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THE ECOLOGY OF THE MANGROVES OF SOUTH FLORIDA: A COMMUNITY PROFILE

by

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CHAPTER 5. COMMUNITY COMPONENTS - PLANTS OTHER THAN MANGROVES

5.1. ROOT AND MUD ALGAE

The aerial root systems of mangroves provide a convenient substrate for attachment of algae. These root algal communities are particularly noticeable on red mangrove prop roots but also occur to a lesser extent on black mangrove pneumatophores located in the intertidal zone. Productivity of prop root algal communities can be appreciable if shading by mangroves is not too severe; as discussed in section 3.6, Lugo et al. (1975) found a prop root community net primary production rate of 1.1 gC/m^2/day, a level comparable to mangrove leaf fall. Biomass of these algae can be as high as 200 to 300 g per prop root (Burkholder and Almodovar 1973). Of course, production of this magnitude only occurs on the edge of the forest and is virtually nil in the center of the swamp. Nevertheless, this algal carbon has considerable potential food value either to direct grazers or detritivores.

Vertical distribution of prop root algae has been studied by many researchers (Gerlach 1958; Almodovar and Biebl 1962; Biebl 1962; Post 1963; Rutzler 1969; Burkholder and Almodovar 1973; Rehm 1974; Yoshioka 1975); only one of these studies (Rehm 1974) was conducted in Florida. There is a tendency for certain genera of algae to form a characteristic association on mangrove roots around the world (Post 1963). Four phyla tend to dominate: Chlorophyta, Cyanophyta, Phaeophyta, and Rhodophyta; the last is usually the most important in terms of biomass. Of 74 species of marine algae recorded as prop root epiphytes between Tampa and Key Largo, 38 were Rhodophyta, 29 Chlorophyta, 4 Phaeophyta and 3 Cyanophyta (Rehm 1974).

Zonation to be expected on Florida mangroves is shown in Figure 9; this sequence comes largely from Taylor (1960). Near the high water mark, a green band usually exists which is dominated by species of Rhizoclonium. Below this is a zone dominated by species of Bostrychia, Catenella, and Caloglossa. It is this association that most people think of when mangrove prop root algae are mentioned. Because much mud is often deposited on the Bostrychia-Catenella-Caloglossa complex, it often has a dingy, gray appearance. There are many other algae found in this zone, but these three genera usually dominate. At brackish or nearly freshwater locations, they are replaced by species of Batophora, Chaetomorpha, Cladophora, and Penicillus. The pneumatophores of Avicennia, when colonized, are often covered with species of Rhizoclonium, Bostrychia and Monostroma (Taylor 1960). Hoffman and Dawes (1980) found that the Bostrychia binderi-dominated community on the pneumatophores of black mangroves had a standing crop of 22 g dry wt/m^2 and a net production of 0.14 gC/m^2/day.

If there is a permanently submerged portion of the prop root, it may be covered with rich growths of Acanthophora, Spyrida, Hypnea, Laurencia, Wrangelia, Valonia, and Caulerpa (Almodovar and Biebl 1962). Additional genera which may be present below mean high water are: Murrayella, Polysiphonia, Centroceras, Wurdemannia, Dictyota, Halimeda, Laurencia, and Dasya (Taylor 1960; Burkholder and Almodovar 1973; Yoshioka 1975). In addition, anywhere on the moist sections of the prop roots there are usually epiphytic diatoms and filamentous green and blue-green algae of many genera.

Rehm (1974) found a significant difference in the prop root algae between south and central Florida. South of Tampa Bay the standard Bostrychia-Catenella-Caloglossa dominates. In the Tampa Bay area, species of the orders Ulotrichales and Cladophorales are dominant.

The mud adjacent to the mangrove root community is often richly populated with a variety of algae. These can include species of Cladophoropsis, Enteromorpha, Vaucheria, and Boodleopsis (Taylor 1960) in addition to a whole host of benthic diatoms and dinoflagellates (Wood 1965) and other filamentous green and blue-green algae (Marathe 1965).

Adjacent to mangrove areas, on the bottoms of shoals, shallow bays and creeks, there is often a variety of

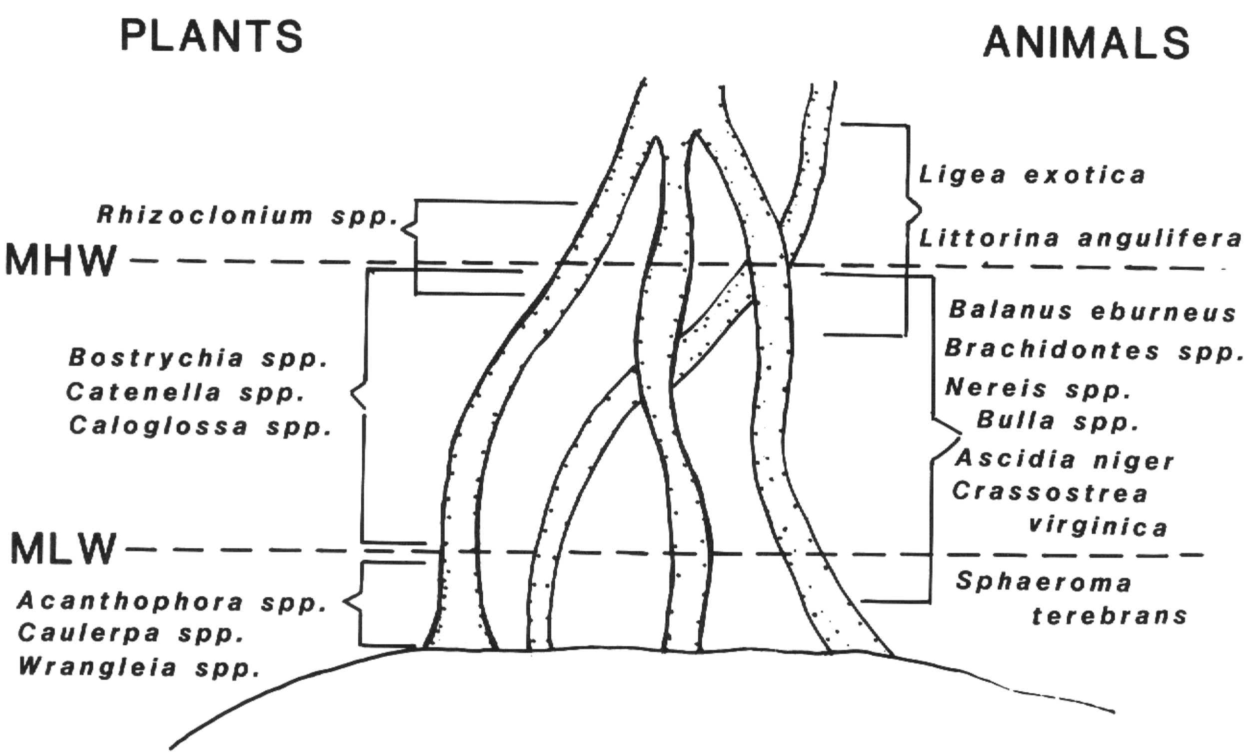

Figure 9. Vertical distribution of selected algae and invertebrates on red mangrove prop roots (compiled from Taylor 1960 and our own observations).

tropical algae including species of Caulerpa, Acetabularia, Penicillus, Gracilaria, Halimeda, Sargassum, Batophora, Udotea, and Dasya. These are discussed at length by Zieman (in prep.). Other pertinent references for mangrove regions include Davis (1940), Taylor (1960), Tabb and Manning (1961), and Tabb et al. (1962).

5.2 PHYTOPLANKTON

All aspects of phytoplankton, from seasonal occurrence to productivity studies, are poorly studied in mangrove ecosystems. This is particularly true in Florida.

Evidence from Brazil (Teixeira et al. 1965, 1967, 1969; Tundisi 1969) indicates that phytoplankton can be an important component of the total primary production in mangrove ecosystems; just how important is not clear. Generally, standing crops of net phytoplankton in mangrove areas are low (personal observation). The nannoplankton, which have not been studied at all, appear to be most important in terms of total metabolism (Tundisi 1969). The net plankton are usually dominated by diatoms such as Thalassothrix spp., Chaetoceras spp., Nitzschia spp., Skeletonema spp., and Rhizosolenia spp. (Mattox 1949; Wood 1965; Walsh 1967; Bacon 1970). At times, blooms of dinoflagellates such as Peridinium spp. and Gymnodinium spp. may dominate (personal observation). In many locations, particularly in shallow waters with some turbulence, benthic diatoms such as Pleurosigma spp., Mastogloia spp., and Disploneis may be numerically important in the net plankton (Wood 1965).

Understanding the mangrove-associated phytoplankton community is complicated by the constant mixing of water masses in mangrove regions. Depending upon the location, the phytoplankton may be dominated by oceanic and neritic forms, by true estuarine plankton, and by freshwater plankton. The pattern of dominance may change daily or seasonally depending upon the source of the principal water mass.

Before we can understand the importance (or lack of importance) of phytoplankton in mangrove regions, some questions must be answered. How productive are the nannoplankton? How does the daily and seasonal shift in phytoplankton dominance affect community productivity? Does the generally low standing crop of phytoplankton represent low productivity or a high grazing rate?

5.3 ASSOCIATED VASCULAR PLANTS

Four species of aquatic grasses occur on bay and creek bottoms adjacent to mangrove forests. Turtle grass, Thalassia testudinum, and manatee grass, Syringodium filliforme, are two tropical sea grasses which occur in waters with average salinities above about 20 ppt. Shoal grass, Halodule wrightii, is found at somewhat lower salinities and widgeongrass, Ruppia maritima, is a freshwater grass which can tolerate low salinities. These grasses occur throughout south Florida, often in close juxtaposition to mangroves. Zieman (in prep.) presents a thorough review of sea grasses along with comments about possible energy flow linkages with mangrove ecosystems.

There are extensive areas of mangroves in south Florida which are closely associated with marshes dominated by a variety of other salt-tolerant plants. For example, along the southwest coast between Flamingo and Naples, marshes are scattered throughout the mangrove belt and also border the mangroves on the upland side. The estuarine marshes within the mangrove swamps have been extensively described by Egler (1952), Carter et al. (1973), and Olmstead et al. (1981). They contain various salt-tolerant marsh species including: salt grass, Distichlis spicata, black needle rush, Juncus roemerianus, spike rush, Eleocharis cellulosa, glass wort, Salicornia spp., Gulf cordgrass, Spartina spartinae, sea purslane, Sesuvium portulacastrum, salt wort, Batis maritima, and sea ox-eye, Borrichia frutescens. Farther north, above Tampa on the west coast of Florida, marshes populated by smooth cordgrass, Spartina alterniflora, and black needle rush, Juncus roemerianus, become more extensive and eventually replace mangrove swamps. Even in the Everglades region, the saline marshes are comparable to mangroves in areal extent, although they tend to be some distance from open water. Studies of these marshes, including assessment of their ecological value, are almost non-existent. Certainly, they have considerable importance as habitat for small fishes which, in turn, support many of the nesting wading birds in south Florida (see section 9).

Tropical hardwood forests may occur within the mangrove zone in south Florida, particularly where old shorelines or areas of storm sedimentation have created ridges 1 m or more above MSL (mean sea level) (Olmstead et al. 1981). Similar forests or "hammocks" occur to the rear of the mangrove zone on higher ground. Typical trees in both forest types include the fan palm, Thrinax radiata, buttonwood, Conocarpus erecta, manchineel, Hippomane mancinella, and, in the past, mahogany, Swietenia mahagoni. Olmstead et al. (1981) provide a description of these communities.

Freshwater marsh plants, such as the grasses, rushes and sedges that dominate the freshwater Everglades, are not mentioned here, although they are occasionally mixed in with small mangroves that have become established well inland. See Hofstetter (1974) for a review of literature dealing with these plants.

Finally, a group of somewhat salt-tolerant herbaceous plants is found within stands of mangroves. They usually occur where slight increases in elevation exist and where sufficient light filters through the mangrove canopy. Carter et al. (1973) list the following as examples of members of the mangrove community: leather ferns, Acrostichum aureum and A. danaeifolium; spanish bayonet, Yucca aloifolia; spider lily, Hymenocallis latifolia; sea blite, Suaeda linearis; chaff flower, Alternanthera ramosissima; samphire, Philoxerus vermicularis; bloodleaf, Iresine celosia; pricklypear cactus, Opuntia stricta; marsh elder, Iva frutescens; the rubber vine, Rhabdadenia biflora; the lianas, Ipomoea tuba and Hippocratea volubilis; and a variety of bromeliads (Bromeliaceae).

Although the lists of vascular plants which occur in mangrove swamps may seem extensive, the actual number of species in any given location tends to be low compared to totally freshwater environments (see Carlton 1977). Analogous to temperate salt marshes, mangrove swamps possess too many sources of stress, particularly from tidal salt water, to have a high diversity of vascular plant species.