Chapter 1

Introduction

1. Mangroves: a threatened ecosystem

Mangroves, one of the most threatened and valuable types of wetlands, are extremely important components of the estuarine system. They consist of holophytic (salt-tolerant) seed-bearing trees approximately 40-50 m high growing along tropical and subtropical shorelines of the world (25° N and 25° S latitude) (Day et al., 1987). Species diversity in mangroves is not the same in all areas. For instance, in the Americas, there are only six species from four genera, but worldwide there are at least 90 species and 55 genera (Chapman, 1970). In the Indo-Pacific region alone, there are 70 species from 45 genera (UNESCO, 1987). Species distribution is related to tide and terrestrial drainage within mangroves (Bunt et al., 1985. In tropical regions, *Rhizophora* are dominant in areas adjacent to open water (Bunt et al., 1985)

Mangrove and other coastal wetlands form part of an interdependent complex of coastal habitats that provide a habitat for many plant and animal species. Moreover, because mangroves grow along shorelines and on tidal mud flats, the trees reduce coastal erosion by acting as windbreaks and reducing the force of coastal storms. They also protect offshore habitats from land-based pollution (Aksornkoae, 1989).

Vast areas of mangroves have been deliberately cleared and destroyed, particularly in the past decade. Unfortunately, this continues in many regions.In Ecuador, for example, nearly half of these protective swamp forests have been cleared, mostly for establishing shrimp ponds. The consequence is serious changes in drainage patterns, nutrient availability, and the frequency of tidal inundation. These changes, of course, have adverse effects on mangrove flora and fauna (Kaeoniam, 1993). The crisis of mangrove forests can also be seen in several countries of Asia, for instance, in India, Philippines, Indonesia, Pakistan, and Thailand. In Indonesia, particularly in Kalimantan, 95% of mangroves have been cleared for pulpwood production (FAO, 1993). In some regions, such as Trinidad, mangroves are being developed for tourism (UNEP, 1993).

1.1 Loss of mangroves in Thailand

In Thailand, where mangrove forests are managed by the Royal Forest Department, the situation is similar to that found in other Asian countries (Aksornkoae, 1989). Mangroves are exploited for the production of charcoal, firewood, and poles. Some conservation areas have been established. Jaruppat (1993) studied mangrove forests in Thailand over a period of 30 years. He reported that, on average, 40,479 rai were being lost each year. The mangrove forests are being severely disturbed principally because: 1) wood is being cut at a faster rate than it is being produced by the forest; 2) of encroachment by human settlement, land reclamation, and road construction; 3) of the establishment of marine animal farms, such as shrimp and fish farms; 4) of mining .

Although mangroves are being depleted at an alarming rate, local people understand that these forests provide valuable resources. It is clear that these areas must be protected. Unfortunately, in Thailand and elsewhere, this does not appear to be a priority.

1.2 Mangrove soils

The mangrove ecosystem consists of more than trees. Mangrove soil is clayish (mud), saline, and often anaerobic (Limpsaichol, 1978). Sometimes, the soil is acidic, depending on the tides that can flood the area once or twice a day. The main source of the sediment is runoff from higher land areas and flocculation in the estuary. The composition of the clay compound is related to adjacent rock and affects plant diversity in the mangroves. Debris in the form of leaf litter and pieces of tree branches are the main sources of nutrients in mangroves (Angsupanich and Aksornkoae, 1993a,b). This is very important for nekton and phytoplankton, organisms that play a key role in the life of mangroves. It has been accepted that the nutrient cycle in mangroves is not a closed system (Gajaseni and Aksornkoae, 1993). This process starts with litter fall, breakdown by organisms such as crab and fish, and final microbial breakdown. Understanding this complex and vital nutrient cycle is necessary.

Although the mangrove sediment has been studied by Aksornkoae and Khemnak (1984) and Narongrit (1992), their studies did not include nutrients in interstitial water. This means that we have a limited knowledge of the vertical distribution of nutrients in mangrove sediment, especially in Thailand. This thesis was undertaken with the objective of making a contribution to a better understanding of this phenomenon by analyzing nutrients in interstitial water.

It is hoped that the knowledge gained from the research undertaken for this thesis will result in a better understanding of the mangrove soil system in Phang-nga Province as well as provide some useful guidelines in the management of all mangroves.

1.3 Objectives of the study

1) Study plant nutrient content in interstitial water at different depths at Klong Lad Khao Kao, Changwat Phang-nga.

2) Study plant nutrients released from the sediment during a tidal cycle.

3) Study plant nutrients released from stirred and unstirred sediment in the laboratory.

1.4 Benefits of the study

1) Understand plant nutrient distribution in mangrove sediment and evaluate enrichment factors at Klong Lad Khao Kao, Changwat Phang-nga.

2) Assess the influence of different seasons on plant nutrient distribution in the sediment.

3) Understand the source of plant nutrients and assesses the impact of plant nutrients on adjacent water.

4) Provide data that can be used in the future to study and protect mangrove ecosystems.