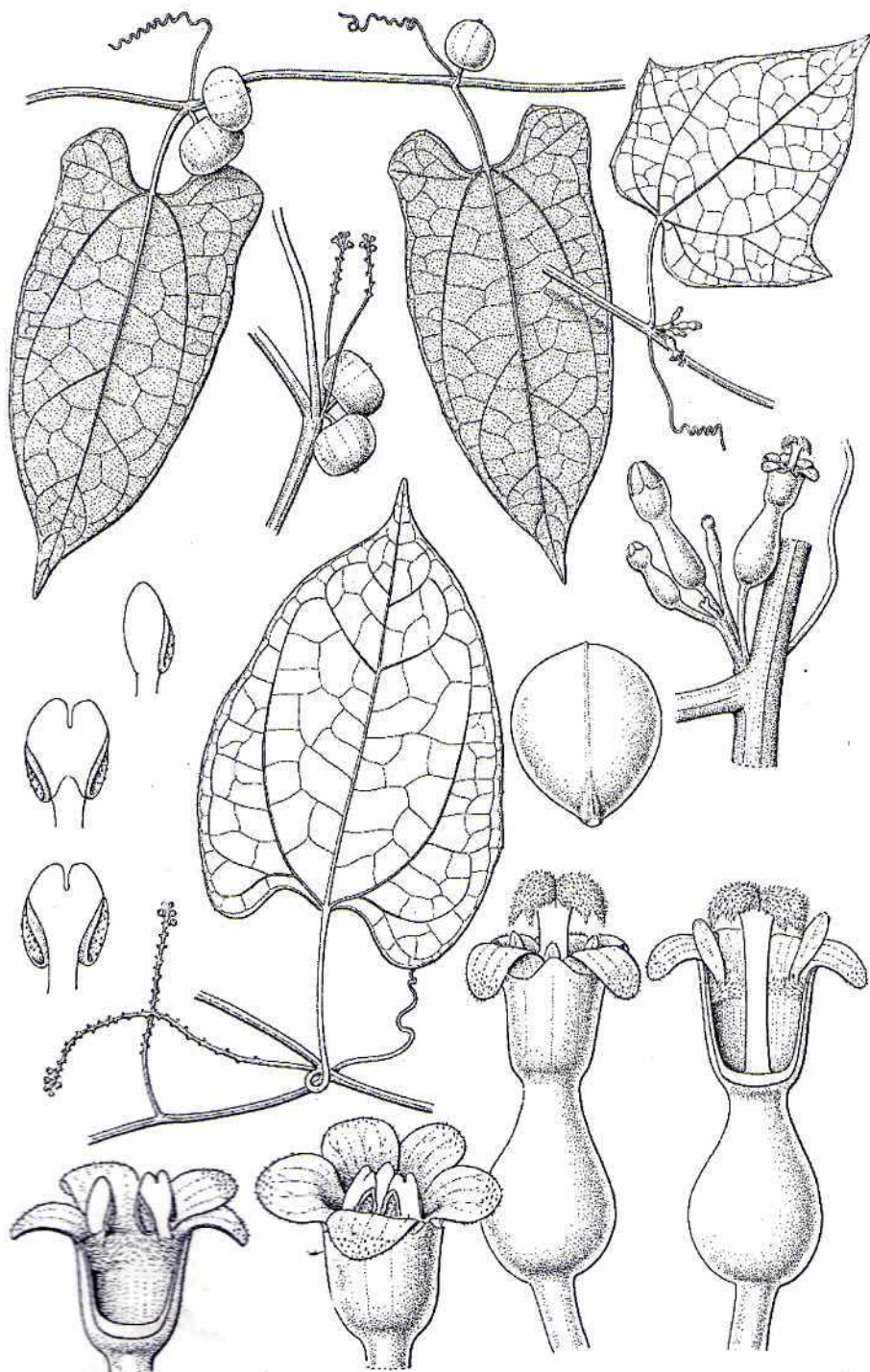




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FOUR NEW SPECIES OF ARENGA (PALMAE) FROM INDONESIA

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ABSTRACT

MOGEA, JOHANIS P. 2004. Four new species of *Arenga* (*Palmae*) from Indonesia. *Reinwardtia* 12 (2): 181 – 189. — *Arenga distincta* from Borneo and *A. longipes*, *A. plicata*, and *A. talamauensis* from Sumatra are described and illustrated for the first time. The descriptions are followed by information regarding the habitat and geographical distribution, and notes on morphological similarities with other, presumably related species. Leaves of *A. longipes* and *A. talamauensis* are paripinnate while the other two species are imparipinnate.

Keywords: *Arenga*, *Palmae*, Indonesia

ABSTRAK

MOGEA, JOHANIS P. 2004. Empat jenis baru *Arenga* (*Palmae*) dari Indonesia. *Reinwardtia* 12 (2): 181 – 189. — *Arenga distincta* dari Borneo; *A. longipes*, *A. plicata*, dan *A. talamauensis* dari Sumatra dipertelakan dan dilengkapi dengan gambar untuk yang pertama kali. Pertelaan tersebut disertai dengan keterangan mengenai habitat, persebaran geografi, dan kesamaan morfologi jenis-jenis yang diperkirakan kerabatnya. *A. longipes* dan *A. talamauensis* berdaun sirip genap, dua jenis yang lainnya berdaun sirip ganjil.

Kata kunci: *Arenga*, *Palmae*, Indonesia

INTRODUCTION

The genus *Arenga* was based on the name given by Labillardière for a sugarpalm from Moluccas, which he named as *Arenga saccharifera*. The name can be found in *Le Bulletin des Sciences par la Société Philomatique* 2 page 161 edited by de Candolle in 1800. The bulletin was published as proceedings of a series of talks given by Labillardière about his expedition in South East Asia in 1791 – 1792. Actually the sugarpalm had been already been described previously by Rumphius in 1741 in the *Herbarium Amboinense* 1 page 57 and Figure 13. At that time it was cited as ‘*Palma indica vineria secunda*’, meaning second wine-producing palm of the Indies. The first wine-producing palm known to him at that time was probably the coconut-palm. Rumphius described the sugarpalm mostly in comparison with other well known flora, fauna, and in relation to the daily lives of the people of Ambon. He also mentioned local names of the palm, namely *gomutus*, *gamut*, and *areng*. The last one apparently was latinized by Labillardière for the name of the genus. However, the sugarpalm was not mentioned in the *Species Plantarum* of Linnaeus (1753), though eight other economic palms were cited namely *Areca catechu*, *Borassus flabellifer*, *Calamus rotang*, *Caryota urens*, *Cocos nucifera*, *Corypha thebaica*, *Corypha umbraculi-fera*, and *Elate*

sylvestris (Moore & Dransfield, 1979).

Other species of *Arenga* were published firstly by Martius (1838) in *Historia Naturalis Palmarum* (*Arenga obtusifolia* and *A. porphyrocarpa*, the latter at that time named as *Orania porphyrocarpa*). During 1844 – 1845, Griffith published three other species of *Arenga* in the *Calcutta Journal of Natural History* Volume 5 No. 17, 19, and 20. Later in 1850, he published again the same species in *The Palms of British East India*. The species were *A. westerhoutii*, *A. wightii*, and *A. nana* (at that time named as *Wallichia nana*). In 1875, Blake described *Saguerus australasicus* (= *A. australasica*) from Queensland Australia. In 1878, Wendland & Drude published a list of palms, and under *Arenga*, eight species were listed, namely *A. bonnetii*, *A. griffithii*, *A. javanica*, *A. manillensis*, *A. obtusifolia*, *A. saccharifera*, *A. westerhoutii* and *A. wightii*. In 1886, Beccari described *A. brevipes* and *A. undulatifolia*, both from Borneo, and *A. engleri* from Taiwan. In 1889, he published *A. microcarpa* from Papua New Guinea, in 1891 *A. listeri* from Christmas Island in the Indian Ocean. In 1898 Bailey described *A. gracilicaulis* from Papua New Guinea, and in 1907 Beccari again described *A. ambong* from Mindanao, the Philippines; in 1909 he removed *Caryota tremula* of the Philippines to *A. tremula*. In 1965, Moore & Meijer added one species from Sabah, namely *A. retroflorescens*. Finally, in

1971, Hatusima changed *A. engleri* to *A. tremula* var. *engleri*. In 1988, Wei described *A. micrantha* from China, and finally in 1989 she also described *A. longicarpa* from Guangdong South China.

A genus very similar to *Arenga* is *Didymosperma*. It was described by Wendland & Drude in 1883; however, the list of six species of the genus had been published previously in 1878 in the *Index General des Palmiers* edited by Kerchove de Denterghem. The species in the list were *D. caudatum*, *D. horsfieldii*, *D. reinwardtii*, *D. nanum*, *D. porphyrocarpum* and *D. tremulum*. The last three were transferred from *Arenga*. In 1889, Beccari described *D. hastatum* and *D. hookerianum*, both from the Malay Peninsula, and *D. borneense* from Borneo. In 1892 J.D. Hooker described *D. gracile* from Assam; Beccari in 1910 added two varieties of *D. caudatum*, namely var. *stenophylla* and var. *tonkinense*, both from North Vietnam. In 1937, Gagnepain elevated the last variety to species rank as *D. tonkinense*.

In 1960, Moore studied the related genera *Arenga*, *Didymosperma*, *Wallichia*, and *Caryota*. He put all these genera under the subfamily *Caryotoideae*, and included *Didymosperma* under synonymy with *Arenga*, placing it under section *Didymosperma*. He also removed *D. porphyrocarpum*, *D. caudatum*, and *D. nana* to *Arenga*. His view was followed by Whitmore (1970) who transferred *D. hastatum* and *D. hookerianum*, and Dransfield (1980) who transferred *D. borneense* to *Arenga*. Hence, in total the genus consisted of 25 species and two varieties.

Although the genus has a long history, some of the species remain poorly known and poorly circumscribed, leading to difficulties in identification. For example *A. pinnata*, *A. westerhoutii* and *A. wightii*, are all large palms with solitary habit that are superficially similar and easily confused; in some areas such as in south of Thailand and Malay Peninsula, *A. pinnata* and *A. westerhoutii* co-occur in the same locality and habitat. The Philippine species *A. tremula*, *A. mindorensis*, *A. engleri* and *A. undulatifolia* have also been confused and there is a great complexity of variation in *A. caudata* in Indochina, Thailand and the Malay Peninsula needing clarification. One reason for these problems may be because the genus has not been studied in detail since the work of Moore in 1960. Therefore a revision of the genus is timely, especially as many more collections have been made and are particularly rich in the herbaria at Leiden, Kew and Bogor. During the revision, four new species were identified. They are described

in this paper. The revision of the genus will be presented separately.

In the specimen citation, “!” means that the specimen had been examined by the author, s.fl. means staminate flower, and p.fl. means pistillate flower.

1. ***Arenga distincta*** Moge, *sp. nov.* — Fig. 1 and 2

Frutices monoeci pleonanthi caulibus ad 2 m altis, ca 1.5 cm diam. (vaginis incl.), internodiis 4 – 8 cm longis. Folia imparipinnata, ca 1 m longa (vaginis, petiolis, foliolisque incl.); ligula 4 – 6 cm longa; foliola alterna, ca 3 in utroque latere, petiolulis ad 0.8 cm longis, lateribus trullatis, subpanduratis, 14– 24 cm longis, 6 – 9.5 cm latis, margine distali praemorsea, foliolo terminali simplice, elliptico, ca 20 cm longo, 10 – 12 cm late; costae 6 – 10, quarum tres ad centrum prominensimus, ceteris characteribus similis *Arenga hastata* (Beccari) Whitmore, praeter margine sepala crenata cum 4 – 6 lobis parvis. TYPUS: Borneo, South Kalimantan, District Tapin, Muara Uya, alt. 100 m, fl. (bud).10.Nov.1971, *Dransfield & Saerudin 2801* (BO - holo!, BH, L!).

Monoecious, pleonanthic shrub, forming clusters; stem up to 2 m long, 1.5 cm diam. (including leafsheath), internodes 4 – 8 cm long. Leaves 5 – 9 in crown, imparipinnate; leafsheath 10 – 20 (–30) cm long, margin and ligule united forming a fine soft black mat; ligule 4 – 6 cm long; petiole 20 – 30 (– 60) cm long, 0.3 cm diam.; blade 45 cm long, 30 cm wide, inter and ultrajugal part 5 – 10 cm long, upper surface of the leaflets glabrous, lower surface with brown indumentum; number of lateral leaflets on either side (2 –) 3 (– 5), in one plane, alternate; main longitudinal veins one, petiole up to 0.8 cm long; lateral leaflets trullate, rather pandurate, 14 – 24 cm long, 6 – 9.5 cm wide, top margin praemorse; terminal leaflet obtriangular, ca 20 cm long, 10 – 12 cm wide; main longitudinal veins 6 – 10, either 2 or 3 of the main longitudinal veins more prominent, distal part of the terminal leaflets with 3 lobes, each lobe with acumen, the middle lobe the longest, up to 3 cm long. Staminate inflorescence sometimes arising from a cleft between the leafsheaths, solitary, slender, up to ca. 45 cm long; peduncle ca 2 cm long, number of bracts ca. 4, erect, slender, up to 10 cm long; peduncle covered by the bracts, up to 20 – 30 cm long; each bearing one rachilla; rachilla pendulous, slender, 20 – 25 cm long. Staminate flower ellipsoid, 8 mm long, 3.5 mm diam.; sepal broadly ovate ca. 2 mm long, 3 mm wide, margin

crenulate, lobes 4 – 6; petal ellipse, up to 8 mm long, 3.5 mm wide; stamens 20 – 30, filament ca. 0.5 m long, anthers ca. 4 mm long; pistillode absent. Pistillate inflorescence similar to the staminate one, mostly shorter, 20 – 30 cm long. Pistillate flower globose, ca. 4 mm diam.; sepal broadly ovate 1 mm long, 2 mm wide, margin crenulate with 4 – 6 small lobes; petal ovate, ca. 4 mm long, 3 mm wide; ovary globose, ca. 4 mm diam.; stigma inconspicuous. Fruit globose, ca. 10 mm diam. Seed one, subglobose to ellipsoid, ca. 6 mm long, surface often with brown spots. Seedling with bifid eophyll, leafsheath 2 cm long, petiole 1 cm long; blade obovate, ca. 4 cm long, 2 cm wide, top margin praemorse, lower surface whitish, rather rough.

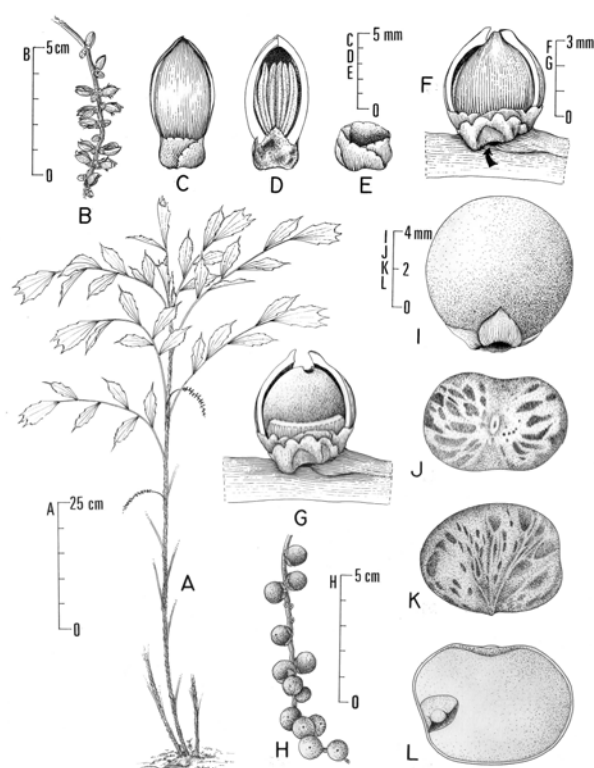


Fig.1. *Arenga distincta*. A. habit of plant cultivated in Bogor Botanic Garden XI.B.XIII.187, other stems of the cluster removed; B. a portion of the rachilla; C. staminate flower nearly at anthesis; D. longitudinal section of the staminate flower; E. calyx of the staminate flower after the corolla and stamens have been removed; F. pistillate flower, a black spot near the flower (indicated by an arrow) is the scar of the protandrous staminate flower; G. pistillate flower after one of the petals has been removed; H. a part of infructescence; I. fruit as seen from the side; J. seed as seen from the base; K. seed as seen from the side; L. longitudinal section of the seed showing the homogenous endosperm and lateral embryo. B – G after *Mogea* 5810; I – L after *Mogea* s.n.

HABITAT AND GEOGRAPHICAL DISTRIBUTION. Endemic to Borneo: Sabah, Sarawak, East and South Kalimantan in lowland mixed dipterocarp forest, up to alt. 500 m. However, usually in small populations.

VERNACULAR NAMES. Sabah: sasa utan (Murut language), anudur (Melayu language), kabal pisakwau (Orang Sungai language).

NOTES. The specimen *Dransfield* 5306 from Sarawak has 5 leaflets on either side of the rachis. According to the field notes: upper surface of the leaflets deep green, lower surface brownish. Sepals green, petals pale green, ripe fruit bright red, mesocarp white. Another collection, *Dransfield & Saerudin* 2801 (type specimen) from South Kalimantan, has a vegetative bud arising at the node 30 cm from the base of the stem.

The surface of the seeds from East and South Kalimantan are covered with faint brown spots.

Whether the seeds from Sabah and Sarawak have the same surfaces is not known.

The lateral leaflets of the specimen *Mogea* et al. B-1559 and *Mogea* et al. B-1593 from East Kalimantan are rather more similar to *Arenga hastata* than to *A. distincta*. The similarities are in the length of the petiole, the form of the leaflets, the shiny glabrous lower surface and the texture. It is possible that this represents a natural hybrid between the two species, as *A. hastata* also occurs in Sarawak and Central Kalimantan.

SPECIMEN EXAMINED. BORNEO. Sabah: District Ranau, southeast of River Mongkodoit, p.fl. (young) 11.Apr. 1983, SAN 96539 *Joseph et al.* (K!, L!, SAN); District Labuk, Sugut, Sinurai Village, s.fl.16.Apr.1983, SAN 95380 *Aban & Dewol* (A, K!, L!, SAN, SAR!); District Telupid, ca Mile 8, Ente Lebung - Menanam, alt. 150 m, s.fl.24.Oct.1979, *Dransfield* 5801 (K!, SAN); District Lahad Datu, Ulu Sungai Danum, s.fl.1.Sep.1976, SAN 85240 *Stone* (K!, SAN); District Tongod, Ulu Menanam Village, alt. 500 m, s.fl.2.Oct.1978, SAN 89298 *Dewol & Kodoh* (K!, SAN); District Betotan, alt. 25 m, fr.16.May.1933, *Castro* 3247 (K!); District Beluran, south of Labuk bridge, alt. 400 m, fr.8.Dec.1979, SAN 91070 *Dewol* (K!, SAN, SAR!). Sarawak: 2nd Div., foot path to Mt. Silantek, left up stream of river Silantek, Mile 85, Sri Aman, alt. 180 m, fl.(in bud).21.Aug.1980, SAN 424575 *Paie* (K!, KEP, NY, SAN); Ulu Belaga, Kuala Linau, River Masoh, Rumah Nyaving, alt. 200 m, s.fl.10.Aug.1975, *Dransfield et al.* 4700 (BM!, K!, KEP, L!, SAR!); 4th Div., Mulu National Park, foot Mt. Muda, alt. 150 m, sterile, 12.Oct.1977, *Dransfield* 5306 (K!, SAN); Niah National Park, near river Sekaloh, s.fl.+ p.fl. 28.Mar.1979, SAN 40054 *Chai et*

al. (K!, NY, SAN); Betotan, logged area, Timber Concession, alt. 25 m, p.fl. 22 Apr.1933, *Orolfo* 3079 (K!, SAR!). East Kalimantan : District Bulungan, Ulu Sebuku, s.fl.+ fr., Aug. 1912, *Amdjah* 390 (BO!); s.fl. + p.fl. 8.Sep. 1912, *Amdjah* 552 (BO!); District Kutai, Long Hut, s.fl. 19.Aug.1925, *Endert* 2662 (BO!, L!); Nature Reserve Mantoko, river Sengata, alt. 40 m, s.fl.+ p.fl.+ fr. 15.Jun. 1971, *Dransfield* 1578 (BO!, L!); northwest Tabang, foot of Mt. Batu Kenye, along Belayan river, alt. 100 – 150 m, s.fl.10.Jan.1979, *Mogea et al. B-1593* (BO!, KYO!); *ibid.*, fl.(in bud), 10.Jan.1979, *Mogea et al. B-1594* (BO!, KYO!); around Jelini, fr.6.Jan.1979, *Mogea et al. 1559* (BO!, KYO!), sterile, 6.Jan.1979, *Mogea et al. B-1560* (BO!, KYO!); G. Mendam, s.fl.16.Jan.1979, Murata et al. *B-2384* (BO!, KYO!). South Kalimantan: Mts. Meratus, Barabai, Kiu, foot of Mt. Besar, mixed lowland dipterocarp forest, on a river bank, alt. 200 m, s.fl.14.Nov.1971, *Dransfield & Saerudin* 2801 (BO - holotype!, BH, L!).

CULTIVATED IN BOTANIC GARDEN. Bogor: living collection under registration number: XI.B.XIII.187 and 201 originally from seed of the collection of *Dransfield & Saerudin* 2801; *ibid.*, s.fl.24.Aug.1984 *Mogea* 5810 (BO!); *ibid.*, fr.4.Aug.1986., *Mogea* 5854 (BO!).

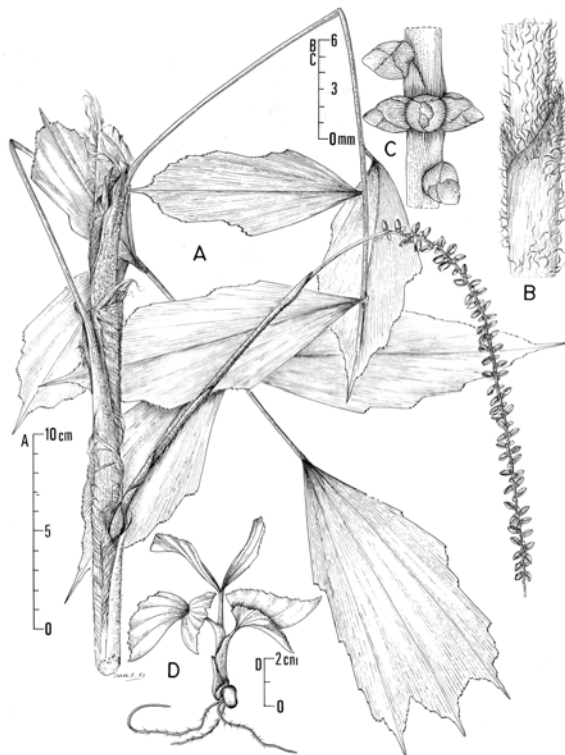


Fig. 2. *Arenga distincta*. A. a portion of the top of the plant bearing leaf and staminate inflorescence; B. a portion of peduncle showing conspicuous villose hairs covering the bracts; C. a portion of inflorescence showing triads; D. seedling. A after *Mogea* 5810, B – C after *Mogea* 5854, D after *Mogea* s.n.

2. *Arenga longipes* Mogea, *sp. nov.* --- Fig. 3 and 4.

Fructices basipetalo-hapaxanthi, monoecicespitosi vel cum stolonibus subterraneis, . Caulis pars basalis cum ca. 4 internodiis; internodiis ca. 3 cm longis, ca. 5 cm diam.; internodiis superis ad 2.5 m longis, ca. 1 cm diam., pedunculoideis. Folia paripinnata, foliolis alternis, ca. 16 in utroque latere; lateralibus linearis, glabris. Inflorescentia solitaria vel ramificans, mascula axillaris, saepe ramificans, rachillae 2 – 6, graciles, pendulae, ad 30 cm longae, saepe ramificantes; floribus masculis gemminatis, ellipticis, ca 1 mm longis, 3 mm diam., sepalis, distinctis imbricatis, staminibus ca 10. Inflorescentia femina similis, sed bisexualis, rachillae inramificantes, ad apex caulis, floribus in triadibus ferentibus; flores pistillati elliptici, ca 7 mm longi, 3 mm diam., sepalis 3 distinctis, imbricatis, staminodiis 3, ovario biloculare, utroque loculo unico ovulo; stigmatibus sessilibus, bilobatis. TYPUS: Sumatra, Prov. Bengkulu, District Rejang Lebong, beside the main road on Km 18 from Kapahiang to Bengkulu, on the slope of mixed dipterocarp forest, altitude 700 m, s.fl.25.Aug.1973, *Dransfield* 3585 (BO! - holo, L!).

Shrub, clustered, hapaxanthic, monoecious or dioecious; distances between the base of stems ca. 50 cm, stem connected by underground stolons; stolon terete, ca. 0.5 cm diam. Proximal stem terete, 25 cm long, 5 cm diam; internodes ca. 3 cm, surface glabrous; the top internode forming the peduncle, terete up to 250 cm long, 1 cm diam., rather tomentose and villose up to massive woolly leafsheath. Leaves 5 in crown, paripinnate, at maturity subsequent leaves gradually reduced in size. Leafsheath up to 40 cm long, mouth of the leafsheath united with ligule forming a fine mat; ligule up to 10 cm long; petiole terete, 50 – 250 cm long, 1 – 1.5 cm diam.; blade 100 cm long, 60 cm wide; rachis glabrous; interjugal part 2 – 7 cm, pulvinus 0.5 cm long; petiole absent. Lateral leaflets ca. 16 on either side, ± in one plane, subalternate, both surfaces glabrous. Lateral leaflets linear, 30 – 60 cm long, 3 – 4.5 cm wide, at the base cuneate, upper margin praemorse, the tip rather obtuse to acute, praemorse; main longitudinal vein of the lateral leaflets one, other lateral veins arising from the base of the leaflet diverging longitudinally. Terminal leaflet obtriangular, 15 – 25 cm long, 3.5 – 6 cm wide, at the base cuneate, at the margin praemorse, at the top with 2 or 3 triangular lobes, margin praemorse obtuse to acute, main longitudinal veins two or three; two top leaves tube-like resembling the prophyll and bract of the inflorescence, terete, 85 cm long, ca. 1 cm diam. Inflorescence solitary, in one stem

bearing 1 to 3 inflorescences, erect; in the dioecious plant, the staminate inflorescence at the top of the stem, in monoecious plant the staminate inflorescences below the pistillate ones. Peduncle slender, terete, up to 30 cm long, 0.3 cm diam; prophyll tube-like, 3 – 15 cm long; bracts 3, tube-like, 10 – 30 cm long, 0.3 – 1.5 cm diam., surface glabrous; number of rachilla 2 – 6, pendulous, slender, up to 30 cm long, sometimes branched. Staminate flower ellipsoid, sepals broadly ovate, 1.5 – 2 mm long, surface minutely roughened, petal elliptic, ca. 10 mm long, 3 mm wide, surface striate; stamens ca. 10, filament ca. 0.5 mm long, anther 5 – 7 mm long, pistillode absent. Pistillate inflorescence similar to the staminate one, at the top of the stem; number rachillae 3 or 4, never branched. Pistillate flower ellipsoid, ca. 7 mm long, 3 mm diam., sepal obovate, ca. 1.5 mm long, 3 mm wide; petal elliptic, ca. 7 mm long, 4 mm wide; staminodes 3, ca. 1.5 mm long, each inserted between the joined petals; ovary globose, ca. 4 mm diam., 2 cells, each with one ovule; stigma sessile, 2 lobed, lobes ca 1.5 mm long. Fruit not known.

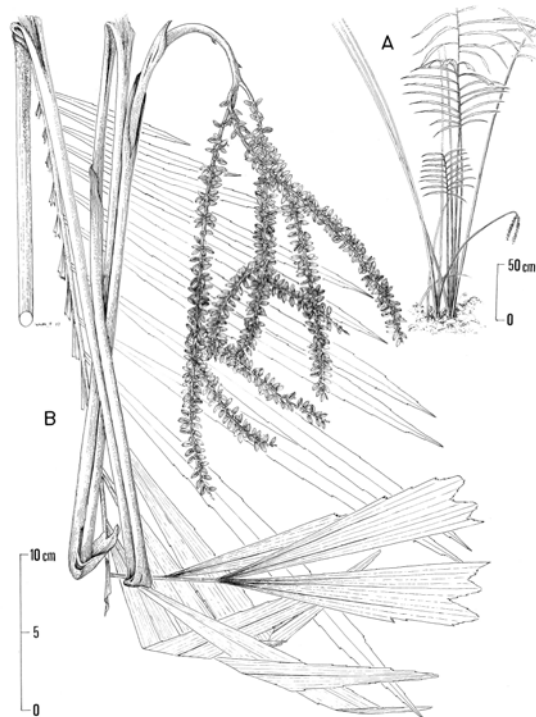


Fig. 3. *Arenga longipes*. A. habit of two plants, one of them bearing the inflorescence (the drawing based on the photograph made by Dr. J. Dransfield), B. top of the stem bearing the staminate inflorescence. After Dransfield 3585 (BO – type specimen).

HABITAT AND GEOGRAPHICAL DISTRIBUTION. Endemic to Sumatra, Prov. Bengkulu in disturbed mixed dipterocarp forest, alt. 600 – 700 m. In a small population very close to the main road between Kapahiang – Bengkulu at Km 19 – 20. However, it was not found in the nearest one hectare of Tabah Pananjung Nature Reserved which is located near the population. According to Dr. J. Dransfield in his field notes, at anthesis the flower smelled of oil of wintergreen (*Gaultheria* sp.).

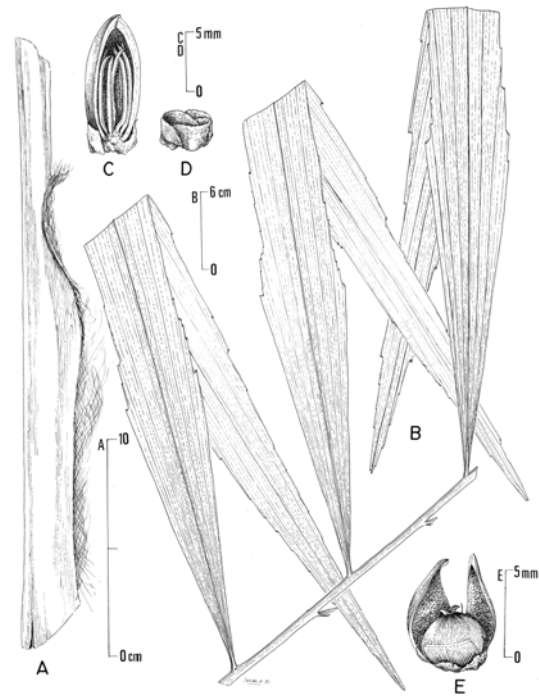


Fig. 4. *Arenga longipes*. A. portion of the leafsheath, B. the middle of the leaf, C. longitudinal section of the staminate flower, D. calyx of the flower after the corolla and stamens have been removed, E. pistillate flower, one of the petals has been removed. A – D after Dransfield 3585 and E after Dransfield 3647 all from BO.

NOTES. There are six clusters of *A. longipes* (Mogea 5965) growing side by side with a population of *A. porphyrocarpa* (Mogea 5964) and *Caryota mitis*. These same natural habitat, distribution, and their morphological similarities could suggest that *longipes* is an intermediate form between these two genera. The stoloniferous habit is very rare in *Arenga* being otherwise known only in *A. retroflorescens* and *A. obtusifolia*.

It is curious that all the paripinnate *Arenga* spp such as *A. longipes*, *A. talamauensis* and *A. hastata* have leaflets glabrous on both surfaces

whilst in the other species of the genus which are imparipinnate, the leaflets are glabrous on the upper surface. The lower surface is always covered by wax and white or brown tomentum, except in *A. caudata*. In this last species, the lower surface of the leaflet has very sparse indumentum or is glabrous.

The glabrous surfaces of the both sides of the leaflet is one characteristic typical of *Caryota*. However, the bipinnate leaf, the always solitary inflorescence, and a ruminant endosperm are characters which are absent in *A. longipes* (except for the ruminant endosperm of *A. longipes* which was so far not available). The similarities between *A. longipes* and *A. porphyrocarpa* are particularly in the similar size, number of the lateral leaflets, number of the rachilla, number of stamens and form and number of staminodium.

A. longipes is very easily identified from other species of *Arenga* because the leaf is paripinnate, both leaflet surfaces are glabrous, the top of the stem is slender, elongate and similar to the peduncle, sometimes the staminate rachillae branch and the pistillate flower has a staminodium. The only other species that has a staminodium is *A. porphyrocarpa*. The branched staminate rachilla as shown in Fig. 3B in fact is an unusual form as it was the only one collection found among the other five collections examined.

SPECIMEN EXAMINED. SUMATRA. Prov. Bengkulu, District Rejang Lebong, Km 18 from Kapahiang to Bengkulu, on slope of disturbed dipterocarp forest near a private coffee estate, alt. 700 m, s.fl.30.Oct.1987, *Mogea* 5965 (BO!,K!, L!); *ibid.*, Km 20, alt. 500 m, s.fl.26.Aug.1973, *Dransfield* 3604 (BO!); *ibid.*, s.fl.26.Aug.1973, *Dransfield* 3605 (BO!); *ibid.*, Km 22, alt. 600 m, s.fl.+p.fl.29.Aug.1973, *Dransfield* 3647 (BO!).

3. *Arenga plicata* Mogea, *sp. nov.* – Fig. 5

Frutex caulis ad 1.5 m altis, ca 3 cm daim. (vaginis incl.), pleoanthus, dioeca. Folia imparipinnata, ca 3.2 m longa (vaginis, petiolis, foliolis incl.), foliolis alternis, ca 12 in utroque latere, lateralibus obtusatis 28 – 39 cm longis, 3.5 – 10.5 cm latis, basi cuneatis plicatis sursum gradatim applanatis, margine distali praemorsa, apice acuto vel truncato, infra cinnamomeis, costa principali 1. Inflorescentia staminata *A. retroflorescenti* affinis, pedunculo crasso, bracteis dense imbricatis laceratis rachillam totam includentibus, rachilla 1 compacta ellipsoidea 4 – 6 cm longa, 3 cm diam., floribus ca 60 dense fasciculatis nodis obscuris obvoideis ca 8 mm longis, staminibus 33 – 38. TYPUS : Sumatra, Prov. Jambi, District Kerinci, road from Penetai to Sungei Penuh, lowland

mixed dipterocarp forest, alt. ca 300 m, s.fl.21.Jul.1972, *Dransfield* 2606 (BO-holo!, BH, K!, L!).

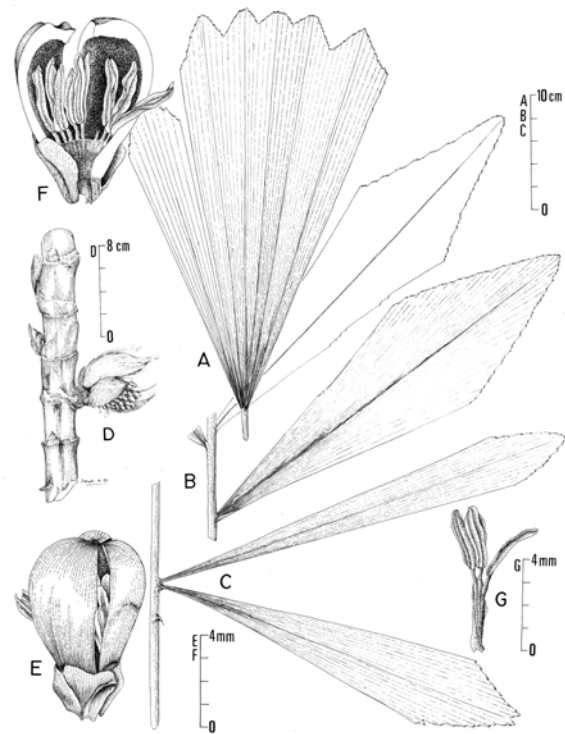


Fig. 5. *Arenga plicata*. A. terminal leaflet, B. lateral leaflets of the middle leaf, C. lateral leaflets of the base of the leaf, D. a portion of the stem bearing the staminate inflorescence, E. staminate flower at anthesis, F. longitudinal section of the staminate flower, G. stamen. A – G after *Dransfield* 2606 (BO – type specimen).

Pleoanthic, dioecious shrub; stem up to 1.5 m long, ca 3 cm diam., internodes 3 – 5 cm long, nodes conspicuous. Leaves imparipinnate, leafsheath ca. 20 cm long, outer surface rough, margin and the ligule forming a fine brown mat, ligule fibrous, many fibers stout and strong, up to 20 cm long; petiole terete, up to 125 cm long, ca. 1 cm diam., surfaces rough, brown. Blade 175 cm long, 40 cm wide; lateral leaflet ca. 12 on either side, alternate, at the base of the blade 4 leaflets in groups, fan-like, upright, other leaflets \pm in one plane, inter and ultrajugal part 3.5 – 10.5 cm long, ultrajugal mostly 3.5 cm long; pulvinus up to 0.5 cm long. Lateral leaflets trullate, 28 – 40 cm long, 3.5 – 10.5 cm wide; plicate at the cuneate base gradually flattening through to the tip; apex acute to truncate, margin praemorse; abaxial surface reddish tinged; main longitudinal vein 1, quadrangular in cross section, 2 mm long, 1 mm

wide. Terminal leaflet obtriangular, 34 – 37 cm long, 14 – 19 cm wide, at the apex with 4 or 5 lobes; lobes acute; main longitudinal veins ca. 6. Staminate inflorescence solitary, infrafoliolar, peduncle covered by bracts, terete, 2 cm long, 0.3 cm diam., bracts ca. 4 obscuring the spike; rachilla 1, ellipsoid, 4 – 6 cm long, 3 cm diam., congested with flowers; bracteolule absent; number of flowers in the rachilla ca. 60; flower arrangement in the rachilla obscure; staminate flower obovoid, ca. 8 mm long, 2.5 mm diam.; sepal obovate, ca. 2 mm long, 2.5 mm wide; petal lanceolate, ca. 8 mm long, 2 – 3 mm wide, outer surface striate; stamens 33 – 38, filament ca 2.5 – 4 mm; stigma ca. 2.5 mm; pistillode absent. Pistillate inflorescence and fruit unknown.

NOTES. The plant is similar to *A. retroflorescens* particularly in its pleonanthic habit, dioecy, nodes of stem very conspicuous, and erect spicate staminate inflorescence, and congested flower arrangement. The plant is known only from the type collection.

4. *Arenga talamauensis* Mogeia, *sp. nov.* – Fig. 6

Frutices dioeci basipetalo-hapaxanthi caulibus 2 m altis, caulis apicalis pedunculo similis ca. 20 cm, ca. 0.2 cm diam. Folia paripinnata, in nodis caulibus apicalibus bracteiformibus. Foliolis alternis, ca. 4 in utroque latere, lateralibus trullatis, \pm panduratis, 16 – 18 cm longis, 3.5 – 10.5 cm latis, basin cuneatis, margine distali praemorsa. Inflorescentia staminata in caule apicali 2 fasciculi, curva, 15 – 35 cm longa. Rachillae ad tertium axem ramificantes, ca. 5, exiles, 12 – 20 cm longae, unisexuales. Flores staminati elliptici, 6 – 7 mm longi, 3 – 4 mm lati, sepalis petalisque glabrescentibus, staminibus ca. 25, pistillodio carenti. Flores pistillati elliptici, ca. 4 mm longi, 3 mm lati, staminodiis carentibus, ovario globoso. TYPUS: Sumatra, Prov. West Sumatra, District Pasaman, Lubuk Sikaping, Bukit Kabung, primary dipterocarp forest, alt. 800 – 1000 m, s.fl. (young). 22. Jun. 1907, *Bünnemeijer 1216* (BO! - holo).

Shrub, apparently in clusters, hapaxanthic, dioecious, stem forming the peduncle at its tip, slender, terete ca. 20 cm long, 0.2 cm diam. Leaves paripinnate, the terminal leaf reduced forming a bract; leafsheath 20 cm long, at the mouth with the ligule forming a fine mat; the ligule up to 1 cm long; peduncle slender, terete, (3–)12 – 16 cm long, 0.3 cm diam.; blade 37 – 50 cm long, 26 – 34 cm wide; pulvinus 0.5 cm, interjugal part 3 – 8 cm, ultrajugal part ca. 12 cm, petiolule up to 1 cm long; lateral leaflets 4 on either side, alternate, \pm in one plane, trullate, 16 –

18 cm long, 6 – 8 cm wide, at the base cuneate, at the tip \pm with acumen, top part of the leaflet margin praemorse, main longitudinal vein 1; terminal leaflet obtriangular, asymmetric, 12 – 14 cm long, 3.5 – 7 cm wide, obtuse at the tip, main longitudinal veins 2 or 3, top part of the leaflet

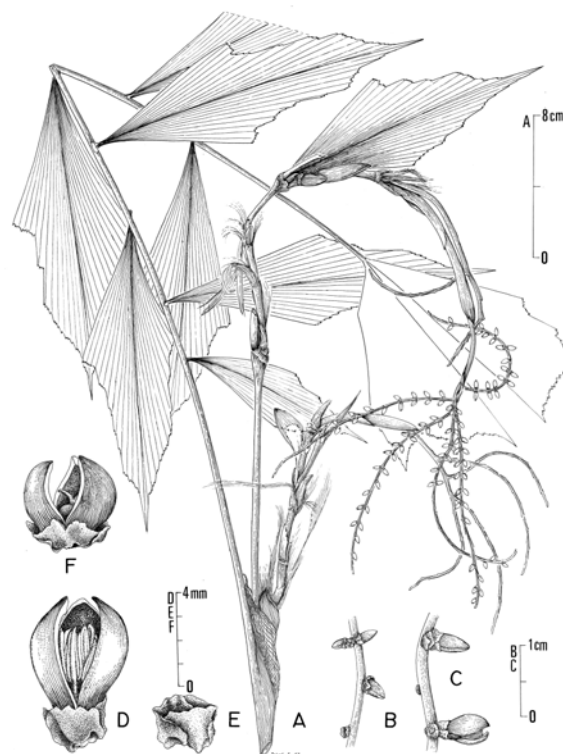


Fig. 6. *Arenga talamauensis*. A. top of the stem showing hapaxanthic habit, B. a portion of the rachilla showing a triad, C. a portion of staminate rachilla showing only one developed staminate flower from each of the triads, D. staminate flower at anthesis, E. calyx of the staminate flower after the corolla has been removed, F. pistillate flower. A – B: after *Bünnemeijer 1216* (BO – type specimen); C – F: after *Bünnemeijer 473* (BO).

margin praemorse. Staminate inflorescence multiple, consisting of 2 inflorescences at the top of the stem, curved, 15 – 35 cm long, branching to the second order; the prophyll tube-like, ca. 2 cm long; bracts 4, tattered, the young bract tube-like, 12 – 15 cm long. Rachillae, ca. 5, slender, 12 – 20 cm long, unisexual; staminate flower in pairs, only either one developing to mature flower; staminate flower ellipsoid, 6 – 7 mm long 3 – 4 mm diam.; sepal ovate, 1.5 – 2 mm long, surfaces glabrous; petal elliptic, ca. 6 – 7 mm long, surfaces striate; stamens ca. 25, filaments 0.5 mm long, anther ca 3 mm long, pistillode absent. Pistillate inflorescence similar to the

staminate, at the 3 or 4 lower nodes number. Pistillate flower ellipsoid, ca 4 mm long, 3 mm diam., sepal ovate ca. 3 mm long, 2.5 mm wide; petal elliptic, ca. 6 mm long, 2 mm wide, staminodium absent; ovary globose, ca. 2.5 mm diam.; stigmas sessile, 2-lobed, ca. 0.8 mm long. Fruit unknown.

HABITAT AND GEOGRAPHICAL DISTRIBUTION. Endemic to Sumatra, Prov. West Sumatra, Lubuk Sikaping, Bukit Kabung and Mt. Talamau, in primary dipterocarp forest, alt. 800 – 1000 m, very rare, the population might be very little.

NOTES. The paripinnate leaves in *Arenga* so far are known in *A. talamauensis*, *A. hastata* and *A. longipes*. In the section *Didymosperma*, multiple inflorescences with the inflorescence consisting of more than one rachilla are present in *Arenga talamauensis* and *A. porphyrocarpa*. Other species such as *A. nana*, *A. caudata*, *A. longipes*, and *A. gracilis* have a solitary inflorescence but each inflorescence may bear more than one rachilla. Other species in the section have a solitary inflorescence, which bears only one rachilla such as in *A. caudata* var. *tonkinensis*, *A. distincta*, *A. hastata*, and *A. plicata*.

SPECIMEN EXAMINED. SUMATRA. Prov. West Sumatra, District Pasaman, Lubuk Sikaping, northwest of "Lelling", Ophir, Mt. Talamau, primary mountain dipterocarp forest, alt. 1000 m, p.fl. Apr. 1907, *Bünnemeijer* 473 (BO!).

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CONTENTS

Page

W.J.J.O. DE WILDE & BRIGITTA E.E. DUYFJES. <i>Kedrostis</i> Medik. (<i>Cucurbitaceae</i>) in Asia	129
J.F. VELDKAMP. Miscellaneous notes on mainly Southeast Asian <i>Gramineae</i>	135
PITRA AKHRIADI, HERNAWATI AND RUSJDITAMIN. A new species of <i>Nepenthes</i> (<i>Nepenthaceae</i>) from Sumatra.....	141
KUSWATA KARTAWINATA, ISMAYADI SAMSOEDIN, M. HERIYANTO AND J.J. AFRIASTINI. A tree species inventory in a one-hectare plot at the Batang Gadis National Park, North Sumatra, Indonesia	145
E.A.P. ISKANDAR & J.F. VELDKAMP. A revision of Malesian <i>Isachne</i> sect. <i>Isachne</i> (<i>Gramineae</i> , <i>Panicoideae</i> , <i>Is.ach.neae</i>).....	159
JOHANIS P. MOGEA. Four new species of <i>Arenga</i> (<i>Palmae</i>) from Indonesia	181
J.F. VELDKAMP. The correct name for <i>Pyrrosia hastata</i> Ching (<i>Polypodiaceae</i> , <i>Pteridophyta</i>).....	191
TRI MULYANINGSIH & COLIN ERNEST RIDSDALE. An additional species of <i>Villaria</i> Rolfe (<i>Rubiaceae</i> ') from The Philippines.....	195
ELIZABETH A. WIDJAJA, INGGIT PUDJI ASTUTI & IDA BAGUS KETUT ARINASA. New species of bamboos (<i>Poaceae-Bambusoideae</i>) from Bali.....	199