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Short Communication: The rattans (Arecaceae) of Wallacea

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Abstract. *Henderson A, Pitopang R. 2018. Short Communication: The rattans (Arecaceae) of Wallacea. Biodiversitas 19: 18-21.* Rattans are spiny, climbing palms whose long, flexible stems provide the canes of commerce. Three rattan genera occur in Wallacea, *Calamus, Daemonorops*, and *Korthalsia*. We give a brief review of the geology and biogeography of Wallacea. We follow this with a review of the Wallacean rattan flora in Sulawesi, the Maluku Islands (Moluccas), and Nusa Tenggara. We emphasize how poorly known the rattan flora of Wallacea is. While recent discussions of the rattan flora of the Asian tropics have noted the paucity of species in Wallacea, we consider that the number of species present may be considerably higher.

Keywords: Arecaceae, *Calamus*, *Daemonorops*, *Korthalsia*, Palmae, palms, Sulawesi

INTRODUCTION

Rattans are spiny, climbing palms found throughout the African and Asian tropics. Their long, flexible stems provide the canes of commerce, used to make rattan furniture. According to Sunderland and Dransfield (2002), the rattan furniture industry is worth approximately USD 6.5 billion per year, and provides employment for many thousands of people. Almost all rattan is collected from the wild, but recently demand has outstripped supply and led to over-exploitation of wild canes, especially those species producing the highest quality canes. This, coupled with extensive deforestation in countries where rattans occur, has threatened the survival of the industry as well as the species on which it depends. Siebert (2012) has given a general introduction to the rattan trade, with emphasis on Sulawesi, and Myers (2015) has given a recent discussion on the current status of the Indonesian rattan sector.

Rattans are collected from several genera of palms, but the principal source in the Asian tropics are the genera *Calamus* and *Daemonorops*. These two genera are closely related and are both included in the subfamily Calamoideae, tribe Calameae, subtribe Calaminae (Dransfield et al. 2008). This subtribe contains four genera of spiny, dioecious, mostly climbing plants (*Calamus, Daemonorops, Ceratolobus, Pogonotium*). *Calamus* is by far the largest genus of palms, and contains approximately 400 species. It is widely distributed from India eastwards to Fiji, with one disjunct species in tropical Africa. The only monograph of *Calamus* was published over 100 years ago by Beccari (1908, 1913, 1914). Beccari (1911, 1912) also published a revision of *Daemonorops*. These works are unrivalled for their clarity and detail, but are now completely out-of-date. Recent systematic work on both genera has consisted mostly of various field guides and manuals. However, this has been a piecemeal approach, with different authors using different species concepts, and with some regions lacking any kind of treatment. One of us (Henderson) is currently involved in a revision of *Calamus*.

The only other rattan genus in Wallacea is *Korthalsia*, from subtribe Korthalsiinae. We include this in our discussion, although canes from this genus are much less used because of their poor quality. *Korthalsia* comprises approximately 27 species (Dransfield 1981a) although only one species occurs in Wallacea.

MATERIALS AND METHODS

Data for numbers of species of *Calamus, Daemonorops*, and *Korthalsia* were taken from study of herbarium specimens in the Herbarium Bogoriense (BO), the Kew Herbarium (K), and the Herbarium of the New York Botanical Garden (NY). We also used data from recently collected specimens in Sulawesi as part of the authors' project on the "Rattans of Sulawesi". We reviewed the literature on the geological history of Wallacea, and all relevant papers on the biogeography of the rattan flora of the area.

RESULTS AND DISCUSSION

Geology and biogeography of Wallacea

Wallacea comprises three more or less distinct islands or groups of islands. Sulawesi is the largest island in the region. To the south of Sulawesi, Nusa Tenggara, the Lesser Sunda islands, consist of an inner island arc comprising Lombok, Sumbawa, Komodo, Flores, Alor, and Wetar, and an outer island arc comprising Sumba, Timor, and the Tanimbar islands. To the east of Sulawesi, the Maluku Islands (Moluccas) comprise numerous smaller islands, the principal ones of which are Morotai, Halmahera, Sula, Obi, Buru, and Seram. Wallacea is traditionally demarcated in the west by Wallace's Line and in the east by Lydekker's Line, marking the eastern margin of the Sunda continental shelf and the western margin of the Sahul continental shelf, respectively. Wallacea can thus be seen as a transitional area not only geologically speaking, between the Sunda and Sahul shelves, but biogeographically speaking, between the Asian biota to the west and the Australasian biota to the east.

Wallacea has had a complicated geological history (Audley-Charles 1981; Moss and Wilson 1998; Hall 2012). The region is a center of convergence not only of the Eurasian and Australian/New Guinea plates, but also to a lesser extent the Philippines Sea and Pacific plates. During the Tertiary, the Australia/New Guinea plate separated from Gondwana and moved in a northwesterly direction. This plate comprised not only Australia and New Guinea, but also elements that would become part of southeast Sulawesi, some eastern parts of Nusa Tenggara, and the Maluku Islands. Other elements of Wallacea were part of the Asian plate, Laurasian in origin. In the middle Eocene, the straits of Makassar opened and led to the separation of west Sulawesi from east Borneo. The Australia/New Guinea plate collided with the Asian plate in the middle Miocene, approximately 15 million years ago, leading to continental fragments being accreted or rearranged such that the islands of the Wallacea region are composite in origin from once widely separated parts. This complicated geological history also means that theWallacea biota has a complex history (Whitten et al. 1987; van Balgooy 1987; Richardson et al. 2012).

Rattans of Sulawesi

In Sulawesi, 26 species of *Calamus* are currently recognized (C. *boniensis, C. didymocarpus, C. inops, C. kandariensis, C. kjelbergii, C. koordersianus, C. leiocaulis, C. leptostachys, C. macrosphaerion, C. minahassae, C. moseleyanus, C. ornatus, C. orthostachyus,C. scleracanthus, C. siphonospathus, C. suaveolens, C. symphysipus, C. tolitoliensis, C. usitatus, C. zollingeri,* as well as six undescribed species). However, Sulawesi is poorly known and the number of *Calamus* species on the island is unclear. Rustiami (2011) recognized 35 species for the whole island, but recent work suggests the number may be higher. In Lore Lindu National Park in western Central Sulawesi, Stiegel et al. (2011) found 33 species of *Calamus*, 24 of which they were unable to identify (see also Mogea 2002). In Lambusango Forest Reserve in southeast Sulawesi, Powling (2009) recorded 19 species of *Calamus*, two of which he was unable to identify. In the Paguyaman Forest in North Sulawesi, Clayton et al. (2002) recorded 24 rattan species, only four of which they were able to identify. Furthermore, Clayton et al. considered that within their study site, rattan communities were highly diverse from location to location. Our own estimate, based on specimens in European and Indonesian herbaria, is that there may be up to 50 species of *Calamus* in Sulawesi, many of which are undescribed. Seven species of *Daemonorops* occur in Sulawesi (Rustiami 2009) and one of Korthalsia (Dransfield 1981a).

Rattans of The Maluku (Moluccas) Islands

There are eight species of *Calamus* currently recognized from the Maluku Islands: *C. aruensis, C. robinsonianus, C. rumphii, C. symphysipus, C. vitiensis*, and three undescribed species. All of these are endemic except for *C. aruensis* and *C. vitiensis*, both reaching the Maluku Islands from New Guinea, and *C. symphysipus*, presumably of Philippines origin. One species of *Daemonorops, D. robusta,* and one of *Korthalsia*, *K. celebica*, also occur in the Maluku Islands.

Rattans of Nusa Tenggara

The rattan flora of these islands is very poorly known. Although there are unlikely to be many species, the specimens that do exist indicate some endemism. In fact, there are so few specimens of rattans from Nusa Tenggara that it is possible to discuss them individually. (i) A sterile specimen at BO (*Tobe 1267*) from Lombok appears to represent a flagellate species of *Calamus* (although the leaf could be a juvenile *Daemonorops*). (ii) A specimen (*Rensch 649*) collected in 1927 from Sumbawa (Batu Dulang) was described by Burret (1943) as *Calamus sumbawensis*. The type, originally at B, was destroyed. The protologue describes a probable juvenile leaf with numerous, narrow pinnae. It is not clear if this comes from a *Calamus* or *Daemonorops*. The name is treated as one of uncertain application. (iii) A specimen at BO (*Wiriadinata HW 13951*) from Sumba has been tentatively identified as *Calamus zollingeri*. This may turn out to be a new species. (iv) Another specimen from Sumba at BO (*Damayanto IPGDP 56*) will key to *C. vitiensis*, although there are some differences in leaf sheath spines. (v) A specimen at BO with a duplicate at K (*Mogea 1000*) from Flores is a sterile, flagellate *Calamus*. This specimen is annotated as "*Calamus* (probably new)" by John Dransfield. (vi) A specimen at BO (*Teijsmann 10791*) from Timor (precise locality not given) was described by Beccari (1913) as a new species, *Calamus timorensis*. The specimen is incomplete and sterile. Beccari reported that the leaf was "apparently cirriferous" but the apex is missing from the type specimen. It is thus unclear to which species group it belongs, or even if it is a *Calamus* and not a *Daemonorops*.

Discussion

Forty-three species of rattan (*Calamus, Daemonorops, Korthalsia*) are known from Wallacea, but the number is likely to be higher. Thirty-four species occur in Sulawesi, 10 in Maluku Islands, and two in Nusa Tenggara. The largest genus by far is *Calamus*, with 35 species in Wallacea.

Seventy-eight percent of Wallacea rattans are endemic to the region. There is a 2% overlap with Borneo (Sunda shelf), 11% with the Philippines, and 4% with New Guinea (Sahul shelf). These figures agree somewhat with those of van Balgooy (1987) who considered that, at both species and genus level, the strongest affinities of the Sulawesi flora were with the Philippines, with much less affinity with Borneo. Within Sulawesi, van Balgooy found a strong affinity of northeastern Sulawesi and the Philippines and between southwestern Sulawesi and Nusa Tenggara.

Phylogenetic relationships of Wallacea rattans are unknown, and there remains the interesting question of the origin of the Wallacea rattan flora. Baker and Dransfield (2000) considered that the ancestors of the Asian calamoid palms dispersed from southern Laurasia into Malesia during early Tertiary and there diversified. Recently Baker and Couvreur (2012) have reviewed palm distributions across Wallace's Line. They considered that *Calamus* had a bimodal distribution and was most diverse west of Wallace's Line, especially in the Sunda region, declined sharply through Wallacea before reaching a second peak of diversity in New Guinea. In support of this, they cited figures of 82 species of *Calamus* in Borneo, 27 in Sulawesi, 11 in the Maluku Islands, and 52 in New Guinea. They noted that this pattern had been used as evidence of a secondary radiation in New Guinea following dispersal across Wallace's Line from west to east following Miocene collision of the Asian and Australian plates (Dransfield 1981b), and that current phylogenetic evidence indicated multiple independent lineages of *Calamus* are present in New Guinea, an argument against a single origin.

Our current estimates are 73 species of *Calamus* in Borneo (68% endemic), 26 in Sulawesi (80% endemic), eight in the Maluku Islands (55% endemic), and 53 in New Guinea (<90% endemic). However, we believe the figure of 26 species greatly underestimates diversity in Sulawesi, and the figure is more likely to be nearer 50. This does not indicate a sharp decline in Wallacea; in fact, considering the much smaller size of Sulawesi compared to New Guinea, it indicates the third peak of diversity. Taking into account the relative size of the islands, Sulawesi has proportionally more species of all palms than New Guinea (using date from Baker and Couvreur 2012), and just for *Calamus* Sulawesi is more or less equal to Borneo and also greater than New Guinea. Furthermore, there seems to be a marked difference in the species composition of *Calamus* of Sulawesi and New Guinea, given the high rates of endemism of the two islands and that 85% of Sulawesi species are cirrate and 87% of New Guinea species are flagellate. However, in both islands there appears to have been a radiation in species, suggesting relatively recent speciation (Dransfield 1981b).

Although we do not find evidence of a sharp decline in Wallacea in terms of the number of *Calamus* species, we do find evidence of multiple dispersals across Wallace's Line. Henderson (unpublished data) recognized four species groups of *Calamus* that occurred in New Guinea, the *C. adspersus* group (3 species in New Guinea), the *C. erinaceus* group (3 species), the *C. heteracanthus* group (1 species), and the Sahul flagellate groups (56 species). The first two groups are also present and more diverse in Sundaland and Wallacea, the third group only in Wallacea, and the fourth group only in New Guinea. The presence of these four groups in New Guinea could argue for four separate dispersal events across Wallace's Line, with subsequent radiation of at least the Sahul flagellate group.

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