

# An Epidemic Dieback Gall Disease of *Rhizophora* Mangroves in The Gambia, West Africa

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## ABSTRACT

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An epidemic dieback gall disease of *Rhizophora* spp. mangroves is reported from The Gambia, West Africa. Projections indicate that the disease will kill one-half to three-quarters of the *Rhizophora* spp. trees in that country by 1986. This disease closely resembles a Florida *Rhizophora* mangrove disease caused by *Cylindrocarpon didymum*.

Mangrove forests occur in muddy tidal waters along most tropical coasts of the world and in some places outside the tropics. The mangrove flora is very specialized, consisting of the mangroves proper, which are shrubs or trees belonging to about six genera, and a few associated species such as vines, ferns, and palms that are rarely or never found elsewhere. The number of species of mangroves and their most generally associated species is more than 30. They are generally restricted to latitudes below 25°, although in Japan and the North Island of New Zealand, they reach latitudes of 27° and 37°, respectively (1).

Mangroves are usually important sources of firewood, charcoal, house timbers, fishing stakes, etc. (2). In addition, they are recognized as having a vital role in the secondary productivity of coastal swamps (3) and in the protection of coastal areas from storms and erosion (2). In Southeast Asia, mangroves have been under forest management since before the beginning of this century (5). Wood of *Rhizophora* spp. is usually

considered the most desirable of the mangroves (5).

In The Gambia, mangrove forest covers some 67,000 ha, extending from the mouth of the Gambia River upstream for 220 km. Three species of *Rhizophora* mangroves are found: the tall gallery forest species, *R. racemosa* G. F. Meyer (sometimes more than 45 m high); an intermediate-height species, *R. harrisonii*

Leechman, that ordinarily occurs behind the *R. racemosa*; and a small (3 m tall) species, *R. mangle* L., that grows farther inland than *R. harrisonii*.

A dieback gall disease of *Rhizophora* spp. has been discovered that is widespread in The Gambia. It affects all three *Rhizophora* species, but not the unrelated mangroves *Laguncularia racemosa* (L.) and *Avicennia africana* P. Beauv. The disease was first noted by R. J. McEwan 4-5 yr ago, and several lines of evidence indicate that it has become serious only recently.

The dieback gall disease occurs along the Gambia River from the Atlantic Ocean as far upriver as large *R. racemosa* are found, 193 km from the river mouth. Dead and dying *Rhizophora* mangroves with dieback gall disease were also seen in Sine-Saloum mangrove forests in

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Fig. 1. *Rhizophora racemosa* gallery forest on the Gambia River, showing trees killed by dieback gall disease.

Senegal, north of The Gambia.

The *Rhizophora* trees affected by the dieback have galls and cankers on branches, trunks, and prop roots that frequently give them a gnarled appearance. The disease disrupts prop root tissues. Many large *R. racemosa* trees had dead crowns (Fig. 1). Branches on some trees had dead leaves; rarely, leaves on entire trees were dead. Galls were not found on first-year *Rhizophora* spp. seedlings.

Symptoms of the dieback gall disease in The Gambia resemble those of an endemic gall disease of *R. mangle* in Florida. The Floridan disease, caused by *Cylindrocarpon didymum* (Hartig) Wallenw., was described by Olexa and Freeman (4). The Gambian and Floridan diseases differ in their lethal effects on the host trees; the Gambian disease causes high mortality, whereas the Floridan disease is not an important cause of mortality, even though 100% of the trees have galls in some areas (4).

The extent of death of *Rhizophora* spp. mangroves could be seen dramatically in 1980 stereo false-color infrared photographs at a scale of 1:25,000. These photographs showed, for example, an area of 10–20 ha near Darusalam where an estimated 95% of the tall (20 m plus) and medium-sized (7–20 m) *Rhizophora* trees were killed, as well as substantial mortality among the low forest trees (less than 7 m high) (Fig. 2). A survey of several areas of tall *R. racemosa* gallery forest where there were occasional dead trees showed that all nearby living trees had galls or cankers. Evidence suggests that most of the tall *Rhizophora* will die within 3–5 yr. The firewood value of *Rhizophora* timber lost to the disease in The Gambia has been estimated at \$40 million.



Fig. 2. *Rhizophora* forest at Darusalam, The Gambia, killed by dieback gall disease.

The finding of groves of large dead *R. racemosa* trees, estimated to be 100–200 yr old, indicates the recent onset of the dieback gall disease in its lethal form. The obvious question with respect to the dieback gall disease is why has this disease become so lethal in recent years in The Gambia? The simple possibilities are that some environmental change has occurred that has made the mangroves of The Gambia susceptible to the disease or that a new pathogen has become active in The Gambia. It is important to determine the causal agent of the disease in West Africa and to compare it with the disease in Florida.

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