

Hydrogeological Wonder of the World - The Microbialites of Southwest WA

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The south west of Western Australia is one of the worlds Biodiversity hotspots. This is due to not only the large number of ecologically significant sites but the fact that they are under threat from anthropogenic forces. One of the most weird and wonderful groundwater dependant examples of this biodiversity is the Microbialites of Southwest WA.

The Microbialites encompass a number of spectacular, incredibly diverse algal communities, which typically biomediate, via respiration, CaCO_3 precipitation from groundwater discharge. They occur in coastal freshwater to hypersaline lakes as well as in groundwater springs and some types are widespread in the early fossil record.

Each community has a different distinctive morphology of limestone produced and are often visually spectacular. They have been classified into stromatolites, thrombolites and tufas based on texture and mode of occurrence. Modern stromatolites occur in Shark Bay and Pink Lake in groundwater discharge areas and are distinguished by the presence of laminations in their structure. These laminations are believed to be representative of annual sedimentation or precipitation rates. See Figure 1 – Stromatolites in Pink Lake.

Modern thrombolites occur in areas of groundwater discharge at Lake Clifton, Lake Richmond, Lake Walyungup and Lake Thetis with many other Holocene (or older) fossil communities documented as well See Figure 2- Thrombolites of Lake Richmond. They are distinguished by a clotted internal texture with a distinct lack of lamination and are often mounded structures.

Many modern and fossil tufa communities occur along the Cape to Cape region of the Leeuwin-Naturalist ridge. They have varied structures including massive, laminated and botryoidal. They occur at coastal and back dune groundwater discharge sites due to a combination microbial respiration and carbon dioxide degassing. See Figure 3A Tufas at Ellensbrook and 3B Tufas at Quarry bay).

The large number of communities occurring in such close proximity, within one of the world's most ancient landscapes is no coincidence. Almost all of the documented communities are highly groundwater dependant. The relative stability and ancient origins of the Australian continent would make this a logical site for modern analogues of these ancient organisms to persist. These communities are the modern evolution of some of the first life forms to colonise the planet. Their respiration is believed to be responsible for the genesis of the early atmosphere, allowing the evolution of higher life forms. They represent a culmination of the interaction between the hydrosphere, biosphere and lithosphere which has been occurring for more than 3.5 billion years.

Many communities are threatened by anthropogenic activities and are highly sensitive bio-indicators. They can be impacted on by either groundwater level changes or groundwater quality changes. Urgent research is needed to help us understand their links to local and regional groundwater regimes, as well as their tolerances to altered hydrology, to ensure they are protected.



Figure 1 – Stromatolites of Pink Lake.



Figure 2 – Thrombolites of Lake Richmond. Upper image is the actively growing part of the community. The lower image is the dormant/fossil community.



Figure 3A - Tufas at Ellensbrook



Figure 3B - Tufas at Quarry bay