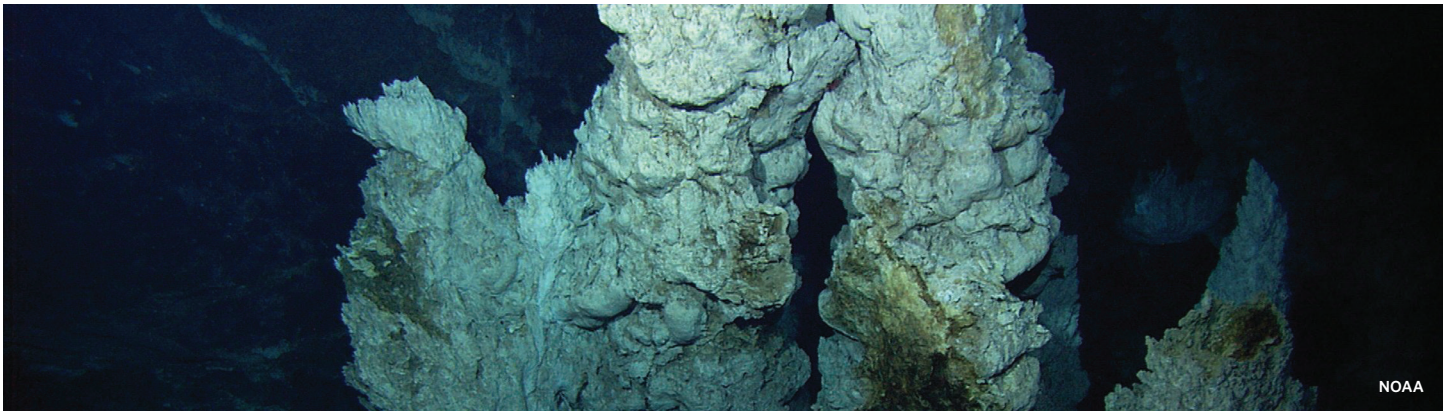
A fact sheet from THE PEW CHARITABLE TRUSTS | Jan 2018



The Mid-Atlantic Ridge

Underwater mountains and hydrothermal vent zones are home to distinctive species and valuable minerals

Overview

The depths of the Atlantic Ocean are home to fascinating geological features and unusual life forms. The Mid-Atlantic Ridge (MAR) is a massive underwater mountain range, 1,700 to 4,200 meters (1 to 2.6 miles) below sea level, that runs from the Arctic Ocean to the Southern Ocean. It is a hot spot for hydrothermal vents, which provide habitat for unique species that could provide insight into the origins of life on Earth.

Hydrothermal vents are fueled by underwater volcanic activity or seafloor spreading, and they spew superheated, mineral-laden water from beneath the ocean floor. As the water cools, minerals precipitate out, forming towers containing copper, gold, silver, and zinc. These minerals are used in electronics such as mobile phones and laptop computers and in cars, appliances, and bridges.

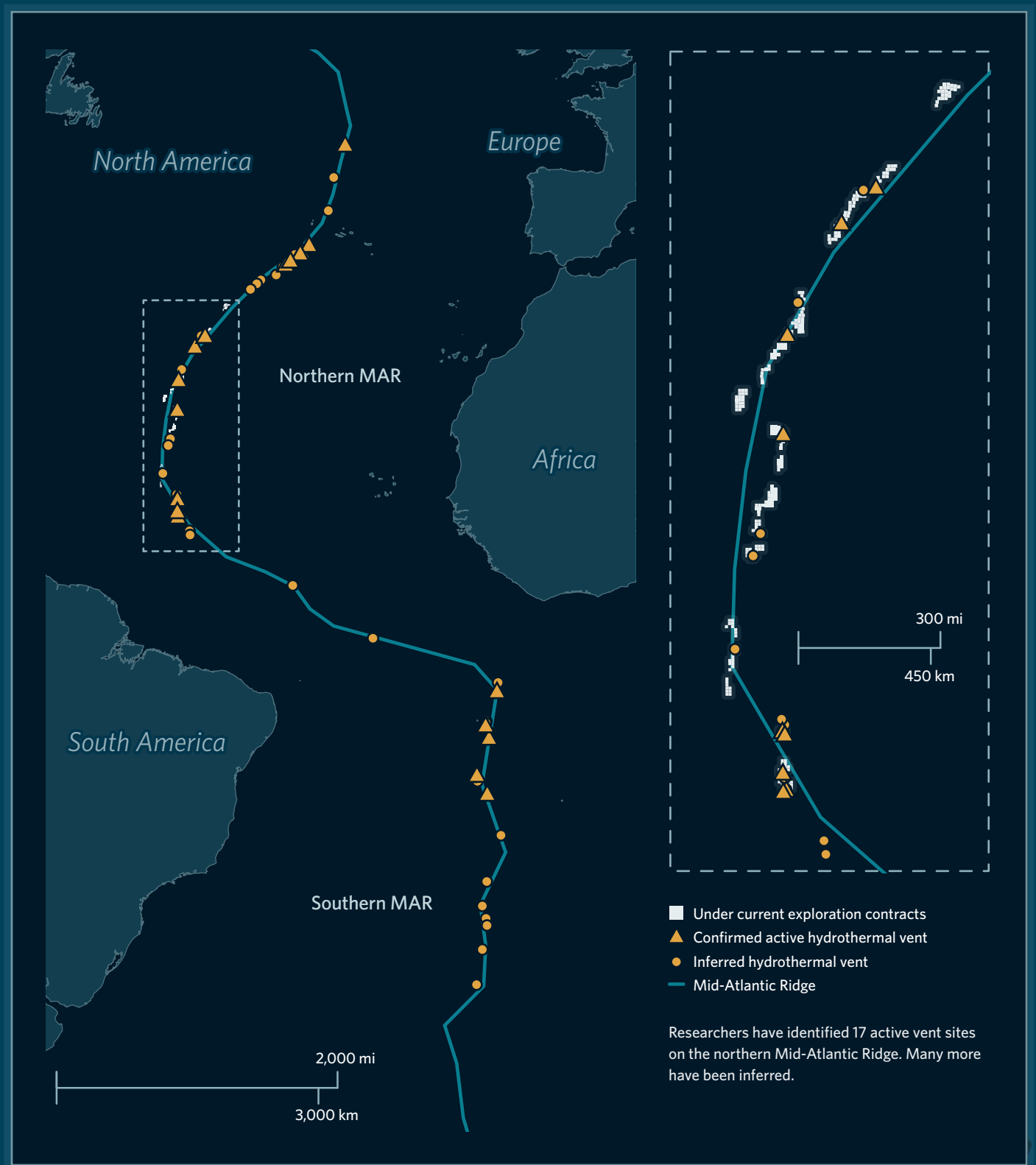
Vent ecosystems support unique species, mostly bacteria, that derive their energy from mineral-rich vent waters rather than sunlight. These microbes form thick, nutrient-rich mats along the seafloor that support shrimp, mussels, worms, snails, and fish. The MAR's vent fields were discovered only in 1985, and scientists expect future expeditions to reveal new vents and species.[1]

The International Seabed Authority (ISA), which is responsible for managing deep-sea mining and protecting the marine environment from its impacts, has entered into exploration contracts along the MAR with France, Poland, and Russia. Once mining begins, equipment will remove or degrade habitats and create sediment plumes that could smother nearby life, while noise and light could also negatively affect deep-sea species. Recovery times for vent communities are unknown.[2]

Most marine scientists agree that effective protection of the MAR will require a precautionary approach to seabed mining that includes excluding large areas of the seafloor from mining and establishing stringent rules governing how it can occur outside those protected areas.

Features of the Mid-Atlantic Ridge

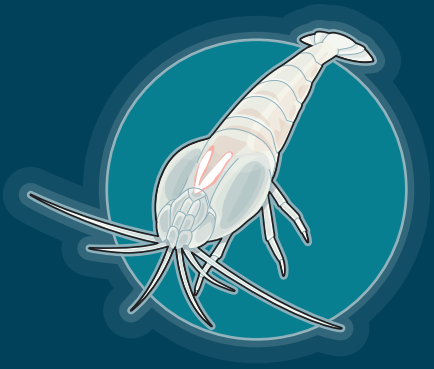
The ridge, which may be mined when rules are approved, is only a small segment of the vast underwater mountain and vent chains in the Atlantic Ocean



Hydrothermal vents can be active or inactive. Active vents, typically classed as "black smokers" or "white smokers," emit plumes of superheated, mineral-rich water. Vent fields may remain active for 10,000 years.

Hydrothermal vents provide a range of ecosystem services. Research suggests that vents play an important role in carbon sequestration; climate regulation; and the global cycling of nitrogen, sulfur, and iron.[3]

Creatures near vents live in extremely hot (572-752 degrees Fahrenheit or 300-400 Celsius) and dark environments and derive energy from hydrogen sulfide rather than sunlight.



Massive swarms of eyeless shrimp cover some vents, even obscuring them from view. Instead of eyes, the shrimp have photoreceptor cells on their backs that are capable of detecting very low levels of light.

Initial biological analyses indicate that the fauna of the southern MAR vents may be similar to those of the northern MAR, dominated by alvinocarid shrimp and bathymodiolid mussels.[4]

A 2011 ISA paper called for chemosynthetic ecosystem reserves and precautionary area-based management and highlighted the need for deep-sea management plans.[5]

Endnotes

1 "InterRidge Vents Database Ver. 3.4," accessed Oct. 10, 2017, http://vents-data.interridge.org; Monterey Bay Aquarium Research Institute, "Challenging Prevailing Theory About How Deep-Sea Vents Are Colonized," ScienceDaily, July 24, 2017, http://www.sciencedaily.com/releases/2017/07/170724133033.htm.

2 Cindy Lee Van Dover, "Impacts of Anthropogenic Disturbances at Deep-Sea Hydrothermal Vent Ecosystems: A Review," *Marine Environmental Research* 102 (2014): 59–72, https://doi.org/10.1016/j.marenvres.2014.03.008.

3 Lisa A. Levin et al., "Hydrothermal Vents and Methane Seeps: Rethinking the Sphere of Influence," *Frontiers in Marine Science* 3 (2016), http://doi.org/10.3389/fmars.2016.00072.

4 José Angel Alvarez Perez et al., "Patterns of Life on the Southern Mid-Atlantic Ridge: Compiling What Is Known and Addressing Future Research," *Oceanography* 25, no. 4 (2012): 16–31, https://tos.org/oceanography/assets/docs/25-4_perez.pdf.

5 Cindy Lee Van Dover et al., "Environmental Management of Deep-Sea Chemosynthetic Ecosystems: Justification of and Considerations for a Spatially-Based Approach" (Kingston, Jamaica: International Seabed Authority, 2011), https://www.isa.org.jm/sites/default/files/files/documents/tstudy9.pdf.

For further information, please visit:

pewtrusts.org/seabed

Contact: Marti Ostrander, manager, communications
Email: mostrander@pewtrusts.org
Phone: 202-540-6961