

JONKER, F. P.: The genus *Rhizophora* in Suriname

The peculiar distribution of the species of *Rhizophora* (*Rhizophoraceae*) is well-known. Floras and manuals usually mention one western species — *R. mangle* L. — that occurs both in the coastal regions of tropical and subtropical America and in the corresponding habitats of west tropical Africa, and an eastern species — *R. mucronata* Lam. — occurring both in tropical Asia and in east tropical Africa. It is also well-known that a few other species occur in tropical Asia; a recent revision has been given by HOU (1958). G. F. W. MEYER (1818) described from British Guiana a second American species, *R. racemosa*, differing in the inflorescence which is forked and 2-flowered in *R. mangle* and much-branched in *R. racemosa*. ENGLER (1876) regarded this species as a variety of *R. mangle*; most botanists, however, considered it synonymous with the latter. LEECHMAN (1918) published an investigation of the *Rhizophoras* of Georgetown, British Guiana. He found not only the two species of Meyer but also a third species, *R. harrisonii* Leechm., provided with a much-branched inflorescence as in *R. racemosa*. The hypocotyls (also considered radicles) of both *R. mangle* and *R. harrisonii* reach a length of up to 30 cm, that of *R. racemosa* a length of up to 65 cm. The opinion of most botanists, however, remained unchanged: namely that the material of the genus *Rhizophora* from both America and West-Africa belongs to one species, *R. mangle* L. In treating the *Rhizophoraceae* for the Flora of Suriname I shared this opinion (JONKER, 1942).

In 1953, however, KEAY published his revision of the West-African *Rhizophoras* based on field observations. He concluded that the three species recognized by Leechman also occurred in West-Africa. SAVORY (1953) studied the ecology of *Rhizophora* in Nigeria and found that the most common species is *R. racemosa*, a pioneer at the outer border of the *Rhizophora* zone. *R. harrisonii* is dominant in the middle region and *R. mangle* in the interior part of the zone. The latter has the highest salt tolerance and occurs in the habitats with the highest salt concentration

in the dry season. The other species obtain, especially in the wet season, more fresh water.

These two recent publications gave me a reason to revise again the Suriname material and at my request Mr. L. W. M. Bouwman studied the herbarium material and arrived at the conclusion that he could recognize the three entities. He was uncertain, however, whether they should be accorded specific rank.

During a short visit to Suriname, from November 1955 to March 1956, I was in a position to study the problem in the field. On January 31st, 1956, I visited the mouth of the Suriname River, N. of Paramaribo, in the former plantation Purmerend. *Rhizophora* occurred along the river bank as well as in the *Avicennia* forest. Especially the trees along the bank were fruiting abundantly. The inflorescence was usually 2-flowered, occasionally 3- or 4-flowered but then the 3 or 4 pedicels were inserted together. The material apparently belonged to one species. On February 10th I visited the banks of the Commewijne River between Marienburg and Kroonenburg. Here the three species occurred together and proved to be easily recognizable. The most common one was *R. harrisonii* Leechm. characterized by its large, loose, spreading inflorescences provided with slender branches and pedicels, the acute flower buds and the yellowish-green midribs. The second in number, *R. racemosa* G. F. W. Mey., is characterized by the short and thick inflorescence branches and pedicels and, consequently, contracted inflorescences provided with smaller, obtuse flower buds. The trees gave a darker impression chiefly caused by the red midribs and petioles of the younger leaves, and the red leaf buds. In older leaves the midribs and petioles are yellowish-green. Contrary to Keay's observations I never saw distinctly red midribs in *R. harrisonii*. The less common was *R. mangle* L., a species with a forked, 2-flowered inflorescence which was found to be rarely 1-, 3- or 4-flowered. On March 4th I investigated the upper part of the Commewijne River between Kroonenburg and the Matapica River and also the banks of the latter and of the Matapica canal. The situation along that part of the Commewijne River is as along the lower part. Along the Matapica River *R. harrisonii* is common. In the dense vegetation of this species one observes a few scattered trees of *R. mangle*, at once recognizable by the many fruits with brown hypocotyls, and comparatively few *R. racemosa*. Along the Matapica canal which leads to the ocean, an *Avicennia* forest occurs with a few scattered trees of *R. mangle*. On February 16th I investigated the lower Nickerie River between Wageningen and Nieuw Nickerie. Near Wageningen only a few withering *Rhizophora* trees occur, downstream the number increases and between Paradise and Nieuw Nickerie the banks are covered with a dense *Rhizophora* vegetation, consisting of *R. racemosa* only. This species is characterized not only by its red midribs, petioles and flower buds, its contracted inflorescences and its obtuse flower buds but also by the often very long hypocotyls.

On February 2nd I studied the banks of the lower Saramacca River between Carl Francois and Calcutta (left bank) — Huwelijkszorg (right bank). The richest *Rhizophora* vegetation was found on the right bank, situated before an *Avicennia* forest with, sometimes, some *Laguncularia* bush at the river side before the *Rhizophora*. *R. racemosa* and *R. harrisonii* were mixed together without a marked difference in the habitat. The river between Carl Francois and the mouth showed, below Carl Francois, at first the same situation as upstream but still more downstream *Rhizophora* disappeared. Near the mouth, however, *Rhizophora* made its appearance again but now only *R. mangle* occurred. Therefore I presumed that

the same situation occurred along the Suriname River from where I knew already the *R. mangle*-vegetation near the mouth. A boat trip on this river, from Jodensavanne downstream confirmed this presumption. *Rhizophora* made its appearance near Carolina where the first scattered treelets of *R. racemosa* were observed. More downstream the vegetation becomes denser. From the boat I only observed *R. racemosa*, as along the Nickerie River, but *R. harrisonii* also occurs as appears from a collection from La Liberté by J. and P. A. Florschütz. N. of Paramaribo these two species are replaced by *R. mangle*. The latter is, consequently, found in the more saline regions as in tropical Africa, but these regions are situated in Suriname near the coast along the river mouths. *R. harrisonii* and *R. racemosa* are found in the less saline zone upstream to circ. 60 km from the coast. Along the Wayombo River also a *Rhizophora* vegetation occurs.

In those areas of a river, where *Rhizophora* occurs on one bank only, one may often observe that in the river bends the *Rhizophora* vegetation crosses the river according to the currents which bring more saline water.

A short visit to the isle of Curaçao showed that there only *R. mangle* occurs, around the bays. From a study of herbarium material it appeared that also in the other smaller West-Indian Islands and in Florida only this species occurs. The two other species, being less salt-tolerant are found in America somewhat downstream along the larger rivers. Added to these ecological preferences are the following morphological differences:

R. mangle: inflorescences forked, 2-flowered, occasionally 1-, 3- or 4-flowered. Flowers large; calyx yellow; corolla white. Midrib and petiole yellowish-green. Fruiting abundantly. Hypocotyl at first green, later brown, up to 30 cm long.

R. harrisonii: inflorescence much-branched, loose, many-flowered. Flower buds acute. Flowers smaller; calyx greenish-white; corolla white. Midrib and petiole yellowish-green (in the youngest leaves midribs sometimes pinkish). Fruiting rather rarely. Fruit smooth. Hypocotyl green, up to 35 cm long.

R. racemosa: inflorescence much-branched, contracted, many-flowered. Flower buds small, obtuse. Flowers rather small; calyx greenish-white; corolla white. Leaves darker green above than in the preceding species; midribs, petioles and leaf buds red. Fruiting rather rarely. Fruit rough. Hypocotyl green, up to 50(65) cm long.

For illustrations, see KEAY (1953).

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