

XII. NOTES ON PHILIPPINE MANGROVE SPECIES

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SUMMARY

Although the mangroves or mangals of the Island of Leyte in the Philippines are small and generally seriously damaged they are still good for botanical surprises. This contribution provides observations made during an inventory in 1996. Three species of *Avicennia* (*A. alba* Blume, *A. marina* (Forssk.) Vierh., and *A. rumphiana* Hallier f.), three species plus one hybrid of *Rhizophora* (*Rh. apiculata* Blume, *Rh. mucronata* Lam., *Rh. stylosa* Griff., and *Rh. × lamarckii* Montr.), and three species of *Sonneratia* (*S. alba* Sm., *S. caseolaris* (L.) Engl., and *S. cf. ovata*) were observed. Specimens with intermediate features suggest that there may be also hybrids between *Rh. apiculata* and *Rh. mucronata* as well as between *Sonneratia* spp. Additional observations are made on *Bruguiera*, *Ceriops* and *Xylocarpus* spp.

There are numerous publications about mangroves or mangals, as the ecosystem is also called, including the Philippines [e.g. Anonymous, 1987; Calumpang & Meñez, 1997]. Since mangals are species-poor compared to other forest formations in the tropics inventories mostly present a restricted and similar set of species and identification of the components does not seem to be a problem. Nevertheless, during a mangrove inventory of the Island of Leyte in May–June 1996 several observations could be made which are remarkable.

The inventory team used boats to explore the coastline of Leyte from Hinundayan on the south-east coast to Sogod Bay in the south, following the west coast to the north up to Carigara Bay. We entered each promising mangal, that is, those that did not consist of a few trees, only. Mangals are not very extensive on Leyte since estuaries of large rivers are absent.

As expected, the mangals were usually heavily affected by human activities such as firewood gathering, transformation into fish ponds, or housing areas. An unusual damage was reported by the local population for a small mangal at Hingatungan on the south-east coast of Leyte. It had been a combat zone between the Philippine Army and the revolutionary group of the New Peoples Army (NPA) in the 1980s, and had been cleared by the Army to destroy hiding places.

Species richness was nowhere particularly high. Most numerous in species was Padre Burgos in S Leyte, where 18 mangroves (including black mangroves) occurred. Nevertheless, during the inventory all typical mangroves could be found. The following account notes some interesting observations on some taxa.

Avicennia spp.

Most of the specimens of *Avicennia* could safely be identified as *A. marina* (Forssk.) Vierh. var. *eucalyptifolia* (Zipp.) N.C. Duke. This species mostly showed a crooked stem with a papery, flaky bark, greyish brown in colour. Petiole c. 1 cm long. Blades slightly elliptic to oval or oblong with a rounded tip, up to 8 cm long, beneath paler than above, glabrous, up to 8 pairs of lateral veins. Young twigs and peduncles 4-angled. The small flowers were orange-yellow with a sweet odour. This species usually was found on the seaward side of the mangal. A curious observation was that the leaves wilted rather quickly while those of the next species appeared to be still fresh after one day. Maybe this feature can be used as field character.

Another, clearly distinct species of *Avicennia* was characterised by its dark brown, fissured bark. The petiole was much longer than that of *A. marina*, c. 3 cm long. The blades also were larger, up to c. 10 cm long, oval to oblanceolate with a cuneate base, a rounded apex, and c. 5 pairs of lateral veins. Young branches as well as the lower face of the leaf showed a distinct indument, which may be the reason of the delayed wilting by reducing evapo-transpiration. Twigs and peduncles were round. This species occurred at the landward side of mangroves. It clearly resembled *A. rumphiana* Hallier f. with the exception of the petiole which was much longer than described by Duke (1991). But Duke also stressed the variability of leaf features. A well-fitting picture of this species can be found in the field guide on Philippine mangroves by Calumpang & Meñez (1997) under its synonym of *A. lanata*.

A third clearly distinct species was *A. alba* Blume. Petiole c. 1.5 cm long. Blades elliptic, c. 8 cm long with an indument on the lower leaf face, base cuneate, apex acuminate, lateral veins c. 8 pairs. Unfortunately, fruits could not be found.

It would be interesting to know if the number of lateral veins has diagnostic significance in *Avicennia*, but this feature has neither been mentioned by Duke nor Tomlinson.

Rhizophora spp.

Rhizophora apiculata Blume, *Rh. mucronata* Lam., and *Rh. stylosa* Griff. as well as *Rh. × lamarckii* Montr. could be identified during the inventory.

Besides the general features of *Rh. apiculata* as mentioned by Ding Hou (1958) and Tomlinson (1986) the stipule colour seems to be an interesting feature here. While Ding Hou (p. 448), based on herbarium specimens, refers to the stipules of *Rh. spp.* in general as "more or less red when fresh", Tomlinson mentions this feature especially for *Rh. apiculata*. Ding Hou described a reddish tinge of the petiole, the lower midrib of the leaves, the calyx lobes, and parts of the fruit only for *Rh. apiculata*. I observed a red colour in *Rhizophora* (field observations) also only in this species or in specimens where identification was complicated due to intermediate features. Thus this species was the only one which had a red stigma. Maybe the red colour is a typical feature only of *Rh. apiculata* or its hybrids. But detailed field observations together with critical identification of specimens in view of the fact of potential hybrids are needed to confirm this assumption. Another observation concerning that species was that the cork warts on the lower face of the leaves were clearly visible although Tomlinson describes them as obviously obscure in fresh leaves.

Another specimen of *Rhizophora* found at Padre Burgus in southern Leyte provided serious problems in identification since it showed strong affinities to *Rh. apiculata*, such as reddish stipules, and a stout peduncle with 2 flowers. But on the other hand it missed very typical features like the arrangement and shape of the inflorescence and of the style. The inflorescences were not below the oldest leaves but in the axils of leaves still attached. The peduncle was stout but about two to three times as long (2–3 cm) as that of typical *Rh. apiculata* (c. 1 cm), and the inflorescence consisted of 2 but sometimes also of 4 flowers. Clearly distinct from *Rh. apiculata* was the style, which was 3–4 mm long. Compared to *Rh. apiculata* it had broader leaves, and the stipules had only a red tinge. Taking into account these features the species exactly fits the description of *Rh. × lamarckii* which Tomlinson describes as a sterile hybrid between *Rh. apiculata* and *Rh. stylosa* for New Caledonia, Queensland, New Guinea, the Solomon Islands, and the New Hebrides. Lakshmanan & Mahalingam (1983) (as cited in Muniyandi & Natarajan, 1985) describe a hybrid (erroneously calling it *Rh. × lamarckii*, see below) also for the Pichavaram mangrove forest, India, which has been confirmed by Muniyandi & Natarajan. Singh et al. (1986, as cited in Debnath & Rao, 1992) described *Rh. × lamarckii* together with its putative parents *Rh. apiculata* and *Rh. stylosa* as part of the mangrove flora of the Andaman Islands. Chan (1996) describes the occurrence of *Rh. × lamarckii* also together with *Rh. apiculata* and *Rh. stylosa* in the west coast of Peninsular Malaysia for Pulau Burung, Negeri Sembilan together with *Rh. apiculata* and *Rh. stylosa*. He describes the hybrid as sterile. The specimen on Leyte could also be seen with flowers only, while the other *Rhizophora* spp. encountered during the inventory bore fruits. This supports the opinion of Tomlinson that this hybrid is sterile, although fruit and seed development seems to occur. Thus Muniyandi & Natarajan reported the finding of one seedling still attached to the tree. Viability has not been tested. They describe the tree as a “tall tree with a spreading canopy” and with “broad and leathery leaves”. Is there possibly some more hybridisation involved? At least the exceptionally broad leaves and the size of the tree are more typical of *Rh. mucronata* than of *Rh. stylosa* as described by Ding Hou.

The likely occurrence of hybrids between *Rh. apiculata* and *Rh. mucronata* has several times been suspected. Muniyandi & Natarajan stated that the occurrence of ‘*Rh. × lamarckii*’ in Sri Lanka proves that this hybrid is between *Rh. apiculata* and *Rh. mucronata*, which then cannot be called *Rh. × lamarckii*. *Rhizophora stylosa* cannot be involved as this species does not occur in the Indian Ocean. Parani et al. (1997) using molecular markers showed that the Indian hybrid was between *Rh. apiculata* (female) and *Rh. mucronata*.

Nevertheless, Tomlinson mentioned *Rh. stylosa* for southern India. Interestingly, Muniyandi & Natarajan noted that their specimen occurring near *Rh. apiculata* and a species “resembling *Rh. stylosa*”, the latter having all typical features of *Rh. stylosa* except the style which is short (thus resembling *Rh. mucronata*?). Baba (1994, as cited in Chan, 1996) provisionally described a possible one for Lombok, *Rh. lombokensis*. Singh et al. (1986, 1987) also stated that in the Andaman Islands *Rh. × lamarckii* occurred together with *Rh. apiculata* and *Rh. mucronata*. Tan et al. (1997) listed an unidentified *Rhizophora* spp. for Sungei Buloh Nature Park in Singapore together with *Rh. apiculata* and *Rh. mucronata*. During the inventory on Leyte there were also specimens with features more intermediate between *Rh. apiculata* and *Rh. mucronata* than between *Rh. apiculata* and

Rh. stylosa. One of the specimens had stipules with a red tinge, a four-flowered, stout inflorescence with peduncle lengths of 2–2.5 cm. Besides these characters which resembled *Rh. × la-marckii* as shown by Tomlinson (1986: 342, t. B-70) the vegetative characters were those of *Rh. mucronata*. The tree possessed large leaves, up to 20 by 8.5 cm. But contrary to the descriptions by Tomlinson or Chan the specimen developed fruits with a hypocotyl of up to 60 cm length, densely covered by brown corky warts.

It may be argued that there are sterile hybrids of *Rh. apiculata* and *Rh. stylosa* but possibly also hybrids between *Rh. apiculata* and *Rh. mucronata* which may develop fruits and probably even fertile seedlings.

Sonneratia spp.

As with the other taxa mentioned above the observations on *Sonneratia* do not fit well in the present knowledge about Philippine mangroves. One specimen found at Punta showed all typical features of *S. ovata* Backer which has not yet been recorded for the Philippines. It had the prominent ribs of the calyx cup, the fruit apex was distinctly depressed at the base of style, and it lacked petals. Petiole 0.5–1 cm long. Blades c. 8 cm long, but 8–11 cm wide. Additionally, the 5 or 6 calyx lobes showed the red colour on their inner sides. A seed count of one fruit provided 25 seeds. Additionally, *S. caseolaris* (L.) Engl. and *S. alba* Sm. could be identified. Nevertheless, features often seemed to be more intermediate than typical.

Taking into account the wide distribution of mangrove species it is unlikely that hybrids are restricted to the few places so far described as was also stated by Tomlinson.

OBSERVATIONS ON OTHER MANGROVE TAXA

Bruguiera cylindrica (L.) Blume described by Tomlinson with 8 calyx lobes had 7–9 at Padre Burgos (Sogod Bay).

Ceriops decandra (Griff.) Ding Hou and *C. tagal* (Perr.) C.B. Rob. Both were found at Punta in S Leyte. Although they grew side by side the hypocotyl of *C. tagal* was heavily invested by a boring insect while that of *C. decandra* was not. Despite the general similarity of the two species there is obviously a strong host specificity in this pest.

Xylocarpus granatum J. Koenig as well as *X. moluccensis* (Lam.) Roem. were very rare. The latter was found only once at Tulingon near Ormoc Bay on a stony beach (coralline limestone) behind the mangal proper, but still under the influence of the high tide. The observation that all fruits of two trees of *X. granatum* at Padre Burgos (Sogod Bay) had a similar size (about 4 cm of diameter in the middle of May) just as on the single specimen of *X. moluccensis* (ripe fruits) supports the assumption by Tomlinson that flowering in *Xylocarpus* is periodic rather than throughout the year.

The observations described above show that even in the species-poor and rather well-known mangal a closer look is always worthwhile and may provide interesting discoveries. Mangroves are much less monotonous than often supposed: at least a more critical look at its species is certainly worthwhile. I suspect that the clear species identifications provided by so many mangrove inventories may sometimes be more the result of sub-

summation of local variability under the species already described for that area than a critical analysis of the study object.

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