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# How do mangroves cope with their environment?

Aquaculture Department, Southeast Asian Fisheries Development Center

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## How do mangroves cope with their environment?

Mangroves have developed certain features to adapt to the intertidal zone. Many mangroves do not actually require intertidal conditions for growth, and will flourish if provided with freshwater. However, all mangroves species occur in the intertidal zone.

**Saline Conditions.** Mangroves are subject to tidal coverage of seawater which varies in salinity, temperature, frequency, height and duration. Depending on rainfall, varying quantities of freshwater enter the mangrove area from surrounding land. Salt levels in the soil are usually higher in drier areas and also vary according to the structure, drainage and nutrient content of the soil.

High salt levels in the environment are dealt with by the mangrove plant in several ways. One or more techniques may be employed by the same species. Most mangroves can tolerate high salt levels in the sap. Some mangroves excrete salt from special pores in the leaves or accumulate salt in older tissues. The majority of mangrove species also actively exclude salt when absorbing water through special tissues in the lower stem and roots.

**Aeration and support.** Soils in mangrove areas are sometimes rocky and poorly drained with

very low oxygen but are usually fine silts and rich in nutrients and organic matter. The soil is usually shallow, limiting the depth available for root growth. In some areas, water currents through the mangroves change in direction and strength with changes in the tide. To counteract water movement and the poor support given by the soft, silty soils, many mangroves have aerial or prop roots and buttressed trunks for support. To make up for lack of root penetration, many plants have pneumatophores and shallow but extensive root system. Oxygen diffuses into the root system when exposed to the air.

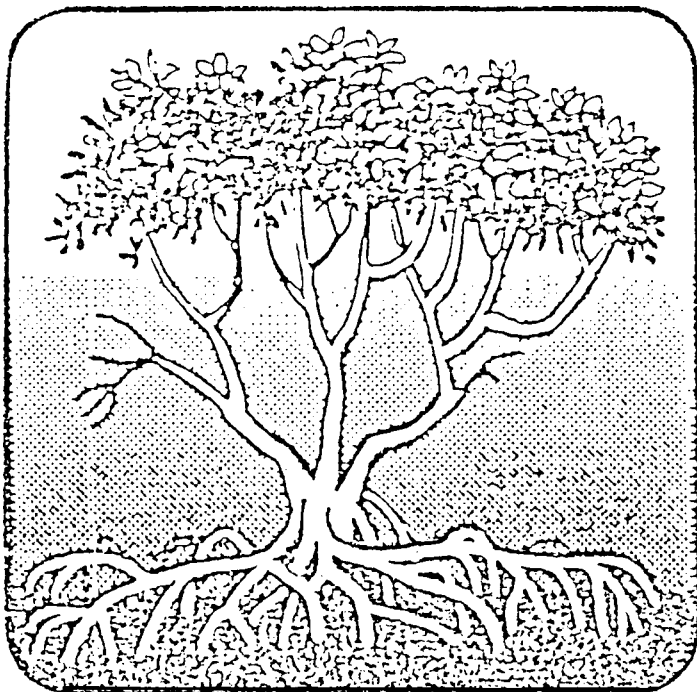
**Propagation.** Many of the conditions in mangrove areas - the waterlogged soil, low oxygen levels and changing current flows - are unsuitable for the germination of seeds adapted to land conditions. Such seeds may be eaten, rot or be washed away before taking root.

One mangrove adaptation to intertidal conditions is the development of seedlings from the fruit while still attached to the parent tree. The seedlings when in contact with the soil, can deal with the adverse environmental conditions. After detachment, the seedlings either lodge in the soil nearby to grow or remain dormant and are carried

by water currents to other places until suitable conditions arise. This seed development process in plants is unique to mangroves.

**Zonation.** This is a vital guide in mangrove reforestation to determine the suitability of a particular species to a particular site. Other factors affecting zonation are shade tolerance, seedling dispersal methods and selective predation of seedling by crabs.

*Sources: (1) Lustica, AL. 1990. Guide in Mangrove Reforestation. Techno Transfer Series. Mar-April 1990. Vol. 1 No. 2. DENR-ERDS, Region VI, Iloilo City. (2) Our Mangroves. Queensland Department of Primary Industries. 1989. 20 pp. (3) Primavera, JH. 1995. Mangroves and brackishwater pond culture in the Philippines. Hydrobiologia 295:303-309. Wong YS and Lam BFY (eds.). Asia-Pacific symposium on mangrove ecosystems. 303 p.*





*The leathery and thick leaves of mangroves excrete salt from special pores (left) while aerial or prop roots (below) and buttressed trunks (inset) counteract water movement.*

