

In many places there are undercut cliffs near the lake edges similar to the intertidal undercuts of the ocean coasts, and at the same level; they are illustrated by Teichert (1950). The existence of these makes it certain that the lakes were connected to the sea at a time when sea level was little different from the present. Most of the common species of the shell deposits still live in coastal waters near Fremantle (principally

in the shelter of Cockburn Sound). Of the others, many, e.g. *Katelysia* spp., are common along the south coast of W.A. and a few are known only from the north west (Shark Bay). Most live in sand or silt but both *Notacmea* and *Hormomya* live on rocky shores. The fauna is that of a marine gulf under stable conditions of temperature and salinity (G. Kendrick, in lit.).

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18.—Fresh Water and Brackish Water Swamps of Rottnest Island

These swamps lie in the eastern half of the Island and, in comparison with the salt lakes, have a very limited area. Most of the larger swamps (Lighthouse, Salmon, Barkers, Bulldozer, Bickley, Rifle Range and Parrakeet) are situated in interdune depressions. Aerodrome Swamp was however, originally part of Government House Lake; it was isolated during the construction of the aerodrome in 1943 and is now much less saline. Corio Pool and the two small Garden Pools lie adjacent to salt lakes and, like the seepages round the lakes, appear to be fed by a seasonally variable seepage. In addition to these waters, there are some wells which act as breeding sites for mosquitoes.

Two important factors affect the biology of the swamps.

(a) Water is generally present only during the winter; the ponds fill near the time of the first heavy winter rains in May or June and the last free water evaporates with the higher temperatures of late October and November. Pools in Bickley Swamp and Aerodrome Swamp may retain water through summer and even in the shorter lived swamps the soil remains moister than in the surrounding dunes.

(b) The water of some swamps is brackish and shows marked seasonal changes in salinity.

Apart from research on frogs and some preliminary studies on dragonflies, no study has been made of the faunal succession of the Rottnest swamps. The frogs have been studied by members of the Zoology Department as part of investigations of the Western Australian amphibian fauna, and the results will be published elsewhere in the near future.

Collections were made from all the freshwaters in October, 1958. Unfortunately, identification of the material is still incomplete, but Table 1 shows the distribution of animal groups. It is evident that not only is the total fauna a restricted one, but that it differs from one swamp to another. It is clear also that animals maintaining populations in the temporary swamps must show certain adaptive characters in relation to the factors mentioned above. (a) They must either aestivate as a drought resistant stage or recolonise the ponds annually from the mainland. All the Crustacea belong to groups known to have aestivating eggs, with the exception of the amphipod, which is the littoral rockpool talitrid, *Hyale rubra* (kindly identified by Dr. K. Sheard). In contrast, larval dragonflies (*Anisoptera*) cannot withstand drying and annual recolonisation occurs; successful breeding depends on rapid growth, but in years when the ponds are short lived, breeding is frequently unsuccessful (Hodgkin and Watson 1958). (b) They must be able to withstand some degree of salinity; the capacity for osmoregulation being important in the range of swamps inhabited. Investigations of the fauna of the Rottnest swamps must give valuable information relative to adaptation to seasonal aridity and to salinity and may also throw light on divergence from the mainland swamp fauna.

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Reference

Hodgkin, E. P., and Watson, J. A. L. (1958).—Breeding of dragonflies in temporary waters. *Nature Lond.* 181: 1015-1016.

19.—The Littoral Environment of Rottnest Island

Fauna and flora of the rocky shores of the Island have been studied over many years and are now fairly well known. Sandy bays and beaches, and the abundant life of the sublittoral rocks have, however, received little attention. Zonation of the animal and plant life of the intertidal limestone platforms, in relation to tide levels and exposure to wave action, has been the particular interest of the writers. Surveys have been made over a number of years; the results have been presented as theses (Marsh 1955, and Smith 1952) and are in preparation for publication.

Tidal range is small, maximum daily range is about 3 ft and extreme range about 5 ft, sea level being influenced by air pressure, water temperature, and prevailing winds (Hodgkin and Di Lollo 1958). Sea temperature varies remarkably little; it rarely exceeds 23° C or is less than 18° C. The water is generally very clear and estuarine water from the Swan River rarely reaches the east end of the Island, even during heavy winter rains.

Sandy bays and rocky headlands with intertidal platforms alternate around the 20 miles of coastline and narrow limestone bars, barely



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