



Deep-Sea Corals and Sponges: Foundation Species

Deep-sea corals and sponges exist in a wide variety of shapes, sizes, and colors. The corals and sponges grow upwards, off the seafloor, creating a varied habitat for many other living creatures. Their intricate shapes and structures provide many small spaces for other living creatures within the coral and sponge communities, just as trees create complex habitats for insects, birds, and other animals. Some of these communities are home to thousands of invertebrates and vertebrates. Deep-sea corals and sponges function as **foundation species**, providing many vital ecosystem services to other organisms.

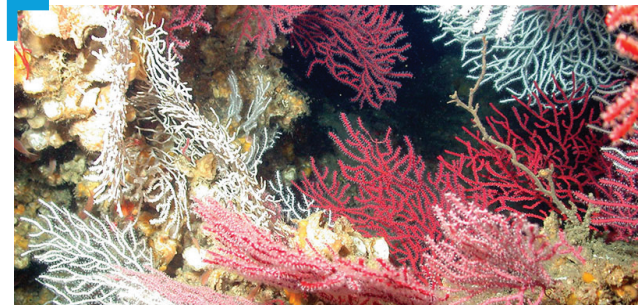
What Ecosystem Services Do Deep-Sea Corals and Sponges Provide?

HOME BASE

- Some organisms make their homes on, or in, deep-sea corals and sponges.
- Several species of sea anemones and barnacles attach themselves to corals and sponges, using them as a home base. Other animals use corals as a foundation to build their homes, such as amphipods, which build tube-like structures on the coral.
- One group of scale worms can even cause corals to alter their growth to produce small tunnels that the worms can live in.
- Some coral and sponge species have symbiotic relationships with other organisms. The Venus flower basket glass sponge often traps a pair of shrimp while building its skeleton. The sponge provides food and shelter for the shrimp, who keep their glass house clean in return.

FEEDING BASE

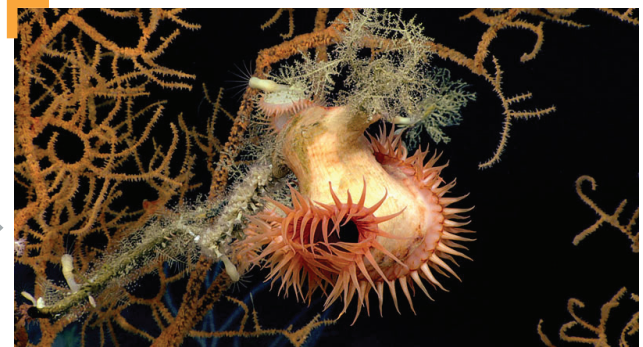
- Like spiders using a bush, feather stars, squat lobsters, and brittle stars cling to coral branches to hunt or filter water for food.
- Squat lobsters are adapted to live in coral branches. They have hook-like dactyls (claws) at the tips of their back legs, used to grip their host.
- Brittle stars wrap their long, snake-like arms over branches. They capture small animals that land on coral or may feed on the mucus that corals produce.



This deep-sea coral garden (reef) in Madison-Swanson Marine Reserve off the west coast of Florida features several species of deep-sea corals in many different colors and colony shapes. *Image courtesy of the National Undersea Research Center at the University of North Carolina, Wilmington.*

FOUNDATION SPECIES

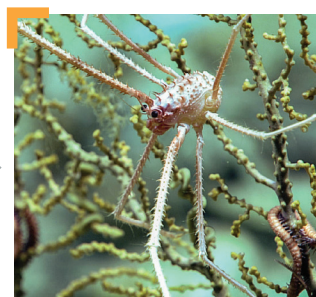
A species that has a large contribution towards creating a habitat/ecosystem that support other species. This is similar to the way that certain types of trees create certain types of forest ecosystems.



Flytrap anemone attached to a black coral. *Image courtesy of NOAA Ocean Exploration.*



Can you spot the crustacean that is trapped in this species of *Euplectella*, photographed in the northwestern Gulf of America? The common name of this glass sponge is the "Venus flower basket." *Image courtesy of NOAA Ocean Service.*



Specific species of squat lobsters and brittle stars are often associated with specific species of coral, like those seen perched on this gorgonian octocoral (*Paramuricea* sp.). *Image courtesy of NOAA Ocean Exploration.*

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PROTECTION

- Just as a tree hides birds and their nests, corals protect other species. They provide nursery habitat for many commercially important fish and invertebrate species.
- Adult fish also associate with coral gardens. Some sharks and skates lay their egg cases on corals, keeping them anchored.
- Studies in Alaska have shown that the health and productivity of rockfish, especially juveniles and smaller species, were superior in highly structured habitats such as coral and sponge ecosystems, compared to other types of habitat.

FOOD SOURCE

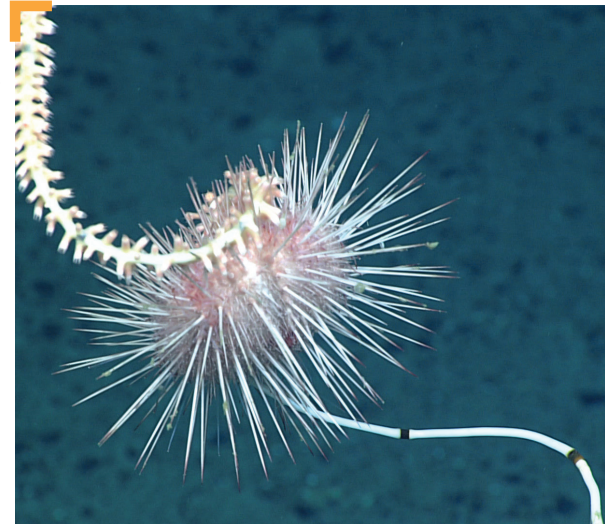
- Many animals, such as urchins and worm-like molluscs, feed directly on coral polyps.
- Similar to a hummingbird sipping nectar, sea spiders insert a muscular proboscis into a polyp and suction out the contents.
- Sea stars extend one of their two stomachs through their mouth to wrap around polyps. Stomach enzymes then dissolve the prey for easy ingestion. Sea stars may remain feeding for months on a single coral colony!

CREATING STRUCTURE

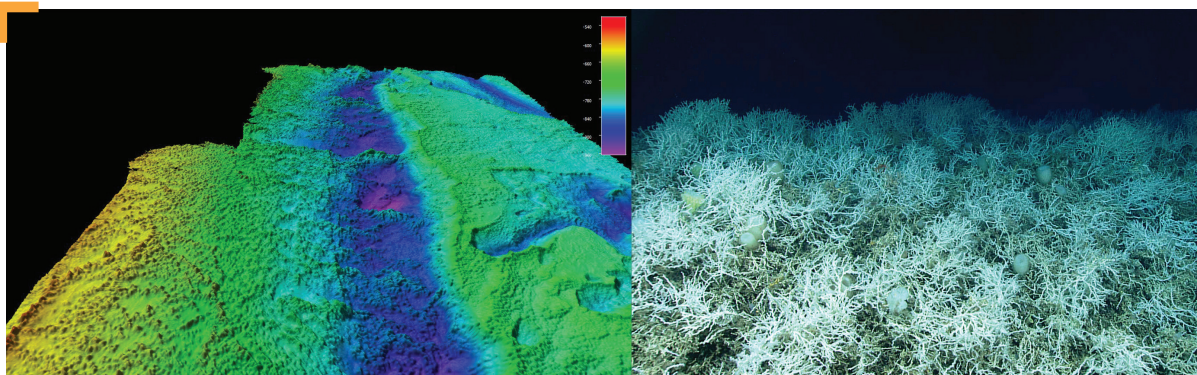
- Over time, deep-sea corals can even change the structure and composition of the seafloor, creating massive mounds.
- Colonies grow larger and the outside branches block nutrients from flowing to the older, inner colony. The inner colony then dies and tiny encrusting and burrowing animals colonize it. The inner colonies eventually break apart, and live coral overgrows the dead foundation.
- As new, live coral continues to grow on the skeletons of the deceased coral below, large mounds form.



An embryonic catshark and egg case attached to an octocoral colony. Image courtesy of NOAA Ocean Exploration.



A sea urchin that has eaten over half of the polyps of a bamboo coral. Image courtesy of NOAA Ocean Exploration.



Dense fields of *Lophelia pertusa* found off the Southeastern U.S. The coral colonies here have been growing for hundreds to hundreds of thousands of years, forming coral mounds that are so large they are visible on bathymetric maps created using multibeam sonar. Images courtesy of the NOAA Ocean Exploration.

Deep-Sea Coral Garden (image): <https://oceanexplorer.noaa.gov/explorations/17sedci/logs/aug19/media/img1-800.jpg>
Home base 1 (image): <https://oceanexplorer.noaa.gov/oceanos/explorations/ex1907/dailyupdates/nov2/media/anemone-800.jpg>
Home base 2 (image): <https://oceanservice.noaa.gov/facts/glass-sponge.html>
Feeding base (image): <https://oceanexplorer.noaa.gov/oceanos/explorations/ex1803/dailyupdates/media/apr19-2-hires.jpg>
Protection (image): <https://oceanexplorer.noaa.gov/oceanos/explorations/ex1811/logs/nov21/media/img4-hires.jpg>
Food source (image): <https://oceanexplorer.noaa.gov/oceanos/explorations/ex2104/dives/dive19/media/urchin-hires.jpg>
Blake Plateau Corals (image): <https://oceanexplorer.noaa.gov/news/oer-updates/2021/media/blake-steton-mesa-hires.jpg>