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Mangroves of the Shark Bay Marine Park

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Background

Located on WA's arid mid-west coast, the Shark Bay Marine Park was created to preserve the outstanding, World Heritage listed, marine biodiversity of this remarkable region. While Shark Bay is very well known for its dramatic coastal landscapes, rare marine stromatolites and iconic marine fauna, fewer people realise that the area also supports the southern-most substantial areas of mangrove in Western Australia. This is despite the fact that Shark Bay is an unusual marine environment with a naturally-occurring salinity gradient within the semi-enclosed gulfs that ranges from normal seawater to nearly double that concentration in the inner reaches of L'Haridon Bight and Hamelin Pool.

Left: Large mangroves near Carnarvon on Shark Bay's eastern coast (photo: Alan Kendrick).

Mangroves do not fall into a single taxonomic group. Instead, they are defined as those plants that grow in the intertidal zone of sheltered marine and estuarine environments. While tropical mangrove stands can be huge and typically comprise many species, the area of mangroves and the diversity of plants in them decreases markedly in temperate areas.

Mangroves exhibit some remarkable adaptations that enable them to live on the fringe of the sea, the most obvious of which are pneumatophores or roots that grow upwards into the air to enable gas exchange away from the typically muddy and anoxic sediments in which they grow. Mangroves are ecologically important as they create complex habitats that stabilise coastal sediments and trap nutrients. They also provide substratum for algae, and refuge and foraging habitat for a wide diversity of other species, such as invertebrates, fish, turtles and birds.

Despite being recognized for their high conservation value, little research has been carried out on the mangroves of Shark Bay. During 2009, scientists from DEC's Marine Science Program and the WA Herbarium began to study these communities to improve our understanding of how they grow in this unique area, and to assist in the development of methods to monitor their condition in the future.

Above (left to right): Shark Bay mangrove residents: the alga *Ulva* growing on pneumatophores; littorinid snails on a branch; mud whelks among pneumatophores; and nesting pied cormorants (Photos: John Huisman).

Above: Large mangrove trees at Blind Inlet (photo: John Huisman).

Left: Sparse and low mangroves on the Wooramel coast (photo: Michael Rule).

Findings

The mangroves of Shark Bay comprise only one species, the white mangrove *Avicennia marina,* and these trees occur around the coastline in widely dispersed and often isolated stands of varying size. They may grow in semi-enclosed lagoons or in the channels that connect these lagoons to the sea. It is not yet clear why these mangroves are so patchily distributed.

Despite all being the same species, Shark Bay's mangroves also vary widely in structure. Some stands consist of large trees which form a dense canopy of up to 5 m in height, while others are low and appear to be relatively stunted. Some stands have a much higher density of adult trees than others and these trees are typically smaller than those in stands supporting a lower density of trees.

These marked differences in the structure of mangroves across Shark Bay are likely to lead to differences in the ecological function of mangroves across the bay. For instance, stands of large mangrove trees are relatively open beneath the leaf canopy and are likely to provide better refuge habitat for large fauna such as fish and turtles, than would dense stands of smaller trees. However, dense thickets of smaller trees may trap more seagrass wrack, possibly making them important areas for the breakdown of organic material and cycling of nutrients.

While it is still unclear exactly which environmental factors are causing the obvious structural differences in mangroves across Shark Bay, the stands with the largest trees mostly occur in areas of oceanic seawater, whereas the smaller and apparently stunted trees tend to be located in areas of Shark Bay that typically have a metahaline, or higher, salinity.

Management Implications

- In contrast to almost all other large mangrove systems in WA, those in the Shark Bay Marine Park are represented by a single species, the white mangrove *Avicennia marina*, which makes them unusual and of high biodiversity conservation significance.
- The structure of Shark Bay mangrove stands is highly variable, which may be related to the location of mangroves in zones of either oceanic or metahaline salinity. This structural variability suggests that these habitats are ecologically different. Consequently, the mangroves in the oceanic and metahaline zones of the Shark Bay Marine Park should be managed for conservation separately, and not considered as a single homogenous resource.
- Further studies should examine the ecological role of these variable mangrove stands within Shark Bay, and more broadly in relation to other mangroves across WA's Pilbara and Kimberley regions.

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