

# The hard bottom Mangroves of Sinai, Red Sea

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## Abstract

Mangrove forests of *Avicennia marina* growing on rocky coral bottoms are found along the Southern coast of the Sinai Peninsula. This faunal and floral association is different from the generally known soft-bottom mangroves. The morphological zonation of the Sinai mangrove is described and the corresponding biotic associations are briefly reviewed.

## Résumé

Les palétuviers de la péninsule du Sinaï sont formés seulement par *Avicennia marina*. Les forêts poussent sur un substrat de rocher corallier et représentent par suite un type de mangroves différent de celui — mieux connu — qui vit sur les fonds vaseux et estuariques. En Sinaï, la combinaison de salinité élevée et fond rocheux donnent au mangrove un ensemble floristique et faunistique jusqu'à maintenant décrit seulement du Great Barrier Reef australien.

Les faciès topographiques du mangrove du Sinaï sont brièvement décrits ainsi que les biocoenoses qui y correspondent.

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Extensive areas of the world are covered by soft bottom mangrove forests of the estuarine type. A second geographically restricted type is that of the mangrove forests growing on hard coral bottoms and under stenohaline marine conditions, or even metahaline conditions.

The reef mangroves were investigated during the Great Barrier Reef Expedition of 1928-1929 [T.A. STEPHENSON *et al.*, 1931] and later by W.B. STEPHENSON *et al.* [1958] and W. MACNAE [1968].

The mangroves of the Red Sea shore of the Sinai Peninsula were first explored in 1956. A more detailed survey was begun after 1967. These mangroves are of the Great Barrier Reef type, and thus, the second known case of reef-mangroves to be investigated.

MACNAE [1968] writes that "... mangrove forests associated with the low-wooded island reefs of the Great Barrier Reef... depart from the norm", since "it is quite surprising to see... the prop roots of *Rhizophora* associated with animals characteristic of the midlittoral flats and pools". The mangrove forests of Sinai have many traits in common with the Australian reef-mangroves.

There are five sites of mangrove in Sinai. Four of them, dense patches of mangrove forest, are situated on a stretch some 20 kilometers long, near the southern opening of the Gulf of Elat, north of the beduin village and palm oasis of Nabq. The fifth site consists of only a few hundreds of mangrove trees growing in a channel behind Ras Muhammad, the southernmost promontory of Sinai. On the African coast, the northernmost mangrove is found some 70 km further to the south [KASSAS & ZAHRAN, 1967]. The four mangrove forests of Nabq are considered to be typical, while the small thickets of Ras Muhammad are an impoverished variant.

On the whole, if compared with the Indian Ocean and even with the Southern Red Sea, the Sinai mangrove is an impoverished one. Of all the different species of mangrove trees known, only *Avicennia marina* is to be found; there are no mud-skippers (*Periophthalmus*) and no red algae of the "Bostrychieum" community on the pneumatophores. This may be attributed to the high salinities found in the Sinai mangrove : 40-47 ‰, as well as to the relatively low winter temperatures of the shallow lagoons, sometimes going down to below 15° C.

Going from the open sea towards the shore, one can distinguish between five basic morphological features :

1. A fossil reef flat, partly or sometimes completely exposed at low tide, comparable to STEPHENSON's "honey comb rock". The width of this flat is 100-300 m.

2. A permanently submerged area parallel to the reef flat, a few tens of meters in width, with rare and isolated young *Avicennia*. This is comparable to STEPHENSON's "mangrove park". The bottom of this submerged area is rocky.

3. The thick growth of *Avicennia marina* follows, with some trees reaching up to 5 m height. The width of the belt may reach up to 300-400 m. Most of the mangrove is completely exposed at low tide, but there are puddles and channels where a few centimeters of water remain. The bottom is muddy.

4. Between the mangrove thickets there are big clearings occupied by roundish pools, 100-200 m in diameter, with depth of up to 1.5 m at low tide. These pools generally communicate with the "mangrove park" through wide openings; waves of a stormy high tide may frequently penetrate. The bottom of the pools is a sandy mud rich in foraminiferans. In one instance (at Shurat el Manqata), the pool is completely surrounded by dense mangrove and is sheltered from waves.

5. A shallow tidal lagoon separates the mangrove from the dry land. During low tide, the landward lagoons are usually dry, or form isolated puddles. The bottom is generally rocky or covered with a thin layer of mud. The landward lagoon is surrounded by muddy flats on underlying rock.

The biotic associations correspond, more or less, to the different morphological features :

1. The "honey comb rock" is covered by desiccation resistant algae like the crust-forming *Dicetyosphaeria cavernosa* and the red alga *Digenea simplex*. It is inhabited by populations of the brittle star *Ophiocoma scolopendrina* and a whole array of typically intertidal animals.

2. In the permanently water-covered belt (the "mangrove park"), seaward of the mangrove, the sea-grasses predominate : *Halodule uninervis* is found under shallow conditions, while *Halophila stipulacea* and *Cymodocea rotundifolia* grow on slightly deeper bottoms. The dominant animals are *Strombus mutabilis* and *Strombus floridus*, *Nassarius* sp., the whelk-like *Volema pyrum nodosa* and the masking crab *Calappa hepatica*.

3. The mangrove forest itself offers a more complicated picture. In the interior of the thickets, the bottom is covered by the red alga *Spyridia filamentosa*; the black crab *Metopograpsus tukuhar* is common. Towards the seaward or lagoon-ward edges, patches of *Digenea* appear. The macrofauna is characterized by swarms of the shrimp *Palaemon pacificus*, two species of the water-strider *Halobates*, and groups of the medusa *Cassiopea andromeda* lying on the bottom. On the seaward tree trunks and pneumatophores, *Spyridia* is accompanied by several species of blue-green algae, and the brown algae *Hydroclathrus clathratus*, *Hormophysa triquetra*, the red alga *Laurencia* sp., etc. The sessile intertidal fauna is composed of *Balanus amphitrite*, *Crassostrea cucullata* and *Littorina scabra*. At subtidal levels, the pneumatophores are covered by sponges, or are settled by the coral *Stylophora pistilata* and the sea urchin *Echinometra mathaei*.

4. The pools have shallow rocky edges, which are covered with *Digenea* patches. The dominant animal is *Strombus tricornis*. Towards the shoreward littoral end of the pools, various species of *Cerithium* and the cerithid *Clypeomorus clypeomorus* start to predominate. The deeper muddy bottoms of the pools have a rich fauna of polychaetes, accompanied by the ghost shrimp *Callinassa bouvieri* and the little shell *Diplodonta*. In the closed pool of Shurat el Manqata, the *Spyridia* growth is followed by a deeper muddy bottom where, down to a depth of 60-70 m, dense meadows of a fern-like biseriate variety of *Caulerpa racemosa* are found.

5. Finally, the shallow sand muddy bottoms separating the mangrove from the shore are submerged only at high tide. Here is the domain of the Ocypodidae : two species of the fiddler-crab *Uca*, and *Dotilla fenestrata*.

### References

- KASSAS (M.) & ZAHRAN (M.A.), 1967. — On the ecology of the Red Sea littoral salt marsh, Egypt. *Ecological Monographs*, **37**, 4, pp. 297-315.
- MACNAE (W.), 1968. — A general account of the fauna and flora of mangrove swamps and forests in the Indo-West-Pacific region. *Advan. Mar. Biol.*, **6**, pp. 73-270.
- STEPHENSON (T.A.), STEPHENSON (A.), TANDY (G.) & SPENDER (M.A.), 1931. — The structure and ecology of low Isles and other reefs, in : *Scientific Reports, Great Barrier Reef Expedition 1928-1929*, **3**, 2, pp. 17-112.
- STEPHENSON (W.), ENDEAN (R.) & BENNETT (I.), 1958. — An ecological survey of the marine fauna of Low Isles, Queensland. *Aust. J. Mar. Freshwat. Res.*, **9**, pp. 261-318.

