THE ECOLOGY OF MANGROVES

These complex ecosystems are found between the latitudes of 32 degrees north and 38 degrees south, along the tropical coasts of Africa, Australia, Asia, and the Americas. There are varying scientific classifications of what constitutes a mangrove plant. According to two reputable scientific studies, mangroves include approximately 16-24 families and 54-75 species. ((Tomlinson (1986) and Field (1995) respectively) The greatest diversity of mangrove species exists in Southeast Asia. For example, there are only twelve mangrove species in the New World and only four species of mangroves exist along portions of the coasts of the southern USA.

Mangrove forests literally live in two worlds at once, acting as the interface between land and sea. Mangroves help protect coastlines from erosion, storm damage, and wave action. The stability mangroves provide is of immense importance. They prevent shoreline erosion by acting as buffers and catch alluvial materials, thus stabilizing land elevation by sediment accretion that balances sediment loss. Vital coral reefs and sea grass beds are also protected from damaging siltation.

A primary factor of the natural environment that affects mangroves over the long term is sea level and its fluctuations. Other shorter-term factors are air temperature, salinity, ocean currents, storms, shore slope, and soil substrate. Most mangroves live on muddy soils, but they also grow on sand, peat, and coral rock. If tidal conditions are optimal, mangroves can flourish far inland, along the upper reaches of coastal estuaries.

Mangroves vary in height according to species and environment, from mere shrubs to 40 meter trees. The prop roots of some mangrove species, such as Rhizophora or "red mangrove", and the pneumataphores of others, such as Avicennia or "black mangrove", contain many small "breathing" pores, called "lenticels." These allow oxygen to diffuse into the plant, and down to the underground roots by means of air space tissue in the cortex, called "aerenchyma." The lenticels are inactive during high tide.

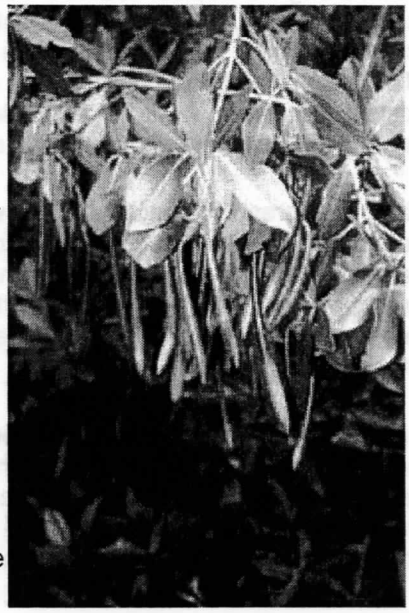
Evolutionary adjustments to varying coastal marine environments have produced some astounding biological characteristics within mangrove plant communities. Certain species of mangroves exclude salt from their systems, others actually excrete the salt they take in via their leaves, roots, or branches. In salt excluding mangrove species , the mangrove root system is so effective in filtering out salt that a thirsty traveler could drink fresh water from a cut root, though the tree itself stands in saline soil.

Certain mangrove species can propagate successfully in a marine environment because of special adaptations. Through "viviparity," embryo germination begins on the tree itself; the tree later drops its developed embryos, called seedlings, which may take root in the soil beneath. Viviparity may have evolved as an adaptive mechanism to prepare the seedlings for long-distance dispersal, and survival and growth within a harsh saline environment. During this viviparous development, the propagules are nourished on the parent tree, thus accumulating the carbohydrates and other compounds required for later autonomous growth. The structural complexity achieved by the seedlings at this early stage of plant development helps acclimate the seedlings to extreme physical conditions which otherwise might preclude normal seed germination.

Another special adaptation is the dispersal of certain mangroves' "propagules" which hang from the branches of mature trees. These fall off and eventually take root in the soil surrounding the parent tree or are carried to distant shorelines. Depending on the species, these propagules may float for extended periods, up to a year, and still remain viable. Viviparity and the long-lived propagules allow these mangrove species to disperse over wide areas.

"Zonation" often characterizes mangrove forests. Certain tree species occupy particular areas, or niches, within the ecosystem. Some mangrove species occur close to shore, fringing islands and sheltered bays; others are found further inland, in estuaries influenced by tidal action.

THE IMPORTANCE FOR LOCAL COMMUNITIES



Mangrove ecosystems have traditionally been sustainably managed by local populations for the production of food, medicines, tannins, fuel wood, and construction materials. For millions of indigenous coastal residents, mangrove forests offer dependable, basic livelihoods and sustain their traditional cultures.

The protective mangrove buffer zone helps minimize damage of property and losses of life from hurricanes and storms. In regions where these coastal fringe forests have been cleared, tremendous problems of erosion and siltation have arisen, and sometimes terrible losses to human life and property have occurred due to destructive storms. Mangroves have also been useful in treating effluent, as the plants absorb excess nitrates and phosphates thereby preventing contamination of nearshore waters.

Article Questions

1. Where are mangroves found?
2. How many mangrove species are in the U.S.?
3. What are two benefits of mangroves to shorelines?
4. Define aerenchyma.
5. How do mangroves deal with salt?
6. Define viviparity.
7. List two benefits of mangroves to humans.