



SOME ECOLOGICAL ASPECTS OF SELECTED MANGROVE
ISLETS IN THE NEGOMBO LAGOON(SRI LANKA).

by

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General Introduction

Mangroves dominate about 75% of world's coastline between 25° N and 25° S (McGill 1958). This ecosystem which was supposed to be waste land in the past is now considered to be highly productive. Scientists in the last decade have decided to explore the mangrove ecosystem for man's needs. Apart from providing timber and charcoal, the mangrove forests form the breeding grounds for fish, prawns, edible crabs and shell fish. Unfortunately mangrove ecosystems are easily destroyed by the rapid growth of human populations, utilising these areas for village expansion schemes, drainage canals and construction of harbours. The Forest Ordinance of Sri Lanka (1966, section 6, 7, & 20) restricts certain abuses namely felling, setting fire, removal of barks, grazing of animals and trespassing, within crown forest, which includes the mangroves. However fishermen use the mangrove timber for building construction, firewood, and the bark for tanning and staining their nets and sails. The twigs of these plants are used for trapping fish in the lagoon. Occasionally oysters are harvested for consumption, and their shells sold as a source of lime. In order to combat the growing population demands it is essential to conserve and utilize these areas, as far as possible, so that the maximum economic value could be obtained without destroying the ecosystem. It was with this intention that a study of a selected mangrove community in Sri Lanka was initiated.

Macnae & Kalk (1962) have drawn attention to the use of the word mangrove to mean either, an association of

trees which grow in areas flooded by tidal waters of the sea or to certain species of trees which occur in such an association within the tidal waters of the sea. Subsequently Macnae(1968) used the term 'mangal' to mean flora of the forest community and 'mangrove' to mean a species of trees which occur in the association. Proceedings of the second Thai National Seminar on Mangrove Ecology held in October 1976 refers to 'mangal' as a dominant flora and fauna association on tropical sheltered and estuarine areas. The 'mangrove ecosystem' is defined in the above journal as the intertidal zone dominated by woody halophytes associated with continuous water courses, swamps and backwaters and their associated populations of plants and animals. In this definition the mangrove ecosystem has two systems linked together, firstly the mangrove forest system and secondly the aquatic system composed of swamps associated with the sea through estuaries and water ways. Here both fauna and flora have been considered with the aquatic system and in this thesis, mangrove ecosystem is used in this sense.

Early workers on mangroves, Blatter(1905), Bowman(1915), Collins(1921), Chapman(1944), Erichson(1921), Cooper & Pasha (1935), Catterjee(1958) dealt only with mangrove flora. Later Verwey(1930), Danserau(1947), Macnae & Kalk(1962), Berry(1963) and Macnae(1963, 1966, 1968) included mangrove fauna as well in their study. Floral and faunal zonation was observed to be a universal feature within the mangrove ecosystem. Rodriguez(1959, 1963) and Berry(1963) did not favour the concept of banded zonation within the mangrove ecosystem, instead they recognized several habitats each

with its own characteristic fauna.

The mangrove ecosystem could be considered as a unique and a complex ecosystem. It is unique due to its limited and selected fauna and flora caused by environmental factors. Plants belonging to different families exhibit convergence in adaptation such as viviparity, pneumatophores, adventitious roots, thick cuticle, bent-knee roots and salt excreting cells in the leaves. It is complex because the mangrove ecosystem is a confrontation of contrasting habitats such as terrestrial, estuarine and marine.

Clarke and Hannon (1969) summarising the holocoenotic complex operating in the mangrove swamps and salt marsh communities of the Sydney District have stated that tidal inundation, soil salinity and the extent of plant cover to be important variables of this environment, which further depend on the slope of the land, elevation above mean sea level, height of the water table, proximity to water sources, drainage and aeration, wind, evaporation, rain, nature of soil and genotype of plants. It may be either the complexity or inaccessibility of the environment or both, that confined earlier workers to only a qualitative study. According to Warner (1969), the only workers who collected quantitative data in the mangrove environments were Golley, Odum, and Wilson (1962) and Rodriguez (1963). Among some of the recent workers who did a quantitative study on the fauna are Sasekumar (1974), Day (1975), Weate (1975), Frith et al (1976), Hutching et al (1977) and Weate & Hutching (1977).

The soil sediment forms an important part of the

mangrove ecosystem. Hence mangrove soil analysis has been carried out for pH, exchangeable bases and other chemical factors by Navalkar and Barucha (1948, 1949, 1950) in India, while the decomposition of organic matter and phosphorous fixation (Hess 1961a, 1962), the formation of elemental sulphur and sulphur oxidation (Hart 1959, 1962) have been investigated in the mangrove soils of Africa. Knowledge on the physical analysis of mangrove soils is limited except for the work of Navalkar (1941) in Bombay and Salsette Islands, Giglioli and Thornton (1965, 1966) in Gambia, Africa; Clarke & Hannon (1967) in Australia, Frith et al (1976) in Thailand, Sasekumar (1974) in Malaysia and Walujo & Karawinsita (1977) in Indonesia.

Although the extent of mangroves in Sri Lanka is not known, Aruchelvam (1968) has estimated the mangrove area to be within 80 - 100 Hectares. The mangroves do not form a continuous coastal belt (Abeywickrema 1964) around the island, but are localised into discontinuous patches chiefly around estuaries and lagoons. Most of the early work on the mangroves of Sri Lanka was mainly by plant taxonomists (Trimen 1900, Tansley & Fritsh 1905, Chapman 1947, Abeywickrema 1956, 1960). A basic study on the mangrove plants and their distribution was made by Aruchelvam (1968). Kugathanan (1969) attempted to quantify the faunal distribution around Thondaimannar lagoon.

The faunal composition of the mangroves in the eastern and western coasts has not been clearly identified in relation to the environment. Hence the present study was initiated on selected islets of

mangrove in the Negombo lagoon with a view to studying the relationship of the mangrove community with the environment. Climate, topography, elevation, soil and vegetation of the mangrove islets are dealt with in the first chapter of this thesis. In order to study the ecology of the mangrove ecosystem a knowledge of the physical factors is essential. Hence factors such as rainfall, tides, temperature, salinity, dissolved oxygen content, pH, water current, wind speed and relative humidity were measured seasonally (Chapter 2) and diurnally (Chapter 3). Further, fauna and flora were found to be influenced by the nature of soil and as such, investigations were carried out for particle size, organic matter, exchangeable cations, nitrogen, pH, salinity of ground water and the level of the water table (Chapter 4). In Chapter 5, investigations on faunal distribution in the islets of mangrove are reported. A population study of the predominant invertebrate fauna (polychaetes, crabs, and oysters) of the selected islets of mangrove was made and the fluctuations in the populations were related to the environmental changes of this habitat (Chapter 6).