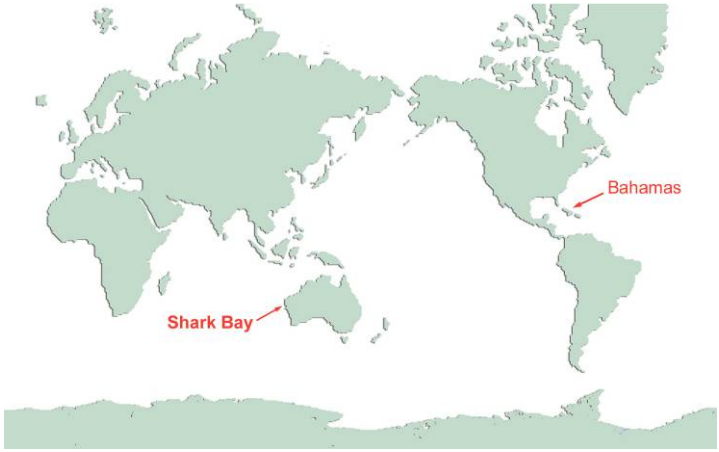
Stromatolites

What is a stromatolite?

A stromatolite (literally, 'layered rock') is a solid structure created by single-celled microbes called cyanobacteria (blue-green algae). The cyanobacteria form colonies and trap sediment with their sticky surface coatings. The trapped sediment reacts to calcium carbonate in the water to form limestone. These limestone deposits build up very slowly – it can take a stromatolite 100 years to grow 5 cm. A 1 m-high stromatolite might be 2,000 years old!

Where are they found?

Shark Bay's stromatolites are found around the shallows of Hamelin Pool , located in the southern part of the eastern bay. Between 4,000 to 6,000 years ago a massive seagrass bank called the Fauré Sill began to block tidal flow into Hamelin Pool, causing the water to become extremely concentrated, or hypersaline. The water in Hamelin Pool is twice as salty as water in the open ocean! Animals that would normally graze on algae, such as chitons and snails, cannot survive in these conditions. Around 3,000 years ago cyanobacteria started flourishing, forming stromatolites much as they did billions of years ago. More than 50 species of cyanobacteria live in Hamelin Pool.



What do they look like?

Stromatolites look like a cross between a cauliflower and a rock. However, unlike rocks they are actually alive – each stromatolite has a top surface layer teeming with living, active cyanobacteria. At least 3,000 million cyanobacteria can fit in 1 m^2! Because cyanobacteria are plants, they photosynthesise their energy from the sun. A by-product of photosynthesis is oxygen, and if you look very carefully you may see the stromatolites gently 'fizzing' as tiny bubbles of oxygen are released by the cyanobacteria into the water.

The size and shape of stromatolites are thought to be influenced by their immediate environment. Large mushroom-shaped stromatolites may form in places where tides and small waves approach from different directions. Loaf-shaped stromatolites are found in protected areas close to the shore. Because cyanobacteria need sunlight to photosynthesise, the stromatolites in Hamelin Pool do not form in water deeper than 4 m, where there is less light.

Why are they so important?

Shark Bays' stromatolites are significant because they represent a major stage in the Earth's evolutionary history, one of the reasons for Shark Bay's World Heritage listing. When the stromatolites were discovered by scientists in 1956, they were the first ever recorded living examples of structures previously found only as fossils in ancient rocks. Although Shark Bay's stromatolites are just 2,000 – 3,000 years old, the cyanobacteria that build them are similar to life forms found on Earth up to 3.5 billion years ago!

Back then, the Earth's atmosphere contained only 1% oxygen. The cyanobacteria dominated the primordial seas, forming extensive stromatolite reefs and releasing increasing amounts of oxygen into the atmosphere. Meanwhile, between 2 billion and 1.7 billion years ago, two types of bacteria merged to form a single-celled organism called a eukaryotic microbe. This more complex cell established the essential building block for the later evolution of higher life forms. By about 500 million years ago the oxygen level had risen to 21% of all atmospheric gases, and the oceans teemed with oxygen-breathing life forms – including the first fish. Thus, Shark Bay's modern stromatolites help explain the role of microbes in the evolution of the Earth's biosphere.

Stromatolites also provide a record of local environmental changes and even the Earth's own evolution as a planet. The sediment layers accumulate in fine concentric bands, like the growth rings on a tree. Cross-sections of ancient stromatolites reveal beautiful layers of fossilised sediment. Because stromatolite growth is controlled by tides, temperature and sunlight, some scientists believe the sediment layers reflect changes in the Earth's rotation on its axis, the tilt of its axis and the planet's orbit around the Sun. In this way the stromatolites of Shark Bay provide not only a unique insight into life at the dawn of time, but also a modern-day diary of our changing planet.

Department of Environment and Conservation