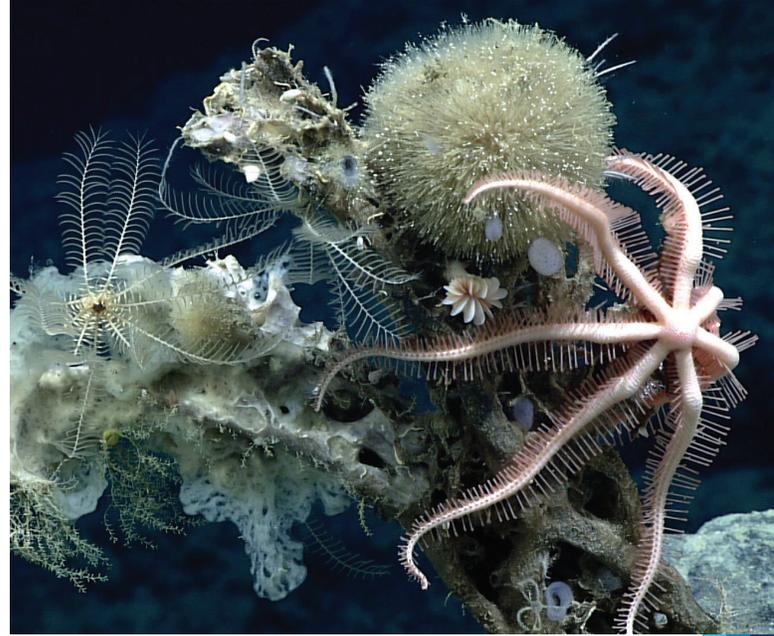
- Conducted 20 ROV dives ranging in depth from 300 to 4,187 meters (984 to 13,737 feet). Data collected can be used to increase understanding of deep-sea ecosystem connectivity across the Atlantic basin.
- Collected 69 biological (45 primary and 44 associates) and 54 geological specimens.
 - Biological specimens were representatives of new records, potential new species, or dominant fauna. Six biological samples were collected to support trans-Atlantic connectivity studies, including *Geodia megastrella*, *Anthomastus* sp., and *Desmophyllum dianthus*.
 - Geological samples will be used to better understand the geologic history of the region, as well as to characterize habitat substrate.
- Conducted ROV dives and mapping operations in the [Northeast Canyons and Seamounts Marine National Monument managed by NOAA and the U.S. Fish and Wildlife Service](#), collecting valuable data of deep-sea habitats and geological features.
- Discovered areas of high diversities of deep-sea corals and sponges on seamounts in the New England and Corner Rise Seamount Chains in areas with no previous exploration.
- Explored an area on Yakutat Seamount that was observed to have remnant scars of anthropogenic impacts from trawling or dredging.
- Collected the first [visual confirmation of ferromanganese nodule fields](#) in the New England Seamount Chain region (at Gosnold Seamount).



Evidence of trawling or dredging seen on Yakutat Seamount on Dive 10 of the 2021 North Atlantic Stepping Stones expedition during an upslope transect. The trawl marks are seen in the fossilized coral rubble. Remotely operated vehicle *Deep Discoverer* shown for scale.

GOAL: Locate and characterize deep-sea coral, sponge, and chemosynthetic communities.

- Documented nine dive sites with high biological diversity.
- Observed deep-sea corals and sponges on every dive except one, which was a dedicated water column exploration dive.
- Observed several potential new species and/or undescribed species, including an unknown “finger sponge” in high-density patches throughout exploration of Yakutat Seamount during Dive 09.
- Recorded significant depth and geographic range extensions for several fish and coral species, including the [deepest known record of rock pens in the Atlantic](#).
- Discovered an unexpectedly [high diversity of organisms while exploring Alleghany Seamount](#) at depths of 3,447 meters (11,310 feet).
- Documented several rarely observed possible predation events and other biological highlights, including:
 - [A sea star \(*Sthenaster emmae*\) feeding on a coral stalk](#), which also happened to be the deepest known record of the sea star species at 1,219 meters (3,999 feet).
 - [Video footage of a yellow sponge \(genus *Hertwigia*\) and pink sea star \(genus *Chondraster*\)](#) that resembled the cartoon characters SpongeBob SquarePants and Patrick Star, collected during Dive 19 within the Northeast Canyons and Seamounts Marine National Monument.
 - [A sea urchin \(genus *Echinus*\)](#) observed during Dive 19 to have seemingly eaten more than half of a bamboo whip coral.
 - [A pink seastar consuming sunken sargassum](#).
 - A [slit limpet actively eating away the material on a surface of a rock](#), leaving a visible, darkly colored feeding track in its wake.



A brisingid sea star, several crinoids, a cup coral (*Desmophyllum dianthus*), and other organisms were seen living on a dead sponge skeleton. No space goes unutilized in the deep sea!

GOAL: Characterize water column habitats using acoustics, visual observations, and emerging technologies.

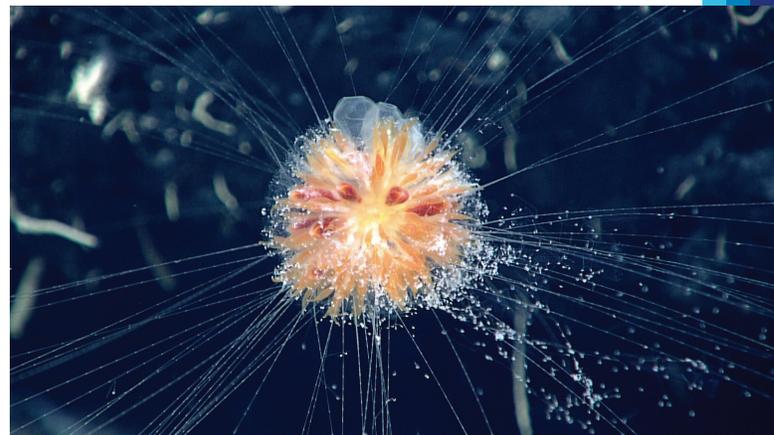
- Conducted midwater exploration at depths ranging from 300 to 1,200 meters (984 to 3,937 feet) during a dive to investigate the diversity and abundance of the largely unknown pelagic fauna at the mouth of Hydrographer Canyon.
- Discovered a potentially undescribed species of [red jellyfish](#) (*Poralia* sp.) in the water column at a depth of 700 meters (2,297 feet).



This red jellyfish in the genus *Poralia* may be an undescribed species. It was seen during the third transect of Dive 20 of the 2021 North Atlantic Stepping Stones expedition, at a depth of 700 meters (2,297 feet).

GOAL: Extend bathymetric mapping coverage in the U.S. EEZ and international waters in support of Seabed 2030.

- Mapped more than 54,000 square kilometers (20,850 square miles), an area larger than Croatia.
- Made new insights into this region, including the discovery of previously unknown seamounts south of the New England Seamount Chain and within the Corner Rise Seamounts, filling in gaps of data in the region.
- Conducted a record of 14 "[map and dives](#)," where higher-resolution mapping data were collected within hours of a dive when previously there was no or poor data at the dive site.
- Mapped 40 seamounts, 20 of which had never been mapped before.



A Rhodallid dandelion was observed midway through Dive 13 of the 2021 North Atlantic Stepping Stones expedition. It appears this same species of siphonophore was also observed during the 2017 Laulima O Ka Moana NOAA Ocean Exploration expedition, potentially making it a widely distributed species.

GOAL: Collect mapping data and conduct ROV dives to support enhanced predictive capabilities for vulnerable marine habitats and geologic ages of the New England and Corner Rise Seamounts.

- Discovered numerous areas of deep-sea coral and sponge habitat, which has not only improved our understanding of this region, but has habitat modeling implications that may apply to many other places in the world.
- Collected mapping data, image and video footage, and physical samples of geological material that may contribute to the understanding of how and when the New England and Corner Seamounts formed and developed through time.

ENGAGING THE SCIENTIFIC COMMUNITY AND THE PUBLIC

NOAA Ship *Okeanos Explorer* is a leading platform for telepresence-enabled exploration, which allows shore-based scientists and managers to fully engage in an expedition and enables members of the public to experience deep-sea exploration and the wonders of science and discovery in real time. Highlights of this engagement during the 2021 North Atlantic Stepping Stones expedition are listed below.

- Engaged over 100 scientists, resource managers, and students, with participation from 11 international countries including Russia, Japan, Kenya, Trinidad and Tobago, Spain, New Zealand, the United Kingdom, Australia, Bermuda, Canada, and Portugal.
- Engaged with audiences around the world, opening a window of understanding into the deep sea through live interactions, live-streamed video, expedition web content, and media/web stories, including:
 - 10 live interactions and a Facebook lunch hour Q&A that engaged over 600 people.



Facebook Live event onboard NOAA Ship *Okeanos Explorer* featuring expedition coordinator Kasey Cantwell, science lead Dr. Rhian Waller, and remotely operated vehicle pilot Chris Ritter. During the event, they provided an overview of the expedition and then took questions from Facebook users.

- More than 350 news/web stories sharing expedition news, including the stories about the “real life” SpongeBob and Patrick Star and the undescribed red jellyfish, which received the most coverage both domestically and internationally. Stories were picked up by NPR, the Huffington Post, IFL Science, Smithsonian Magazine, Fox News, People Magazine, USA Today, the Hill, and many others.
- More than 191,000 views to the live video feeds during the expedition.
- More than 14,000 views to expedition-specific web content during the expedition, with more than 7,400 additional views coming in the month immediately following the expedition, largely due to exposure on social media and subsequent media interest.



COLLECTING AND SHARING DATA

Data collected during this expedition will inform initial characterization of the areas visited and include multibeam, single beam, subbottom, ADCP (acoustic Doppler current profiler), XBT (Expendable bathythermograph), CTD (conductivity, temperature, and depth), and dissolved oxygen profiles; surface oceanographic and meteorological sensors; video and imagery; and physical specimens. All data from this expedition will be publicly available through national archives. A direct link to the expedition data archive will be provided on the [expedition website](#) once the data are available. For questions or inquiries about this expedition, please email ex.expeditioncoordinator@noaa.gov.



Atlantic Seafloor Partnership for
Integrated Research and Exploration

By leading national efforts to explore our ocean and making ocean exploration more accessible, NOAA Ocean Exploration is filling gaps in our basic understanding of U.S. deep waters and the 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.