MANGROVES OF PAKISTAN

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Summary

Mangroves are salt tolerant forest ecosystems of tropical and subtropical intertidal regions of the world. These tidal forests play an important supportive role to improve the socio-economic condition of the people in the Tropics and constitute a natural refuge for survival and growth of a variety of plants and animals. Due to over exploitation and very little input for their perpetuation this erstwhile resource is fast disappearing. The present paper summarizes the managroves of Pakistan, the area and distribution, flora and fauna, management, utilization, and causes of degradation. Suggestions have also been made to improve the situation.

Introduction

The mangrove ecosystems play a significant role in the economics of tropical societies providing a wide variety of goods and services to a multitude of people, including timber and fuelwood production, tannin, foliage fodder, support for commercial and subsistence fisheries, salt production,and coastal erosion control and lastly recreation and employment to thousand of people. This rich resource, however, is being perpetually degraded and destroyed due mainly to over exploitation by cutting trees for fuel, incessant lopping for fodder and extensive grazing. Besides wave action, siltation and reduction in frequency in flushing with sweet river water due to construction of many dams on the rivers have deteriorated this rare ecosystem. The mangrove forests of Pakistan are not any exception.

There have been no management plans to maintain and improve the mangrove forests of Pakistan. However, recently, some interest has developed and cutting and exploitation of these forests has been checked to protect the major sea ports of the country—Karachi Port and Port Mohammad Bin Qasim.

General Description and Distribution of Mangroves

Mangroves constitute a type of habitat forming forests in estuaries, salty marshes and muddy coasts between high tide and low tide levels, occuring in lagoons and creeks of tropics, extending outside the tropics only to a limited extent. Schimper (1903) defined mangrove as tidal woodlands occuring in creeks and lagoons where the movement of sea and air are weaker. In physiognomy, the mangrove resembles scrub or bushland. The mangrove flora is a very specialized one, consisting of about 20 natural orders belonging to 70 species, including some of the halophytic herbs and allied sand-dune species (Sindhu, 1963). According to Good (1952) the number of mangroves and their most generally associated species is about thirty

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and they are generally restricted to latitude below 25°, though in places like Japan and North Islands of New Zealand, they reach much higher latitudes. Chapman (1974) subdivided the world mangrove vegetation into two large groups—the Old World Mangroves and the New World Mangroves which also include those on the West coast of Africa. The Old World Mangroves extend from East Africa, up the Red Sea, across the Indian Ocean to Australia, thence northwards to the Philippines and Southern Japan and southwards to New Zealand, finally reaching their eastern limit in Samoa. Apart from the west coast of Africa, the New World mangroves are essentially restricted to the shores of the Americas and the West Indies, and extends westwards to Fiji. The Old World area contains a large number of species, about 60, though the number varies depending upon the interpretation of a mangrove species. There are in contrast, only about 10 species in the New World group. It can, therefore, be argued that the original centre of distribution must have been in the Old World (Chapman, 1944).

Most of the magrove species are characterized by prevalence of vivipary, high osmotic and suction pressure in leaves and presence of various types of pneumatophores. The "Mangrove" habitat is as old as the early land flora (Croizat, 1952).

Area and Distribution in Pakistan

Covering an area of about 283000 ha mangrove forests in Pakistan lie between 24°10-ft. and 25°37-ft. latitude North and 61°38-ft. longitude East. They occur mainly in the Indus daltaic swamps in the province of Sind in the south along the Arabian sea coastline. Small patches exist also in the deltaic swamps of small rivers, Hools, Porali-Hingol and Dasht which meet the sea at Kalmat Hor, Niani Hor and Gwadar Bay in the province of Baluchistan (Champion et al. 1965). According to Kogo (1985), along the Baluchistan coast, they are found at the inlets where there is less wave action.

Climate

The climate is arid subtropical coastland with a mean annual rainfall of 150—250 mm, received mainly in the warm summer season (Sind) or cool winter period (Baluchistan). Relative humidity is high, being 75%. Temperatures are moderate with a sea-breeze throughout the summer. The mean maximum temperature of the hottest month is around 35°C and mean minimum of the coldest month is around 18°C. (Champion et al. 1965).

Soil

The soil of various islands in the back water consists of recent fine alluvium with plenty of clay rich in salts. The entire coastal area of this region has been built up by the Indus which has been shifting its course from the rocky western limits of Kohistan tract to the sandy areas in the east. The deltaic land is furrowed into large number of coastal islands separated by various creeks (Ahmad, 1983).

Flora and Fauna

1. *Flora*

According to Saifullah (1982), eight species of mangroves occurred in Pakistan as given in the table 1 but *Avicennia marina* is the most common. The average height of the often only trees is 3—6 m; the best patches attain 6—7.6 m. (Champion et al. 1965).

TABLE 1

Tree species of mangroves in Pakistan

	Species	Family
1.	*Aegiceras corniculatum* (L.) Blance	Myrsinaceae
2.	*Avicennia marina* (Forrsk.) Vierh	Avicenniaceae
3.	*Bruguiera gymnorhiza* (Linn.) Savigny	Rhizophoraceae
4.	*Ceriops tagal* (Perr.) C.B. Robinson	—do—
5.	*R. apiculata* Blume	—do—
6.	*Rhizophora decandra* (Criff.) Ding Hioh	—do—
7	*R. mucronata* Poir	—do—
8.	*Sonneratia caseolaris* (Linn.) Engl.	Sonneratiaceae

According to Kogo et al. (1980) occurrence of *B. gymnorhiza* and *S. caseolaris* is doubtful and the species of *Rhizophora*, occupying a large area in Miani Hor, is *R. stylosa* and not *R. apiculata*. *C. tagal* occurs in Miani Hor but only as scattered trees. Kogo et a. (1980) found only one tree of *A. corniculatum* in China creek. *B. gymnorhiza* and *C. tagal* were checked in Hab river delta but they appear to have disappeared even in the *A. marina* habitat, while *R decandra*, *R. mucronata*, *S. caseolaris* and *A. marina* were not found during their studies.

A. marina grows on new muddy sheltered shores subjected to periodic inundation. When the deposits of silt and clay mount up the character of vegetation changes with the rise in ground level. The *Avicennia* becomes more bushy and coarse greasses come up with salt bushes. When the land becomes too high even for occasional tidal submersion mangrove species give way to desert flora such as *Salsola foetida*, *Sueda fruticosa* and coarse grasses like *Helechlora dura*, *Halopyrum micronatum*, *Aeluropus lagopoides*, *Urochandra setulosa* and *Cenchrus setigerus* (Ahmad, 1983). Mirza et al. (1983) reported appearance of some other types of vegetation like *Cyperius arenarius*, *Heliotropium tuberosum* and *Cressa citrica*.

2. *Fauna*

A large number of animals find their abode or feeding grounds in the mangrove environment. Fishing cat, small Indian civit, smooth Indian otter, crocodiles, tortoises, numerous amphibians and many migratory and resident birds, many species of fin fish, prawns, shrimps, crabs, oysters, mussels and cockles occur (Ahmad, M.F., 1983).

Utilization

The mangrove forests play a very important role in the economy of the local population which is composed of fishermen, nomads and a few farmers. The main uses are firewood, poles, fodder and grazing. Of course lot of fishing is also available due to the peculiar habitat provided by the mangroves.

1. *Wood for heating, cooking, hutments and poles.*

The coastal dwellers are mostly fishermen, professional graziers. They require timber for the construction of their huts and firewood for heating and cooking. Charcoal is also made from wood. They require fishing poles about 3 metres long for holding fishing nets in small creeks. Wood is also needed for curing the prawns. These forests have also been an important source of firewood in the city of Karachi before Sui gas was available.

2. *Grazing, fodder, browse*

These forests are heavily grazed almost all the year round by camels and buffaloes and goats. The pressure become all the more severe when pastures in the provinces of Sind and Baluchistan have been droughty condition and thousands of camels are guided to the mangroves by their owners to feed on the fallen leaves and lower branches. Stall feeding is also done with leaves and branches. Once a week fresh drinking water is brought from outside in the country boats for the camels. It is surprising that the camels have adapted themselves to live and feel at home on muddy flats which are subjected to tidal inundation.

3. *Fishing*

A number of scattered fishing colonies are situated all along the shoreline. Nearly 10,000 fishermen are engaged in catching fish, prawns, shrimps, lobsters, crabs, oysters etc. The fish is collected mostly for export to other parts of the country as well to many other countries of the world. The spoiled fish is used as fertilizer.

4. *Wildlife*

Crocodile and fishing cat are important wildlife of this ecosystem. Skin of crocodile fetches high prices. However these animals are now relatively rare in this area. The habitat also provided nesting ground for a large variety of migratory birds providing hunting and recreation to the people.

Causes of degradation

— The mangroves have been regarded as no man's property since ages. Consequently these have been exploited and plundered at will not only by the local population but also the people living in other parts of the country for firewood. Due to over grazing, lopping and browsing most of the species with the exception of *A. marina* have disappeared. *R. stylosa* and *C. tagal* being better for poles and as firewood have been over exploited. The mangroves vegetation in the areas contiguous to the main land has completely disappeared. Poorer species such as *Sueda fruticosa*, *Tamarix gallica* and some other shrubs and grasses have taken over since ages.

— Construction of dams and barrages has effected the mangrove vegetation as enough quantity of sweet water is not available in the Indus delta making the salinity still higher. Some mangrove species which could not tolerate higher salinity have disappeared. Even *A. marina* grows slowly if the salinity is high.

— The adverse biotic and edaphic factors have not allowed the natural regeneration to establish.

— The forests have not been scientifically managed as it is not possible to protect vast tracts in the open sea.

Past and present management

During the British period, the mangrove areas belonged to the Revenue Department and no forest management was done. After World War II, in 1946, E. A. Garland, Development Conservator of Forests, suggested the systematic management of the mangroves. However, the areas continued to be under the charge of Revenue authorities. In 1955, the Inspector General of Forests pressed for the systematic management of mangrove forests. A development scheme was sanctioned and a forest division was established in 1958 to manage. In 1959, these forests were declared as 'Protected Forests' and were managed under the Forest Act, however, enforcement of the Forest Act was a very difficult task as the local people were not aware of the Forest Laws and Regulations (Kogo, 1985).

In 1964, Working Plan of the Coastal Zone Afforestation Division (From 1963-64 to 1982-83) was prepared. This was the first working plan with the object of protecting and improving the forests. To attain the objectives of management, the following working circles have been constituted:

— Selection-cum-improvement Working Circle
— Afforestation Working Circle
— Lopping, Grazing and Browsing Working Circle.

In 1983, a National Mangrove Committee was formed with the charter of development, improvement and co-ordination of all activities including forest, fisheries, bio-mass and environ-

ment in the mangroves. In 1985, a revised management plan was prepared so that mangrove forests could be managed for production on sustain yield basis (Ansari, 1985).

Experimental fellings have been carried out since 1962-63 in Korangi and Keti Bundar North to find out yield for economic extraction. The best areas yield on an average 45.6 m^3/ha (Ahmad, 1983).

Research

There has been no research programme for development of mangrove forests in the past. In early sixties the Forest department tried experimental plantation of exotics from Bangladesh. Out of five species tried viz. *Heritiera minor*, *Excoecaria agallocha*, *Carapa moluccensis*, *Sonneratia apetala* and *Nipa fruticans* only *E. agallocha* appeared promising (Khan, 1965). The need for protection and development of the magrove forests has ultimately been realized. In view of their multifarious importance these forests have been put on the research programme of Pakistan Forest Institute, Department of Botany, Karachi University, Institute of Marine Biology and Wildlife Forest Department, Government of Sind. In this respects, among other aspects, research on habitat types, forest zonation, succession, regeneration status of tree species and ecological relationships of forests is intended. Possibility of introduction of more economic tree species is being explored.

Currently several mangrove species are being raised in the nursery at Karachi. These have shown lot of promise at the nursery stage.

BIBLIOGRAPHY

1. Ahmad, H. 1983. Management of coastal forest in Sind. In: Mangroves of Pakistan. Pakistan Agricultural Research Council, Islamabad. pp. 22—25.

2. Ahmad, M.F. 1983. Vertebrate fauna of the mangrove swamps. In: Mangroves of Pakistan. Pakistan Agricultural Research Council, Islamabad. pp. 45—47.

3. Amjad, M. and N. Khan. 1983. The state of forestry in Pakistan. Pakistan Forest Institute, Peshawar. pp. 10.

4. Ansari, T.A. 1985. Management plan for mangrove of Pakistan. Govt. of Sind, Forest Development Project. pp. 3 (Mimeo).

5. Champion, H.G., S.K. Seth and G.M. Khattak. 1965. Forest types of Pakistan. Pak. Forest Inst., Peshawar. pp. 87—95.

6. Chapman, V.J., 1944. Cambridge University Expedition to Jamaica. J. Linn. Soc. Bot. (Lond.). 52, 407—533.

7. ————————. 1976. Mangrove Vegetation. J. Cramer. Vaduz. pp. 18-19.

8. Croizat, L. 1952. Manual of Phytogeography. W. Junk. Hague. 588 pp.

9. Good, R. 1952. The Geography of the Flowering Plants. Longmans Green and Co. London. 403 pp.

10. Khan, S.A. 1965. Mangrove Forests, their past and present management in Hyderabad region. Science and Industry 3(1): 12—16.

11. ————————. 1966. Working plan of the coastal zone of afforestation division from 1963-64 to 1983-84. Govt. of W. Pakistan, Agri. Dept., Lahore.

12. Kogo, M. 1985. A report of mangrove research and recommendations of afforestation in Pakistan. UNDP/UNESCO Regional Project on Mangrove Ecosystems of Asia and the Pacific-RAS/72/002; Nov. 1985; Al-Gurm Research Centre, Tokyo. pp. i-v 47.

13. Kogo, M. K. Sato, S. Takatsuki, and R. Takeishi. 1980. A report of the 2nd Research on Mangroves on the Arabian Gulf and Pakistan. Japan Cooperation Centre for the Middle East, Tokyo.

14. Mirza, M.I., M.Z. Hasan, S. Akhtar, and J. Ali. 1983. Identification of mangrove vegetation in Indus delta using LANDSAT data. In: Mangroves of Pakistan. Pakistan Agricultural Research Council, Islamabad. pp. 19—21.

15. Saifullah, S.M. 1982. Mangrove ecosystem of Pakistan. In: The Third research on mangroves in the Middle-East, Japanese Cooperation Centre for Middle-East, Publ. No. 137. pp. 59—80.

16. Schimper, A.F.W. 1903. Plant Geography. Oxford. 839 pp.

17. Sindhu, S.S. 1963. Studies on the mangroves of India. 1. East Godavari region. Ind. Forester. 89 (5): 337—51.