An Introduction to the Palms of Sulawesi

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In this article, I give a review of the palm flora of the fascinating island of Sulawesi, Indonesia.

Sulawesi is one of the larger islands of the Indonesian archipelago, situated just to the east of Borneo and just to the west of the Maluku Islands and New Guinea. It is supposed to be the eleventh largest island in the world. From north to south, in a straight line, it is about 800 km long, and from west to east about 700 km wide, but you cannot really go in a straight line for very far, because the island has a peculiar shape with several peninsulas jutting out in easterly and southerly directions.

Sulawesi is poorly known botanically compared with the rest of Indonesia, and yet it is a very interesting island, situated as it is in the center of Wallacea. This is the biogeographical region east of Borneo (and east of Wallace's Line) and west of the New Guinea/Australia region. Wallacea comprises not only Sulawesi but also the Lesser Sunda Islands and the Maluku Islands. The islands of Wallacea have had a complicated geological history and have been isolated from areas to the west and east for a long time. As such they have a highly endemic fauna and flora, with few species in common with other areas. For example, in Sulawesi, only seven species of dipterocarps have spread eastwards from Borneo (where there are over 260 species), and only one species of *Eucalyptus* has spread westwards from the New Guinea/Australia region (where there are almost 700 species).

There are still large areas of forest remaining in Sulawesi, especially in the mountains. Most of the lowlands are deforested, and most of the southwestern peninsula, but there are still huge areas of forest in other parts of the island, particularly in central Sulawesi. I recently spent several months there, working on a project on rattans. Although my main concern was with *Calamus*, I did see various other palms. In this article I give my first impressions of the palms of the island. There have been two published articles on palms of specific areas in Sulawesi: Mogea (2002) on Lore Lindu National Park and Powling (2009) on Buton Island. Mogea (2002) also gave a checklist of all species from the island, listing 71 species, 72% of which he considered endemic. Kew's Monocot Checklist recognizes 65 species of palms occurring in Sulawesi. We still do not know enough about some genera, particularly *Pinanga* and *Calamus*, to be able to give a definite figure on the number of species.

There are five genera of fan palms: *Corypha*, *Saribus*, *Licuala*, *Pholidocarpus* and *Borassus*. *Corypha utan* is common in Sulawesi. It is most

1. *Pholidocarpus ihur* near Tolitoli.

2. Fruits of *Pholidocarpus ihur*.

3. *Arenga undulatifolia* near Tolitoli.

often seen in disturbed areas near roads and seems to be able to persist in such places. We never saw it in anything resembling a natural habitat, but it was very abundant on the deforested hills west and east of Gorontalo. In the eastern peninsula, east of Luwuk along the coast from Dondo to Pangkalaseang, *C. utan* was quite common, growing amongst the coconuts and in disturbed areas. We saw one fruiting and another, a long way off, in full flower. It is a widespread species, occurring from the Andaman Islands in the west to Australia in the east.

Saribus rotundifolia (formerly *Livistona rotundifolia*) is common and widespread, both in the forest and planted as an ornamental. It is a beautiful palm, especially when young with its perfectly round leaves. The leaf bases form a characteristic pattern along the upper part of the stem (Back Cover). Locally, it is known as *nimbung*. *Saribus rotundifolia* is widespread in the Philippines, Sulawesi and the Maluku Islands.

Licuala is a genus that needs more study in Sulawesi. There are supposedly two species, both endemic to the island, *Licuala bissula* and *L. celebica*. We only saw rather scrappy plants of *Licuala* on two occasions. Mogea (2002) also listed *L. spinosa*, and certainly one of the plants we collected looked a lot like this species.

Just south of Tolitoli, in a wet, swampy area, we came across a grove of *Pholidocarpus ihur* (Fig. 1). One plant was in fruit, and we picked up some of the curious, warty fruits from the ground (Fig. 2). This was the only place we saw this species. It is native to Sulawesi and the Maluku Islands.

Borassus flabellifer is cultivated in Makassar, in the southwestern peninsula, and surrounding areas, but we did not see in the rest of the island. Powling (2009) noted that it also occurs on Buton Island, just off the southeastern peninsula. The natural range of this widespread and useful species is not known (Bayton 2007), and it may well have been introduced into Sulawesi.

Two caryotoid genera, *Caryota* and *Arenga*, occur in Sulawesi. After coconuts, *Arenga pinnata* is the commonest palm, not only in disturbed areas along the roads but also in the forest, where it seems to occur naturally. It is known as *areng*, and all parts are used. The most important use seems to be the preparation of palm wine, from tapping the inflorescences. A second species of *Arenga* is common in the forests, the acaulescent *A. undulatifolia* (Fig. 3). It is also known from Borneo and Palawan in the Philippines, but my impression is that the Sulawesi ones have much wider pinnae. Two *Caryota* are seen in the forest, the clustered-stemmed *C. mitis* and

4. *Caryota angustifolia* (left) growing with *Arenga pinnata* (right).

5. *Areca vestiaria*. A. Habit. B. Crownshaft. C. Stilt roots. D. Ripe fruits.

6. *Oncosperma horridum* near Manado.

7. Calamus zollingeri.

the larger, single-stemmed *C. angustifolia* (Fig 4). Apparently, this latter species was first noticed by Dransfield (1974a) but not described until recently (Jeanson et al., 2011). A third species of *Caryota*, *C. rumphiana*, is on the Monocot Checklist, but it is not clear if it is present in Sulawesi or not (Jeanson 2011).

Five arecoid genera are said to occur in Sulawesi: *Areca, Pinanga, Oncosperma, Hydriastele,* and *Orania*. *Areca vestiaria* is extremely abundant and easy to identify, with its stilt roots, red crownshaft and bright red fruits (Fig. 5). Plants are quite variable, particularly in the color of the crownshaft (see also Dransfield 1974b). It is endemic to the Wallacea region. There is one other species of *Areca* in Sulawesi, apart from the cultivated *A. catechu*, and that is *A. oxycarpa*. We did not see this species, but Heatubun et al. (2012) described it as having small, solitary stems and dark brown or black crownshafts. It is known only from northeastern Sulawesi.

Pinanga is more diverse, and the Monocot Checklist gives seven species in Sulawesi, while Mogea (2002) listed 12, eight of them undescribed. We saw quite a few obviously distinct species but were able to identify only one with any certainty, *P. caesia*. One species from near Luwuk was quite distinct in its spirally arranged flowers and fruits and may represent *P. rumphiana*, known from the Maluku Islands and New Guinea. Powling (2009) mentioned that *P. rumphiana* also occurs in Buton Island.

Oncosperma horridum (Fig. 6) is relatively common, and in some places has extraordinarily tall, clustered stems. It is unusual for an arecoid palm in having spiny stems, leaves and inflorescences. This species is widespread from Peninsular Thailand through Sumatra, Borneo and Sulawesi, and also occurs in the Philippines.

There are two other genera that are reported for Sulawesi that we did not see, *Hydriastele* and *Orania*. There are four species of *Hydriastele* described from the island. I think these may be more common in southern parts of the island, where we did little field work.

According to Dr. John Dransfield, the only evidence for the occurrence of *Orania* in Sulawesi is from David Fairchild's book on his travels in tropical Asia (Fairchild 1943). Fairchild certainly knew *Orania* because he described collecting *O. palindan* in Luzon, in the Philippines, but the only other mention in the book of an *Orania* is in a caption of a photograph of a palm from Sulawesi: "Though this *Orania* palm from Celebes [Sulawesi] looks much like a coconut, its fruits are no larger than billiard-balls." The palm in the photograph looks like an *Orania*, but exactly where it is from is unclear.

There are six calamoid (scaly-fruited) genera of palms in Sulawesi: *Calamus, Daemonorops,*

8. *Pigafetta elata* near Tinombala, growing with *Pandanus*.

9. Coconuts near Gorontalo.

Korthalsia, Pigafetta, Salacca and *Metroxylon*. Of these, the first three genera are climbers, rattans, and the last three non-climbing. Rattans are important plants commercially in Sulawesi, and large amounts of raw cane are collected from the forests and exported, mostly to the furniture factories of Java. Because of their economic importance there have been several studies of their ecology in Sulawesi (e.g., Siebert 1997, 2005; Clayton et al. 2002; Stiegel et al. 2011; Pritchett et al. 2016). Siebert (2012) also gave much information on the economic and cultural aspects of rattan in Sulawesi. However, taxonomic knowledge of the species is still incomplete, despite some relatively recent studies (Rustiami 2011, Rustiami & Henderson 2017), and there are no doubt new species to be discovered.

We found about 28 species of *Calamus*, several of them undescribed. All these species are endemic to the island except for two. One, *C. siphonospathus* from the Philippines, just reaches the northwestern tip of the island, and the second, *C. ornatus* from Borneo, is common throughout the island. One of the commonest species, and the most commonly harvested is *Calamus zollingeri* (Fig. 7). The relatively high number of *Calamus* species gives the palm flora of Sulawesi a lop-sided appearance. There are almost as many species of *Calamus* as there are all other species combined. The other interesting thing about *Calamus* is its diversity in Sulawesi, especially when the size of the island is taken into account. There are 73 species of *Calamus* in Borneo and 59 species in New Guinea, but both these islands are more than five times the size of Sulawesi. In proportion to its size, Sulawesi has more species than either of the larger islands. There are a few species of *Daemonorops* in Sulawesi, probably about five, and a single *Korthalsia, K. celebica*. This is a common and almost weedy species.

Of the non-climbing calamoid palms, *Pigafetta elata* (Fig. 8) becomes abundant in more upland areas, its straight trunks reaching more than 30 m tall. It is a beautiful palm, and the great stands of this species growing on steep mountain slopes are a wonderful sight. Most of Sulawesi is near the equator, and the equator itself runs through the northern peninsula, and so the island does not suffer from typhoons. This may be one of the reasons that *Pigafetta*, and the forests, can grow so tall, at least in the central part of the island – that and the volcanic soil. *Pigafetta elata* is endemic to Sulawesi, and the second species in the genus, *P. filaris* is known from the Maluku Islands and western New Guinea (Dransfield 1998).

The two other non-climbing calamoid genera are represented by one species each, *Metroxylon sagu* and *Salacca zalacca*. These two are very

common and commonly used, but both are apparently introduced from other areas. Mogea (2002) also listed *Eugeissona* for Sulawesi, but I do not think it occurs there.

Last but not least, *Nypa fruticans* is quite common in Sulawesi. We saw it in many places near the coast.

There are several cultivated palms in Sulawesi. By far the commonest of these is the coconut. There are millions and millions of coconuts especially in low elevation areas near the sea (Fig. 9). They are one of the most important crop plants in Sulawesi, along with rice, cloves and cacao. They appeared to me to be unusually tall-stemmed, and every coconut in Sulawesi seems to have notches cut into the trunk for climbing. Coconuts are grown for copra production, and it is a common sight to see copra drying by the side of the road. Most of it is apparently exported to Java for oil extraction. In towns and villages, one sees a variety of other cultivated palms grown as ornamentals, such as *Actinorhytis calapparia*, *Dypsis lutescens*, *Ptychosperma macarthurii*, *Rhapis excelsa, Roystonea regia, Thrinax radiata*, *Veitchia merrillii* and *Wodyetia bifurcata*.

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