

A Revision of the Genus *Nenga*

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Nenga is a small genus of arecoid, forest undergrowth palms confined to the per-humid areas of West Java, Sumatra, Bangka, Borneo, Singapore, Malay Peninsula, S. Thailand and Indo-China. It was established by Wendland and Drude in 1875 based on *Pinanga nenga* Bl. This type species was earlier fully described and illustrated by Blume (1839) in his *Rumphia* based on material from West Java. Scheffer (1876) later made two new combinations in the genus from *Areca* and *Pinanga*, and also provided the new name *Nenga wendlandiana* Scheff. for the type species *Pinanga nenga*. Beccari (1877) subsequently described six new taxa and transferred one more species from *Pinanga*. Wendland (1878) listed only seven species and one variety in *Nenga* and made a new combination, *N. pumila* (Mart.) H. A. Wendl., citing *Areca pumila* Mart. as the basionym and *Pinanga nenga* Bl. as a synonym. (The nomenclature of the type species is discussed further below).

In 1855 Beccari published the first revision of the genus where he separated all his five new species and one new variety described in 1877 into three distinct genera (*Gronophyllum*, *Adelonenga*, *Leptophoenix*). In the same revision Beccari also reinstated his new combination, including Scheffer's (1876) species in *Areca* and *Pinanga*. He further described two new species, *N. schefferiana* Becc. from Sumatra and *N. intermedia* Becc. also from Sumatra but extending to the Malay Peninsula. Four years later (1889), a new species, *N. macrocarpa*, was added.

A new variety, *N. wendlandiana* Scheff. var. *malaccensis* Becc., and a morphological form (forma *hexapetala*) were also described by Beccari. All three taxa were based on specimens collected in the Malay Peninsula.

Drude (1889), in his brief treatment of *Nenga* in Engler and Prantl's "Die natürlichen Pflanzenfamilien", recognized 11 species and included Beccari's *Adelonenga*, *Leptophoenix*, *Nengella* and *Ophiria* in the genus. Drude had obviously overlooked Beccari's (1885) revision.

From 1889 until 1936, three more species were added to *Nenga*. Lauterbach in* 1911 described *N. novo-hibernica* Lauterb. from the Bismarck Archipelago. In 1936 Burret transferred two species in *Pinanga* (later *Areca*) to *Nenga*, namely *N. banaensis* (Magalon) Burret and *N. nannospadix* (Burret) Burret, both from Indo-China.

In Beccari's posthumously published account of the arecoid palm genera edited by Pichi-Sermolli (Beccari and Pichi-Sermolli 1955), the genus was redescribed and only four species recognized, one species (presumably *N. pumila*) being referred to as very variable. Moore (1973) in his survey of the major groups of palms recognized only two species in *Nenga*. In both these accounts, however, no indication is given as to which species are recognized and which are synonyms. The most recent addition in *Nenga* is *N. gajah*, a species with remarkable features collected in Sumatra and described and illustrated in detail by Dransfield in 1975.

Recent collections have revealed a

much wider range of variation within *Nenga* and also have extended its geographical range to include Borneo and Thailand. A new species related to *N. macrocarpa* has also been found in the Malay Peninsula and is described below.

Relationships with Other Genera

Nenga is one of the genera belonging to the *Areca* alliance of arecoid palms (Moore 1973). The genus is most closely related to *Pinanga* and *Areca* in general features of the inflorescence, flowers and fruits. *Nenga* is characterized by the spirally arranged flower groups (one pistillate between two staminate flowers) along the rachilla, with the distal portion being mostly entirely male, and the lateral attachment of the ovule which is evident in the seed as a lateral raphe.

The characteristic spiral arrangement of the flower groups, however, is also found in some species of *Areca* (Sections *Microareca* and *Mischophloeus*) and some species of *Pinanga* (Section *Spirantheae*). In some of the *Areca* species with spiral flower groups, the distal terminal portions of the rachillae are also entirely male. Thus the infructescence often bears long, dead, tail-like branch tips as in *Nenga*. This particular feature is unknown in *Pinanga*. The inflorescence structure in *Nenga*, however, appears to be more like *Pinanga* in aspects of its branching patterns.

The most striking feature distinguishing *Nenga* from *Areca* and *Pinanga* is the lateral attachment of the ovule. Both *Areca* and *Pinanga* have basal ovular attachment.

In general, *Nenga* seems most closely related to *Pinanga*, especially in the branching of the inflorescence, the often pendulous infructescence, and in features of the habit.

Morphology

The species of *Nenga* are slender or moderate, unarmed, erect, solitary or

caespitose palms confined to the undergrowth of the rain forest. They reach up to about 9 m tall. The stems are distinctly annulate because of the horizontal leaf scars, and range from 2 cm to 15 cm in diameter, to a mere 2 m long, often with very short internodes, or up to 8 m long with longer internodes. At least one species, *N. gajah*, develops prominent stilt roots near the stem base. Recent collections from Sumatra of *N. pumila* var. *pachystachya* also indicate the presence of stilt roots. These adventitious roots are apparently common in most *Nenga* species, although often not properly observed and recorded by collectors.

The only known caespitose species in *Nenga* so far is *N. pumila* and its variety *N. pumila* var. *pachystachya*.

As in many arecoid palms, the tubular leaf sheaths tightly enclose the uppermost portion of the stem and form a crownshaft, except in *N. gajah* which does not form a well-defined crownshaft due to the tardily abscising leaves; the sheaths are thus usually obscured by detritus. The exposed area of the leaf sheath in *Nenga* is often pale green or yellowish-green to slightly purplish-green and covered with brown scale-like indumentum. The inner surface is usually smooth and shiny.

About 5 to 10 wide-spreading pinnate leaves, 1–3 m long, form the crown. The young and developing leaves are generally erect at first. The petiole in *Nenga* possesses a prominent adaxial groove and is rounded and smooth abaxially, and pale green or yellowish-orange with sparse brown scale-like indumentum. Petiole length is very variable and may range from a mere 4 cm up to 50 cm, even within the same taxon. (The longest petiole belongs to *N. gajah* which reaches up to ca. 75 cm long.) The rachis is often subangular to triangular and tapers gradually towards the apex. The leaflets are regularly arranged, opposite to subopposite or alternate. They are generally linear-elliptic or sigmoid to subfalcate, glabrous, and coriaceous; the adaxial surface is dull green

to bright green, and the abaxial surface much paler, with rammenta prominent along the costae. There may be up to about 30 leaflets on each side of the rachis, but sometimes many fewer (8–10) as occasionally in *Nenga gajah*. The basal leaflets are often 1–2 costate, narrower than the rest, and with long-acuminate tips. The middle leaflets are 1–5 costate and are generally the longest; the tips are likewise long-acuminate. The terminal leaflet pair may be 1–8 or 10 costate and is about as long as the basal leaflets. The tips may be long-acuminate or slightly toothed, the lobes corresponding to the major costae. The terminal leaflet pair may sometimes be joined at the base along the rachis.

The inflorescence in *Nenga* is infrafoliar and pendulous, except for *N. gajah* which has an interfoliar and erect inflorescence. Because of its interfoliar inflorescence, *N. gajah* has other associated features in its inflorescence structure not shared by other species. Apart from the inflorescence being erect, the peduncle is also very long (22–30 cm) and the prophyll is thick, coriaceous, almost woody, and persistent through anthesis. The bracts subtending the rachillae are likewise thick and stiff. In the rest of the genus, the peduncle is short (only 1–5 cm), the prophyll is rather thin and caducous, and the bracts subtending the rachillae are thin and membranous. The number of rachillae in the inflorescence and their length may vary considerably even within the same species, although it is rather consistent in at least one species. In *N. pumila* var. *pumila* the inflorescence may have 3–7 rachillae, often 3–4; *N. pumila* var. *pachystachya*, 2–6, often 2–4; *N. banaensis*, 4–6; *N. macrocarpa*, 3–5, often 3–4; and *N. gajah*, 3–5. In *N. grandiflora*, however, the inflorescence has consistently only 2 rachillae. Each rachilla usually bears both staminate and pistillate flowers in triads (1 pistillate between two staminate), especially along the proximal portion. The distal terminal portion often consists purely of staminate flowers. Occa-

sionally, some rachillae may bear only staminate flowers throughout. In *N. gajah*, up to 4 rachillae may be entirely staminate.

As in the other arecoid palms, *Nenga* flowers are unisexual and dimorphic. The staminate flowers are generally triangular, or sometimes angular and oblong. The pistillate flowers are globose to subglobose, often shorter than the staminate flowers. The staminate flower bears 3, free, valvate, usually subulate, dorsally carinate, flexuous sepals. The petals are elliptic to narrowly ovate or lanceolate, much shorter than or equal to subequal with the sepals. *N. gajah* differs in its staminate flowers from all other species; the sepals in this species are oblong-ovate to broadly ovate, but minute (only to 1 mm long), sometimes almost inconspicuous; the petals are oblong to slightly obovate, rather thick and marked within with impressions of the 6 stamens. Filaments are very short; the anthers are erect, basifixed, linear, and usually sagittate at the base. A pistillode may be present in the form of a minute conical structure but it is sometimes indistinct. In the pistillate flower the sepals and petals are very similar, being free, imbricate, usually broadly ovate, concave, and ciliate along the margin. The ovary is ovoid to spherical with a conical 3-lobed stigma and parietal ovule. Staminodes may be present as 6 minute conical structures or may occasionally be indistinct. *Nenga* flowers when fresh are generally cream-colored or greenish-cream.

Pollen in *Nenga* is monosulcate, with a very coarse to slightly fine reticulate exine. The amb shape is generally broadly elliptical (spherical in *N. gajah*). The exine is tectate. Pollen will be described in detail elsewhere (Fernando, in prep.).

The infructescence in *Nenga* is usually pendulous; the branches are densely covered with fruits except for the withered tips (the remains of the entirely staminate portions). In *N. gajah*, the infructescence is a single clublike head of fruits. The fruit varies from oblong or oblong-ellipsoid to

ovoid or obclavate or obpyriform to fusiform, ranging in size from 1.8–2.0 cm × 0.8–1.0 cm to 5–8 cm × 1.5–2.5 cm. *Nenga* fruits ripen orange-brown or brick-red, or purplish-brown to purplish-black. The fruit is often distinctly tipped by the remains of the 3-lobed stigma and is also usually beaked as in the large-fruited species. The epicarp is smooth and glabrous and the mesocarp is fibrous. In most species of *Nenga* the fibers of the endocarp are free at both ends when the mesocarp has eroded away. In *N. gajah*, however, the fibers do not become free (Dransfield 1975). The pericarp structure in *Nenga* fruits (based on an unidentified species from the Malay Peninsula) is described by Essig and Young (1979).

The seed in *Nenga* is laterally attached along its length to the endocarp by a raphe, and is cylindrical-ellipsoid or ovoid, the apex acute to acuminate or spinescent and the base rounded-truncate or concave. In *N. gajah* the seed is more or less fusiform with a rounded to obtuse base. The seed surface in *Nenga* is also characterized by narrow, shallow anastomosing grooves, and the endosperm is deeply ruminant with the embryo basal.

Geographical Distribution and Ecology

There are 3 taxa in the Malay Peninsula, 1 in Singapore, 2 in Sumatra, 1 in West Java, 1 in Borneo, 2 in S. Thailand, and 1 in Indo-China. The Malay Peninsula, Sumatra, and Indo-China have each 1 endemic species and West Java 1 endemic variety.

Beccari and Pichi-Sermolli (1955) also cited S. Burma as within the natural range of *Nenga*, although I have not seen any specimen nor literature reference to confirm this. It is, indeed, very likely that it may extend to S. Burma, especially near the Thai border.

The species of *Nenga* are usually found in the undergrowth of dense humid for-

ests, along streams or in river valleys or hill slopes up to ca. 1,300 m alt. *N. pumila* var. *pachystachya* is sometimes found along the landward edge of mangrove swamps. In Borneo, it is also found in heath forest on sandstone or granitic sand. *N. pumila* var. *pumila* is known to tolerate limestone soils (Backer and Bakhuizen 1968), while *N. banaensis* is reported only from granitic soil. *N. macrocarpa*, *N. grandiflora* and *N. gajah* seem to be strictly limited to humus-rich soils of the Dipterocarp forest.

Taxonomy

Nenga H. A. Wendl. & Drude in *Linnaea* 39: 182 (1875); Becc., in *Malesia* 1: 24 (1877) (pro parte); Benth. & Hook. f., *Genera Plantarum* 3: 888 (1883); Drude in *Engl. & Prantl, Die naturlich. Pflanzenfam.* 2(3): 75 (1889) (pro parte); Becc. & Hook. f., in *Hook. f., Fl. Br. India* 6: 412 (1892); Ridley, *Mat. Fl. Mal. Pen.* 2: 144 (1907) and *Fl. Mal. Pen.* 5: 12 (1925); Becc. & Pichi-Sermolli in *Webbia* 11: 37 (1955); Backer & Bakh., v.d. Brink, Jr., *Fl. Java* 3: 192 (1968); Whitmore, *Palms Mal.* 79 (1973); Moore in *Gentes Herb.* 11: 134 (1973).

Solitary or caespitose, slender or moderate, unarmed, pleonanthic, monoecious, undergrowth palms. Stem erect, sometimes stilt-rooted; nodes prominent. Crownshaft well-defined (except in *N. gajah*), elongate, slender or swollen, sometimes slightly angular, leaf sheath covered with brown scale-like indumentum, pale green, yellowish-green or purplish-green. Petiole adaxially grooved, rounded abaxially, smooth, with scattered brown indumentum. Leaves pinnate; rachis subangular, tapering towards apex, triangular in cross section; leaflets regular, opposite to subopposite or alternate; linear-elliptic or falcate-sigmoid; lamina dull to bright green, paler beneath, drying greyish-green or brown, glabrous, coria-

ceous, with sparse to numerous rammenta along costae on abaxial surface; basal leaflets often narrower than the rest, usually 1-2 costate, long-acuminate at tips; middle leaflets 1-5 costate, long-acuminate at tips; terminal leaflet pair 1-8 costate, sometimes joined at the base to several cm along the rachis, long-acuminate or gradually narrowed or slightly toothed at tips. Inflorescence infrafoliar or rarely interfoliar; pendulous or erect, protandrous (Dransfield, pers. comm.); prophyll ensiform or lanceolate, usually soon caducous or rarely long-persisting through anthesis, peduncular bract triangular, acuminate or ovate, often membranous; peduncle often not more than 5 cm long (much longer in *N. gajah*), flattened; rachillae 2-4, sometimes 5, but rarely to 6 or 7, each subtended by a triangular, often membranous bract; triads (one pistillate between two staminate) spirally arranged to more than half of axis length from proximal end, distal portion all staminate, or rarely all staminate throughout. Staminate flowers soon caducous, very shortly pedicellate or sessile, the whole flower angular, often trigonous, asymmetric; sepals 3, free, valvate, linear-subulate to very narrow lanceolate, usually carinate dorsally, flexuous, unequal, or rarely minute and triangular (as in *N. gajah*); petals 3, free, valvate, elliptic or narrowly ovate to lanceolate, generally shorter than or equal to subequal to sepals (oblong, plane or cucullate and much longer than sepals in *N. gajah*); stamens 6, filaments short, anthers erect, linear-oblong, sagittate at base or nearly so, basifixed; pistillode conical, minute. Pistillate flower sessile, ovoid to globose or subglobose, much shorter than or subequal to the staminate flower; perianth not clearly differentiated into calyx and corolla, often long-persisting through fruiting stage; sepals 3, free, imbricate, broadly ovate, concave, sometimes cucullate at tips, ciliolate along the margins; petals 3 as the sepals, slightly shorter; ovary unilocular, ovoid to spher-

ical or subglobose; stigma conical, 3-lobed; ovule parietal; staminodes short or indistinct. Infructescence pendulous, with 2-4, rarely 5-7 branches densely covered with fruits or with a single clublike head of fruits. Fruit ripening orange-brown to brick red or purplish-black, oblong to ellipsoid or ovoid to fusiform, usually prominently beaked and tipped with the 3-lobed stigma; epicarp smooth, glabrous; mesocarp fibrous; endocarp smooth, shiny within. Seed attached laterally to the endocarp, cylindrical-ellipsoid to ovoid, abruptly or gradually acute to acuminate or spinescent at tip; base shallowly or deeply concave intruded, rounded-subtruncate to truncate; endosperm ruminant; embryo basal. Type species: *Nenga pumila* (Mart.) H. A. Wendl.

Key to the Species of *Nenga*

1. Inflorescence interfoliar, peduncle long, to ca. 25 cm; prophyll long-persisting through anthesis; sepals of staminate flower minute, triangular or broadly ovate, much shorter than petals, not more than 1 mm long. *N. gajah*.
- * Inflorescence infrafoliar, peduncle short, to ca. 5 cm; prophyll caducous; sepals of staminate flower subulate to narrowly triangular, much longer than, equal or subequal to petals, more than 3 mm long. 2.
2. Stem caespitose; calyx of staminate flower much longer than corolla. *N. pumila*.
- Stem solitary; calyx of staminate flower equal or subequal to corolla. 3.
3. Infructescence usually not more than 20 cm long; stem not more than 4 cm in diameter. ...
..... *N. banaensis*.
- Infructescence usually more than 20 cm long; stem often more than 4 cm in diameter. 4.
4. Inflorescence with 3-4, rarely 5 branches; fruit ellipsoid; remnants of stigma less than 5 mm long, trilobed; seed short-ovoid, usually less than 2 cm long, abruptly acute at apex.
..... *N. macrocarpa*.
- Inflorescence with 2 branches; fruit ovoid to obclavate or obpyriform; remnants of stigma 5 mm or longer, only the upper half trilobed, the lower half entire; seed long-ovoid, usually more than 2 cm long, gradually acute to acuminate or slightly spinescent at apex. *N. grandiflora*.

1. ***Nenga pumila*** (Mart.) H. A. Wendl.
in Kerch., Palm. 251 (1878) and in

List of Palms in Kew Rep. 1882: 54 (1884); Koord., Exk. Fl. Java 1: 242 (1911) (cited as *N. pumila* (Bl.) Wendl.); Backer & Bakh. v.d. Brink Jr., Fl. Java 3: 193 (1968).

Areca pumila Mart., Hist. Nat. Palm. 3: 177, t. 153 (1838) (non Bl., in litt. et non Griff.) (infructescence erroneously shown as erect), 312 (1853) (excl. synonym *Areca (Anacasmus) pumila* Griff.); Miq., Fl. Ind. Bat. 3: 14 (1855) (excl. var. *pachystachya* Bl.) and De Palm. Arch. Ind. 23 (1868). Type: t. 153 in Mart., *l.c.*

Areca nenga Bl. ex Mart., Hist. Nat. Palm 3: 179 (1838) (pro parte); Scheff. in Natuurk. Tijdschr. Ned. Ind. 32: 166 (1873) (as *A. 'nengah'* Bl.).

Pinanga nenga (Bl. ex Mart.) Bl. in Rumphia 2: 77, t. 107 (1839) (excl. var. *pachystachya*) (pistil erroneously drawn with 2 locules).

Nenga wendlandiana Scheff. in Ann. Jard. Bot. Buitenz. 1: 153, tab. 9-10 (1876) (excl. synonym *Areca hexasticha* Kurz); Becc. in Malesia 1: 25 (1877) (cited as *N. wendlandiana* (Bl.) Scheff.) and in Ann. Jard. Bot. Buitenz. 2: 83 (1885)—nomen illegit.

Pinanga neglecta Burret in Notizbl. Bot. Gart. Mus. Berlin-Dahlem 15: 204 (1940). Type: Java, Reservat Depok, Burret 330 (Holotype B).—**synon. nov.**

(a) *Var. pumila*

Slender palm with stems ca. 2-3 m long, rarely more, 2.5-5 (8) cm diam., clustering at the base; leaf scars prominent; internodes to 8 cm long, smooth, green to greenish-brown. Crownshaft elongate, cylindrical, to ca. 50 cm long, rarely swollen. Leaves 5 to 6 in crown, leaf sheath ca. 40 cm long, dull greenish or yellowish-brown, petiole ca. 30-50 cm long, to 1.5 cm diam. Leaflets to 25 on each side of the rachis, often drying greyish-green or light brown; basal leaflets

usually narrower than the rest, 1 costate, ca. 30-35 × 1 cm, long-acuminate; middle leaflets 2-3 costate, ca. 35-50 × 2.5-4.5 cm, gradually narrowed at tips; terminal leaflet pair 3-7 costate, ca. 10-25 × 2-4.5 cm, acuminate or slightly toothed at tips, sometimes joined to 7 cm long at base along the rachis. Inflorescence infrafoliar, pendulous; prophyll ensiform or lanceolate, rather thin, drying chestnut-brown, caducous; peduncle short, ca. (1) 1.5-3 (4.5) × 1.6 cm, flattened, glabrous; peduncular bract triangular-acuminate, to 1.5 cm long, 1.0 cm at the base, membranous; rachillae usually 3-4, rarely to 7, ca. 20-30 cm long, each subtended by a triangular membranous bract to 5 mm long. Staminate flower triangular, or trigonous, asymmetric, flexuous; sepals subequal, linear-subulate or very narrowly lanceolate, dorsally carinate, very flexuous, ca. 1.0-1.5 cm long; petals narrowly ovate to lanceolate, straight to subfalcate, acuminate at tip, much shorter than sepals, ca. 5-7 × 1.5-2 mm; filament short, to 1 mm long; anthers erect, linear, to 2 mm long, sagittate at base; pistillode conical, minute. Pistillate flower ovoid to subglobose; sepals to 3 × 3 mm; petals as the sepals or only slightly smaller; ovary ovoid to spherical to 1.5 × 2 mm; stigma 3-lobed; staminodes indistinct. Infructescence pendulous, branches densely covered with fruits. Fruit ripening orange-brown, oblong to oblong-ellipsoid, ca. 1.8-2.0 × 0.8-1.0 cm, tipped with a circular, cushion-shaped stigma, the stigmatic lobes not prominently erect and parted or only slightly so; epicarp drying with longitudinal, slightly anastomosing ridges. Seed oblong-ovoid, ca. 8-11 × 5-7 mm, abruptly acute to acuminate at tip; base rounded-truncate, shallowly concave-intruded.

Distribution and Habitat. West Java; in mixed hill forest, also on limestone, ca. 150-1,300 m alt. Endemic.

Vernacular Names. *Djambe nenge*, *Nenge* (Sundanese); *Ngingi* (Javanese).

Specimens Examined: WEST JAVA: Pandeglang, Mandalawangi, G. Pulosari, 600 m alt., fl. and fr., *Dransfield 4184* (K); Ciapus, ster., *Herb. Lugd. Bat. 329* (L); G. Salak, fl. and fr., *Herb. J. C. Schoute* (L); Batavia, Ciampea, 150–200 m alt., fl., *Koorders 30777B* (L), Preanger, Takoka, ca. 1,200 m alt., fr., *Koorders 33370B* (L); Localities unknown, ster., *Herb. Lugd. Bat. 202, 328, 330–335* (L), fl., *Herb. Lugd. Bat. 197–199, 201*, fr., *Herb. Lugd. Bat. 203* (L), fr., *Blume s.n.* (*Herb. Lugd. Bat. 337*) (Type of *Pinanga nenga* Bl. var. β *hanjaware*; Holotype L).

Note. *Pinanga neglecta* Burret was based on a collection from Reservat Depok near Bogor in West Java. The holotype (*Burret 330*) has not been found among the remaining Burret palm collections in Berlin. However, the original description matches *N. pumila* var. *pumila* and cannot be referred to any known Javanese *Pinanga* (*Dransfield, pers. comm.*). *P. neglecta* is, thus, here reduced to synonymy under *N. pumila* var. *pumila*.

Nomenclatural Notes. Until 1935, this species was commonly known as *Nenga wendlandiana*. The name was proposed by Scheffer in 1876 for the type species of the genus, originally designated by Wendland and Drude (1875) as *Pinanga nenga* Bl., but unfortunately no new combination was made. The name *N. wendlandiana* Scheff. is, however*, illegitimate as was discussed by Furtado (1935). Wendland (1878) who strictly followed the rule of priority, provided the correct and valid combination—*Nenga pumila* (Mart.) H. A. Wendl.—based on *Areca pumila* Mart., which is an earlier validly published name for *Pinanga nenga* Bl. Furtado (1935) discussed in detail this particular nomenclatural problem and gave satisfactory reasons why *N. wendlandiana* should be rejected and *N. pumila* accepted.

(b) *Var. pachystachya* (Bl.) E. Fernando, **comb. nov.**

Pinanga nenga (Bl. ex Mart.) Bl. var. *pachystachya* Bl. in *Rumphia* 2: 78 (1839). Lectotype: Sumatra (locality unknown), *Korthals Sumatra No. 16* (L).

Areca (Anacasmus) pumila Griff. in *Calc. J. Nat. Hist.* 5: 456 (1845) and *Palm. Br. India* 151 (1850).

Areca pumila Mart. in *Miq., Fl. Ind. Bat.* 3: 14 (1855) and *Prodr. Fl. Sum.* 253 (1860).

Areca nenga sumatrana Scheff. in *Natuurk. Tijdschr. Ned. Ind.* 32: 168 (1873) (as *A. "nengah"*).

Nenga schefferiana Becc. in *Ann. Jard. Bot. Buitenz.* 2: 84 (1885). Type: Sumatra (locality unknown), *Scheffer s.n.* (Holotype FI).—**synon. nov.**

Nenga intermedia Becc. in *Ann. Jard. Bot. Buitenz.* 2: 85 (1885) Type: Sumatra, Padang, Sungei Bulu, *Beccari PS 942* (Holotype FI; Isotypes BM, K).

Nenga wendlandiana Scheff. var. *malaccensis* Becc. in *Malesia* 3: 182 (1889); Becc. & Hook. f. in *Hook. f., Fl. Br. India* 6: 142 (1892). Type: Malay Peninsula, Perak, Larut, *Kunstler 4022* (Holotype CAL (not seen); Isotypes BM, K, L).

Nenga wendlandiana Scheff. var. *malaccensis* Becc. forma *hexapetala* Becc. in *Malesia* 3: 183 (1889). Type: Malay Peninsula, Perak, *Scortechini s.n.* (Holotype FI).

Nenga wendlandiana Scheff. in *Ridley, Mat. Fl. Mal. Pen.* 2: 144 (1907) (excl. synonyms *Pinanga nenga* Bl. et *Nenga pumila* Wendl.) and *Fl. Mal. Pen.* 5: 12 (1925).

Caespitose, slender to moderate palm with stems sometimes stilt-rooted at the base, ca. 3–5 m long, (2) 3–6 (8) cm diam.; internodes to ca. 10 cm long, smooth, bright green to brown. Crownshaft elongate, cylindrical, ca. 35–80 cm long, only slightly swollen. Leaves to 7 in crown, leaf sheath ca. 25–60 cm long, pale green to greenish or yellowish-white;

petiole ca. 4–50 cm long, to 1.5 cm diam. Leaflets to 30 on each side of the rachis, often drying dull reddish-brown; basal leaflets 1 costate, ca. 25–40 × 0.5–1.0 cm, long-acuminate; middle leaflets 2–3 costate, rarely 4 or 5 costate, ca. 35–70 × 2–4 (5) cm, long-acuminate; terminal leaflet pair 3–6 costate, rarely to 10 costate, ca. 20–40 × (1.5) 2–2.5 (4) cm, acuminate or slightly toothed at tips, sometimes joined to 4 cm at the base along the rachis, rarely more. Inflorescence infrafoliar, pendulous; prophyll ensiform or lanceolate, ca. (18) 20–25 (70) × 1.5–3.0 cm, drying chestnut-brown, caducous; peduncle ca. 1.5–3.0 (4) × 0.4–1.3 cm, flattened, glabrous; peduncular bract triangular to narrowly triangular, acuminate, ca. 8–15 × 8–10 mm, membranous; rachilla 2–4, usually 3, rarely to 6, ca. (15) 20–35 (50) cm long, to 6 mm thick, each subtended by a membranous triangular bract to 10 mm long. Staminate flower triangular, asymmetric, flexuous; sepals subequal, linear-subulate or very narrowly lanceolate, dorsally carinate, very flexuous, ca. 9–13 (20) mm long; petals elliptic to lanceolate, acuminate, straight to subfalcate, much shorter than sepals, ca. 5–7 (9) × 2–2.5 mm; filaments 1–2 mm long; anthers erect, linear, ca. 1.5–2 mm long, sagittate at base; pistillode conical, minute. Pistillate flower ovoid to subglobose, shorter than the staminate flower; sepals ca. 3–4 mm × 4 mm, petals as the sepals, or sometimes only slightly smaller; ovary ovoid to spherical, to 1.5 mm × 2 mm; stigma distinctly 3-lobed; staminodes indistinct. Inflorescence pendulous, branches densely covered with fruits. Fruit ripening brick-red, oblong to oblong-ovoid or ovoid-ellipsoid, ca. (2) 2.4–3 × 1–1.5 (1.8) cm, beaked, tipped with a prominent 3-lobed stigma to 2 mm high, the lobes erect; epicarp often drying with shallow dimples. Seed broadly ovoid, ca. 10–15 mm × 7–9 mm, acuminate to spinescent at tip, base rounded-truncate, shallowly concave-intruded.

Distribution and Habitat. S. Thailand, Malay Peninsula, Singapore, Sumatra, Bangka, and Borneo; along the landward edge of mangrove or in dense humid Dipterocarp forest on hillslopes or river valleys, also in heath forest on sandstone or granitic sand, to ca. 1,100 m alt.

Vernacular Names. *Kache* (Thailand); *Rasau*, *Pinang horaiung* (Borneo); *Keredan*, *Pinang muring* (Malay Peninsula); *Pinang unoo* (Singapore); *Kajoe djambe* (Sumatra).

Specimens Examined. S. THAILAND: Pato: Langsuan, 100 m alt., fr., *Kerr 12122* (BM, K); Ranawang: Lam Lieng, 50 m alt., fr., *Kerr 11727* (K), Ja-un, 150 m alt., fr., *Kerr 16483* (BM, K), Muang Len, 150 m alt., fl., *Hansen & Smitinand 11944* (L); Terutao: Satul, fl., *Kerr 14227* (BM, K).—MALAY PENINSULA: Langkawi Is.: Burau, fl. and fr., *Robinson 6264* (K); Kelantan: Sungei Ketch, fr., *Md. Nur SFN 12001* (K); Perak: Larut, fl. and fr., *Kunstler 4022* (Type of *N. wendlandiana* Scheff. var. *malaccensis* Becc.; Isotypes BM, K, L), Gopeng, G. Cantek, fr., *Furtado SFN 33084* (BH, K, L).—Locality unknown, fl., *Scortechini s.n.* (Type of *N. wendlandiana* Scheff. var. *malaccensis* Becc. forma *hexapetala* Becc.; Holotype FI); Pahang, Temerloh, Kemansul Forest Reserve, fl., *Hamid 10580* (K) Selangor: Klang, Bt. Canggang, fl. and fr., *Md. Nur SFN 33998* (BM, K), Ulu Gombak, fl. and fr., *Ridley s.n.* (K), Lampang Mines, fr., *Ridley 15880* (K); Negri Sembilan: G. Angsi, fr., *Md. Nur SFN 11707* (K); Johore: between G. Blumut and G. Bacya, fl., *Holtum SFN 10843* (K), Telerau, Bunei, fl., *Ridley 13236* (BM, K), Mersing, Jemeluang Forest Reserve, 100 m alt., fr., *Dransfield 895* (K) fr., *Moore & Pennington 9053, 9056, 9071* (BH), Kluang Forest Reserve, ster., *Tan Ah King 16, 17* (K); Locality unknown, fr., *Furtado s.n.* (BH).—SINGAPORE: Selatar: Nee Soon area, fl. and fr., *Maxwell 77–80* (L), fr., *Ridley 3164* (BM, K);

Jurong: fr., *Corner SFN 26101* (BH, BM, K); Chenchu Kang: fl., *Corporal 3162* (BM), fl., *Ridley s.n.* (BM); Mandai Rd: fr., *Sinclair s.n.* (K).—SUMATRA: Langkat: Bohorok, Bt. Lawang, 450 m alt., fr., *Dransfield 3147* (K, L); Sigamata: near Rantau Parapat, fl., *Toroos 3244* (L); Payakumbuh: Taram, 500–1,000 m alt., fl. and fr., *Meijer 6880*, *6972* (L), fl., *Meijer 7010* (L); Padang: Sungei Bulu, fl. and fr., *Beccari PS942* (Type of *N. intermedia*, Holotype FI; Iso-types BM, K); Jambi: Sungei Penuh, Tapan, 700 m alt., fl., *Dransfield & Mogeia 4130* (L); Palembang: Bt. Seburong, Negeri Batin, Muara Dua, 250 m alt., fl. *Dransfield & Saerudin 2438* (L), Locality unknown, fr., *Kostermans 12081* (L); Bengkulu: Kepahiang, 700 m alt., fl. and fr., *Dransfield 3571* (K, L), *3572* (L); Kerang Berak: S. Sumatra Ist Nature Reserve, 100 m alt., fl. and fr., *Dransfield 1256* (L); Localities unknown: *Korthals? 16* (Lectotype of *Pinanga nenga* Bl. var. *pachystachya*, L), *Korthals s.n.* (L) (fragments of inflorescence only); ster., *Blume s.n.* (*Herb. Ludg. Bat. 335–336*) (L).—BANGKA IS: Lobok Besar: G. Padding, fr., *Kosterman & Anta 913* (L).—BORNEO: Sabah: Semporna Mapat Reserve, Timbun Mata F.R., fl. and fr., *Puasa BNB For. Dept. 7412* (K); Sepilok, Kabili, Bakarit, fr., *Agama BNB For. Dept. 7265* (L); Keningau, 100 m alt., fl., *Dransfield 5517* (K); Elphinstone Prov., near Tawau, fr., *Elmer 21256* (BM, K); Sarawak: Niah, G. Subis, fl. and fr., *Mohidin S21628* (K); 1st Division, Lundu District, G. Pueh Forest Reserve, near Bahuching, fr., *James et al. S34611* (BH); 4th Division, Ulu Koyan, Mt. Dulit, 800 m alt., fl., *Richards 2020* (K); 5th Division, Lawas, Ulu Sungei Masia, Kota F.R., 1,100 m alt., fl. and fr., *Tong & Jugah S32923* (BH); Baleh, Ulu Mujong, 950 m alt., fl., *Ashton S13996* (BH, K); Kalimantan Selatan: Barabai, Pergunungan Meratus, 800 m alt., fl., *Dransfield 2829* (L); Locality unknown: fl., *Low s.n.* (K).—

CULTIVATED: Singapore Bot. Gard., fr., *Flippance s.n.* (K).

The two varieties in *N. pumila* may be keyed out as follows:

- Fruit usually smaller, ca. 1.8–2.0 × 0.8–1.0 cm, ripening orange-brown, tipped by a circular cushion-shaped stigma, mature pericarp drying with longitudinal ridges; seed often narrower, ca. 5–7 mm wide, oblong or narrowly ovoid, abruptly acute to acuminate at tip.
.....*N. pumila* var. *pumila*.
- Fruit usually larger, ca. (2.0) 2.4–3 × 1.0–1.5 (1.8) cm, ripening brick-red, tipped by a conical, prominently trilobed stigma, mature pericarp drying with broad shallow dimples; seed often broader, ca. 7–9 mm wide, broadly ovoid, acuminate to spinescent at tip.
.....*N. pumila* var. *pachystachya*.

Notes: *Nenga pumila* var. *pachystachya* is the most widespread of the taxa in the genus; until recently it was regarded as inseparable from the typical variety from West Java.

N. schefferiana is here reduced to synonymy under the variety. Figures of flowers, fruit and seed (based on the type of *N. schefferiana* collected by Scheffer) mounted on a herbarium sheet at Kew show staminate flowers with extremely long sepals. A specimen in Leiden (? *Korthals Sumatra No. 16*) also cited by Beccari (1885) in the original publication of *N. schefferiana*, containing only a fragment of an inflorescence branch, likewise has staminate flowers with immensely long sepals. This is apparently only a size difference; similar specimens have never been collected again. Moore (1963) had earlier hinted that *N. schefferiana* might be no more than a variety of *N. pumila*. *N. intermedia* was based on a collection by Beccari himself from Sungei Bulu near Padang (*Beccari PS 942*) with leaves having very short petioles. To this species Beccari (1885) also referred a collection from Ching Forest in Malacca, Malay Peninsula, earlier described by Griffith (1845) as *Areca (Anacclasmus) pumila*, also with a short petiole. Griffith's species was later cited by Beccari (1889) as a synonym of

N. wendlandiana var. *malaccensis*, but Beccari preferred to maintain *N. intermedia* from Sumatra as a distinct species. More recent collections have, however, revealed much overlapping in variation between the Malayan and Sumatran populations. Ridley (1907) had much earlier recognized this by reducing *N. intermedia* to synonymy under *N. wendlandiana*.

Beccari (1889) described *N. wendlandiana* var. *malaccensis* forma *hexapetala* based on a single collection (*Scortechini s.n.*) from Perak with staminate flowers having 6 petals in two series. This must be considered as a monstrosity. The material from South Thailand and Borneo represent the first published records of the genus in these areas. *N. pumila* var. *pachystachya* does not appear to me sufficiently disjunct in reproductive characters to justify its separation as a distinct species from *N. pumila*.

2. **Nenga banaensis** (Magalon) Burret in Notizbl. Bot. Gart. Mus. Berlin-Dahlem 13: 347 (1936).

Pinanga banaensis Magalon, Contrib. Etude. Palm. Indochine. Franc. 149 (1930) and in Feddes Rept 28: 112 (1930). Type: Indo-China, Tourane, Mt. Bana, *Magalon s.n.* (Holotype P).

Areca banaensis (Magalon) Burret in Notizbl. Bot. Gart. Mus. Berlin-Dahlem 13: 198 (1936).

Nenga nannospadix (Burret) Burret in Notizbl. Bot. Gart. Mus. Berlin-Dahlem 13: 347 (1936)—**synon. nov.**

Pinanga nannospadix Burret in Feddes Rept. 32: 116 (1933). Type: Indo-China, Annam, Mt. Bani, *J. & M. S. Clemens 4398* (Isotype K).

Areca microspadix Burret in Notizbl. Bot. Gart. Mus. Berlin-Dahlem 13: 198 (1936).

Solitary, slender palm, with stem to ca. 3 m long, 3.5 cm diam. Crownshaft elongate, cylindrical, slightly robust. Leaves spreading in crown; leaf sheath ca. 15-

20 × 3-4 cm, green; petiole ca. 20-30 × 1 cm. Leaflets often drying dark greyish-green to greenish-brown; basal leaflets narrow, 1-2 costate, ca. 23-37 × (0.6) 1.0-2 (2.3) cm, long-acuminate; middle leaflets 2-3 costate, ca. 30-40 × 2.5-5 cm, long-acuminate; terminal leaflet pair 2-6 costate, ca. 21-35 × 1.7-5.5 cm, acuminate or slightly toothed at apex. Inflorescence infrafoliar, pendulous; prophyll ensiform or lanceolate, ca. 10 × 3.5-4.0 cm, caducous; peduncle short, ca. 1.0-1.5 × 8 mm, flattened, glabrous; peduncular bract triangular or ovate, to ca. 6 mm long, membranous; rachillae 4-6, ca. 5-20 cm long, to 5 mm thick, glabrous, each subtended by a triangular, membranous bract to 2 × 4 mm. Staminate flower triangular, asymmetric; sepals equal or subequal, subulate, dorsally carinate, ca. 4-7 mm long; petals broadly elliptic, obtuse at tip, equal to sepals; filament short, ca. 0.5-1.0 mm long, anthers erect to ca. 1.5 mm long, slightly cordate-sagittate at base; pistillode indistinct. Pistillate flower globose to subglobose, slightly shorter than the staminate flower; sepals ca. 3-5 × 3-4 mm, petals as the sepals, sometimes smaller; ovary subglobose, ca. 1.5 × 1 mm; stigma obscurely 3-lobed; staminodes indistinct. Infructescence pendulous, the branches often with rather short dead tips. Immature fruit oblong-ellipsoid, ca. 10 × 5-6 mm, tipped with a prominent 3-lobed stigma; endocarp apparently smooth. Seed not known.

Distribution and Habitat. Indo-China; in humid forest on granitic soil. Endemic.

Vernacular Name. *Cay cau rung*.

Specimens Examined. INDO-CHINA: Tourane: Mt. Bana, fl. and fr., *Magalon s.n.* (Holotype P); Mt. Bani, fl. and fr., *J. & M. S. Clemens 4398* (Type of *N. nannospadix* (Burret) Burret; Isotype K); Locality unknown: fl., *Polaine 7246* (K).

Notes. This species is still incompletely known; mature fruits and seeds have never been collected. The specimens representing this species in the herbarium contain

only juvenile fruits. The species referred to as *N. nannospadix* (first described in *Pinanga*) for the short inflorescence (only 4.5 cm long) fits quite well within the range of variation of *N. banaensis*. The isotype of *N. nannospadix* (J. & M. S. Clemens 4398) at Kew has a rachilla reaching approximately 13 cm long, very much longer than as originally described by Burret (1933). Inflorescence length in this species is variable. The holotype of *N. banaensis* (*Magalon s.n.*), for example, also has two inflorescences with rachillae reaching only 6–7 cm long. The holotype of *N. banaensis* was not seen by Burret as he had indicated (Burret 1936a, 1936b). The type specimens of both *N. banaensis* and *N. nannospadix*, moreover, were collected from about the same area near Tourane on granitic soil. There is so much overlap in variation between the two taxa that I have no doubt that they are conspecific.

3. ***Nenga macrocarpa*** Scort. ex Becc. in *Malesia* 3: 180 (1889); Becc. & Hook. f. in *Hook. f., Fl. Br. India* 6: 42 (1892); Ridley, *Mat. Fl. Mal. Pen.* 2: 145 (1907) and *Fl. Mal. Pen.* 5: 12 (1925); Whitmore, *Palms Mal.* 79 (1973) (excl. Figs. 66 and 68a). Lectotype: Malay Peninsula, Perak, Maxwell's Hill, *Scortechini 547a* (chosen by H. E. Moore, Jr. in annot. FI).

Solitary, robust palm. Stem ca. 2–6 m long, 4–6 cm diam.; internodes to ca. 15 cm long, smooth, green to greenish-brown. Crownshaft elongate, cylindrical or slightly angular, to ca. 60 cm long, often swollen. Leaves to 7 in crown; leaf sheath ca. 20–45 cm long, pale green with dull purplish-brown specks; petiole ca. 10–55 × 1.5 cm. Leaflets to 30 on each side of the rachis, drying brown; basal leaflets narrowly linear-acuminate, 1 costate, ca. 30–40 × 0.7–1.3 cm; middle leaflets 2–3 (5) costate, ca. 30–65 × 1–3 (5) cm, long-acuminate; terminal leaflet pair 2–4 (6)

costate, ca. 25–40 × 1–3 (4) cm, long-acuminate or slightly toothed at tips, the pair sometimes joined to 9 cm at the base along the rachis. Inflorescence infrafoliar, subpendulous to pendulous; prophyll ensiform or lanceolate, ca. 20–30 × (3.5) 4–5 cm, slightly purplish, drying brown, caducous; peduncle ca. (1.5) 2–3 (3.5) × 1–1.8 cm, flattened, glabrous; peduncular bract narrowly triangular, to ca. 3.5 cm long, 8 mm wide at the base, membranous; rachillae 3–4, rarely to 5, ca. 25–45 cm long, to 8 mm thick, glabrous, each subtended by a membranous, triangular bract to 5 × 5 mm. Staminate flower triangular, asymmetric, flexuous; sepals equal or subequal, subulate, acutely and dorsally carinate, flexuous, ca. 6–13 mm long; petals elliptic to elliptic-lanceolate, acuminate, equal or subequal to the sepals; filaments ca. 2 mm long; anthers erect, linear, ca. 3–4 mm long, sagittate at base; pistillode of 2–3 tubercles. Pistillate flower shorter than the staminate flower; sepals ca. 4–6 × 5–6 mm, petals as the sepals, often smaller, ca. 4 × 3–4 mm; ovary ovoid to subglobose, to 3 × 2 mm; stigma distinctly 3-lobed; staminodes of 6 minute teeth. Infructescence pendulous. Fruit ripening purplish-black, ellipsoid, ca. 3–4 (4.5) × 1.3–1.7 cm, prominently beaked, tipped with a distinct 3-lobed stigma to 3 mm high, the lobes erect; epicarp often drying with longitudinal ridges; the inner apical part usually with a distinct cylindrical or conical, corky solid tissue. Seed broadly ovoid, ca. (1.2) 1.5–1.6 (1.8) × (0.7) 1–1.2 cm, abruptly spinescent at tip; base truncate, shallowly concave.

Distribution and Habitat. S. Thailand and Malay Peninsula; in dense humid forest; ca. 150–1,300 m alt., more widespread in the Malay Peninsula where it is common at higher altitudes.

Specimens Examined. S. THAILAND: Koh Gah: fr., *Kloss 6589* (K); Labu Mine, near Banang Sta., 400 m alt., fl., *Whitmore 3123* (K).—MALAY PENINSULA: Kedah: Baling, Ayer Terjun Valley, fr.,



1. *Nenga grandiflora*, habit, G. Blumut, Johore, May 1968. Photo by J. Dransfield.

Furtado SFN 33048 (BH, K, L), G. Hang, 760 m alt., fl., *Furtado SFN 35024* (BH); Perak: Maxwell's Hill, 1,000–1,300 m alt., fl. and fr., *Scortechini 547a* (Lectotype FI), fl. and fr., *Scortechini 302b* (Paratype FI), ca. 975 m alt., fr., *Burkill & Haniff 12790* (K), Gopeng, fl. and fr., *Dr. King's Coll. 4775* (BM, K), G. Batu Putih, ca. 1035 m alt., fl. and fr., *Wray 930* (K), G. Kerbau, ca. 1,050 m alt., fr., *Robinson s.n.* (K), G. Bintang Hijau, fl., *Dransfield 5386* (K), Semangko, fr., *Ridley 14715* (BM); Pahang: Bentong, ca. 580 m alt., fl., *Furtado SFN 33110* (K); Kemaman: Ulu Bendong, ca. 150 m alt., fl., *Corner SFN 30065* (K); Selangor: G. Bunga Buah, ca. 850 m alt., fl. and fr., *Whitmore FRI 0322* (BH, L), Ulu Langat, Menuang Gasing, fl., *Kloss s.n.* (K); Negri Sembilan: G. Tampin, fl., *Ridley s.n.* (K), ca. 400 m alt., fl., *Burkill SFN 2849* (K).

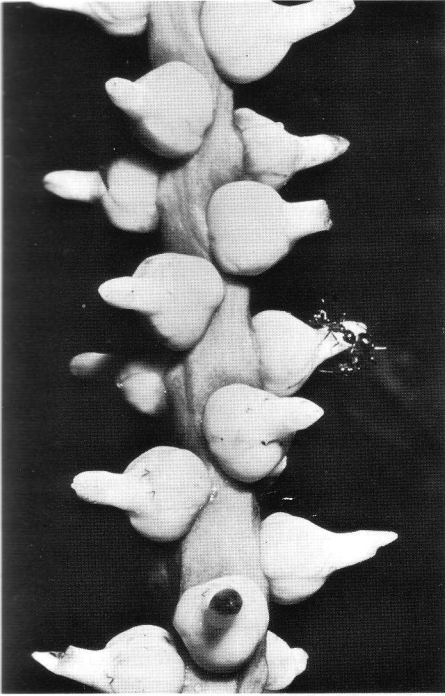
Notes. This species is apparently a strictly solitary palm, although it has



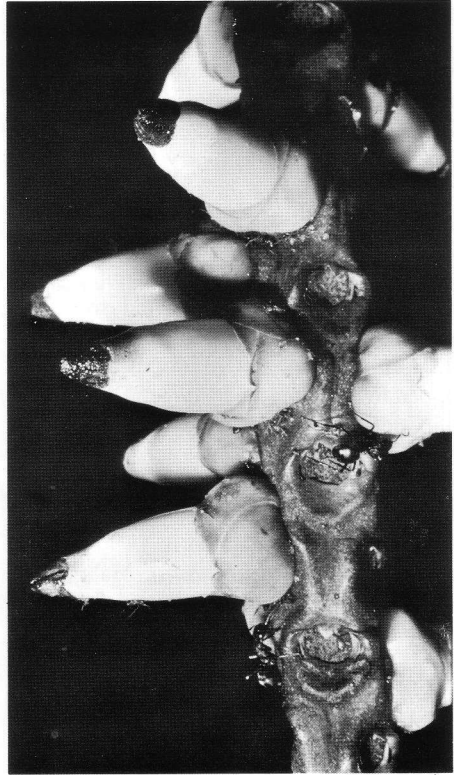
2. *Nenga grandiflora*, staminate and pistillate flowers in bud, G. Panti, Johore, June 1977. Photo by J. Dransfield.

sometimes been erroneously reported as occurring in clumps. *Nenga macrocarpa* is easily distinguished by its staminate flowers with equal or subequal perianth parts, and its large ellipsoid fruits which are prominently beaked and tipped by a distinct 3-lobed stigma.

4. *Nenga grandiflora* E. Fernando, **sp. nov.**; *N. macrocarpa* affinis, sed floribus masculis majoribus, fructu ovoideo, obclavato vel obpyriformi, valde longirostrato, inflorescentia duas rachillas semper ferenti differt. Typus: Malay Peninsula, Johore, Kota Tinggi, Panti East, 400 m alt., fl. et fr.,



3. *Nenga grandiflora*, details of pistillate flowers at anthesis with ant collecting nectar, G. Pantti, Johore. June 1977. Photo by J. Dransfield.



4. *Nenga grandiflora*, young fruit, G. Pantti, Johore, June 1977. Photo by J. Dransfield.

Dransfield & Fong 5048 (Holotypus K; Isotypi KEP, L).

Solitary, robust palm. Stem ca. 2 m long, 8 cm diam.; internodes to 5 cm, brown. Crownshaft elongate, cylindrical, to 75 cm long, very swollen. Leaves 7-8 in crown, leaf sheath ca. 30-60 cm long, dull green to slightly purplish; petiole ca. 32-54 × 1.6 cm, slightly yellowish-orange, rachis angular, rather sharp along the edges. Leaflets to ca. 30 on each side of the rachis, drying light brown; basal leaflets 1-2 costate, ca. 25-42 × 0.8-1.2 cm, long-acuminate; middle leaflets 3-4 costate, ca. 40-82 × 5-6.5 cm, long-acuminate; terminal leaflet pair 3-6 costate, ca. 30-56 × 3-5.5 cm, acuminate or slightly toothed at tips, the pair sometimes joined to 10 cm at the base along

the rachis. Inflorescence infrafoliar, pendulous; prophyll ensiform or lanceolate, ca. 28 × 2.7 cm, drying brown, caducous; peduncle ca. 1.7-4 × 0.8-1.5 cm, flattened, glabrous; peduncular bract triangular, to ca. 5 mm long, 4 mm at the base, membranous; rachillae always 2, ca. 24-30 cm long, 7-10 mm thick near the base, glabrous, each rachilla subtended by a membranous, triangular bract to ca. 5 mm long. Staminate flower triangular, trigonous, asymmetric, slightly flexuous; sepals equal or subequal, subulate, acutely and dorsally carinate, flexuous, ca. 1.3-1.6 cm long, to 3 mm wide; petals elliptic or elliptic-lanceolate, acute to acuminate at tips, equal or slightly subequal to the sepals; filaments ca. 2-2.5 mm long;

anthers erect, linear, ca. 6–7 mm long, deeply sagittate at the base; pistillode conical, minute. Pistillate flower shorter than the staminate flower; sepals ca. 5–8 × 5–7 mm, petals as the sepals, slightly smaller, ca. 4–6 × 4–5 mm; ovary broadly ovoid or subglobose, to 3 × 3 mm; stigma distinctly 3-lobed; staminodes of 6 minute teeth. Infructescence pendulous, densely covered with fruits. Fruit ripening deep red then purplish-black, ovoid to obclavate or obpyriform, ca. 3.8–5.4 × 1.5–2.0 cm, prominently long-beaked and tipped by a stigma 5–7 mm long, the upper half deeply 3-lobed; epicarp drying with longitudinal ridges; seed narrowly ovoid, ca. 2.3 × 1.2 cm, acute to acuminate or shortly spinescent at tip; base truncate, slightly concave intruded.

Distribution and Habitat. Malay Peninsula (Johore); in dense humid forest on steep rocky hillslopes or river valley bottoms; ca. 180–500 m alt. Endemic.

Specimens Examined. MALAY PENINSULA: Johore: Kota Tinggi, Panti East, 400 m alt., fl. and fr., *Dransfield & Fong 5048* (Holotype K; Isotypes KEP, L), G. Blumut, below Camp 2, ca. 500 m alt., fr., *Dransfield 841* (K), Sungei Kayu, fr., *Corner & Furtado SFN 29482b* (K), Kluang, Lenggor Forest Reserve, ca. 180 m alt., fr., *Dransfield 810* (BH), Mersing Forest Reserve, fl. and fr., *Moore & Pennington 9061* (BH).

Notes. This species is very distinctive in its very large staminate flowers, the consistently 2-branched inflorescence, and the prominently long-beaked, ovoid to obclavate or obpyriform fruit tipped with a distinctly long, 3-lobed stigma. It is most closely related to *N. macrocarpa* in vegetative features, as well as in the staminate flowers with equal or subequal perianth parts. *N. macrocarpa* is, however, easily distinguished from *N. grandiflora* by its inflorescence with often 3–4 rachillae, the much smaller staminate flowers, and the more ellipsoid fruits. Figures 66

and 68a in Whitmore's 'Palms of Malaya' (1973: 80) labelled as *N. macrocarpa* belong to this new species.

5. **Nenga gajah** Dransf. in *Principes* 19: 27 (1975). Type: Sumatra, Bengkulu, Kepahiang, Cagar Alam, near Curup, *Dransfield 1234* (Holotype BO; Isotypes K, L).

Solitary, stem stout, stilt-rooted, to 2 m long, 15 cm diam.; internodes short, to 1 cm long, greyish-brown. Crownshaft not well-defined. Leaves 8–10 in crown, leaf sheath ca. 50–60 cm long, pale yellowish-green, not falling off but rotting on the stem; petiole ca. 50–75 × 2.5 cm, circular in cross-section, with sparse dark brown indumentum; rachis to 8 mm thick. Leaflets ca. 8–27 on each side of the rachis, drying dull greyish-brown; basal leaflet 1 costate, ca. 34 × 1 cm, long-acuminate; middle leaflets 3–6 costate, ca. 32 × 4.5–8.0 cm, long-acuminate; terminal leaflet pair 3–5 costate, to ca. 32 × 3–4 cm, acuminate or bifid to slightly toothed at tips, the pair joined to ca. 4 cm at the base along the rachis. Inflorescence interfoliar, erect; prophyll ensiform, ca. 25–35 × 4 cm, coriaceous or woody and fibrous, hard, covered with scurfy brown indumentum especially along the margins, long-persisting through anthesis; peduncle ca. 22–30 × 1 cm, flattened, covered with sparse brown hairs; peduncular bract triangular ca. 6 mm long, thick and stiff; rachillae 3–5, ca. 10–12 cm long, 5–8 mm thick, each rachilla subtended by a short, thick, stiff, triangular bract to 5 × 5 mm; the lower 2–4 rachillae all staminate, the terminal or apical rachilla staminate and pistillate, or rarely all staminate only. Staminate flowers arranged in 5–7 vertical rows, or in tight spirals, angular, oblong; sepals minute, triangular, oblong-ovate or broadly ovate, slightly concave, to 1 mm long, often shorter; petals oblong to slightly obovate, unequal, ca. 4.5–5 × 2–2.5 mm,

rounded-truncate or cucullate at apex, rather thick, the inner surface marked with impressions of stamens; filaments to 1 mm long; anthers erect, linear-oblong, ca. 2–2.5 mm long, deeply sagittate at the base; pistillode indistinct. Pistillate flower with sepals to 7 × 6 mm, coriaceous, persistent; petals as the sepals; ovary spherical, to 3 × 4 mm; stigma obscurely 3-lobed; staminodes 6, minute, triangular, to 0.5 mm long. Infructescence pendulous, a single club-like head of fruits. Fruit ripening dark purplish-brown, fusiform, ca. 5–8 × 1.5–2.5 cm, beaked, tipped by a short blunt stigma; epicarp drying with few longitudinal ridges. Seed narrowly ovoid to fusiform, to ca. 4.5 × 1.8 cm, acute to acuminate at tip, base rounded to obtuse.

Distribution and Habitat. Sumatra; in hill Dipterocarp forest on hillslopes, valley bottoms, and streamsides; ca. 800 m alt. Endemic.

Vernacular Name. Pinang gajah.

Specimens Examined. SUMATRA: Bengkulu: Kepahiang, Cagar Alam, near Curup, 800 m alt., fl. and fr., *Dransfield 1234* (Holotype BO; Isotypes K, L), G. Pagar, 850 m alt., fl. and fr., *Dransfield 3625* (K, L). (*Dransfield* (1975) also cites *Bunnemeijer 295, 296, 417, 1013a* (BO) from the N.E. slopes of G. Talakmau, Bukittinggi).

Notes. This species differs from all other species of *Nenga* in its interfoliar, erect inflorescence with a long peduncle, and bearing a persistent, coriaceous, woody prophyll, the club-like head of fruits, and the structure of the male flowers with minute sepals. This species possesses many aberrant characters; however, despite the peculiar nature of this taxon, it seems to fit more reasonably in *Nenga* than in any other closely related genus. The laterally attached ovule, the spirally arranged triads near the proximal end of the rachilla, and the distal terminal portion being entirely of staminate flowers are distinctive features of *Nenga* (see *Dransfield* 1975).

EXCLUDED SPECIES

- Nenga affinis* Becc. in *Malesia* 1: 29 (1877); H. A. Wendl. in *Kerch.*, *Palm.* 251 (1878) = ***Nengella affinis*** (Becc.) Burret in *Notizbl. Bot. Gart. Mus. Berlin-Dahlem* 13: 316 (1936).
- Nenga calophylla* Lauterb. & K. Schum., *Fl. Deutsch. Sudsee* 208 (1900) = ***Nenga calophylla*** (Lauterb. & K. Schum.) Becc. in *Engl. Bot. Jahrb.* 52: 27 (1914).
- Nenga geelvinkiana* Becc. in *Malesia* 1: 28 (1877); H. A. Wendl. in *Kerch.*, *Palm.* 251 (1878) = ***Hydiastele geelvinkiana*** (Becc.) Burret in *Notizbl. Bot. Gart. Mus. Berlin-Dahlem* 13: 484 (1937).
- Nenga gracilis* (Roxb.) Becc. in *Malesia* 1: 28 (1877); H. A. Wendl. in *Kerch.*, *Palm.* 251 (1878) = ***Pinanga gracilis*** (Roxb.) Bl. in *Rumphia* 2: 77 (1839).
- Nenga latisecta* (Bl.) Scheff. in *Ann. Jard. Bot. Buitenz.* 1: 20 (1876); Becc. in *Malesia* 1: 25 (1877) = ***Pinanga latisecta*** Bl. in *Rumphia* 2: 79 (1839).
- Nenga nagensis* (Griff.) Scheff. in *Ann. Jard. Bot. Buitenz.* 1: 120 (1876); Becc. in *Malesia* 1: 25 (1877) = ***Areca triandra*** Roxb. ex Buch.-Ham. in *Mem. Werner. Nat. Hist. Soc.* 5: 310 (1826).
- Nenga novo-hibernica* Lauterb. in *Engl. Bot. Jahrb.* 45: 357 (1911) = ***Areca novohibernica*** (Lauterb.) Becc. in *Engl. Bot. Jahrb.* 52: 23 (1914).
- Nenga pinangoides* Becc. in *Malesia* 1: 28 (1877); H. A. Wendl. in *Kerch.*, *Palm.* 251 (1878) = ***Nengella pinangoides*** (Becc.) Burret in *Notizbl. Bot. Gart. Mus. Berlin-Dahlem* 13: 314 (1936).
- Nenga selebica* Becc. in *Malesia* 1: 30 (1877); H. A. Wendl. in *Kerch.*, *Palm.* 251 (1878) = ***Gronophyllum selebicum*** (Becc.) Becc. in *Ann. Jard. Bot. Buitenz.* 2: 82 (1885).
- Nenga variabilis* Becc. in *Malesia* 1: 26 (1877); H. A. Wendl. in *Kerch.*, *Palm.* 252 (1878) = ***Hydiastele variabilis*** (Becc.) Burret in *Notizbl. Bot. Gart. Mus. Berlin-Dahlem* 13: 483 (1937).

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LITERATURE CITED

- BACKER, C. A. AND R. C. BAKHUIZEN VAN DER BRINK. 1968. Flora of Java. Vol. 3. p. 193. Wolters-Noordhoff N.V. Groningen.
- BECCARI, O. 1877. *Palmae Papuanae*. Malesia 1: 17-102.
- . 1885. *Reliquiae Schefferianae*—Illustrazione di alcune palme viventi nel Giardino Botanico di Buitenzorg. Ann. Jard. Bot. Buitenz. 2: 77-171.
- . 1889. *Nuove palme Asiatiche*. Malesia 3: 169-200.
- AND R. E. G. PICI-SERMOLLI. 1955. *Subfamiliae Arecoidearum Palmae Gerontogaeae*. Webbia 11: 1-187.
- BLUME, C. L. 1839. *De quibusdam generibus e tribu Arecinearum*. Rumphia 2: 63-99.
- BURRET, M. 1933. *Palmae gerontogaeae*. II. Feddes Rep. 32: 115-117.
- . 1936a. *Palmae gerontogaeae* V. Notizbl. Bot. Gart. Mus. Berlin-Dahlem 13: 185-200.
- . 1936b. *Palmae gerontogaeae* VI. Notizbl. Bot. Gart. Mus. Berlin-Dahlem 13: 347-348.
- . 1940. *Indomalayische Palmen*. Notizbl. Bot. Gart. Mus. Berlin-Dahlem 15: 164-210.
- DRANSFIELD, J. 1975. A remarkable new *Nenga* from Sumatra. *Principes* 19: 27-35.
- DRUDE, O. 1889. *Palmae*: 109. *Nenga* Wendl. et Dr. In A. Engler and K. Prantl., *Die Natürlichen Pflanzenfamilien*. Vol. 2. No. 3, p. 75. Verlag von Wilhelm Engelmann, Leipzig.
- ESSIG, F. B. and B. E. YOUNG. 1979. A systematic histological study of palm fruits. II. The *Areca* alliance. *Syst. Bot.* 4: 16-27.
- FURTADO, C. X. 1935. *Palmae Malesicae* II. *Nenga wendlandiana* Scheff. or *Nenga pumila* (Mart.) Wendl.? *Gard. Bull. Str. Settl.* 8: 159-163.
- GRIFFITH, W. 1845. The palms of British East India (Subfamilia *Arecinae*). *Calcutta J. Nat. Hist.* 5: 445-491.
- LAUTERBACH, C. 1911. *Beiträge zur flora von Neu-Mecklenburg*. *Engl. Bot. Jahrb.* 45: 354-365.
- MOORE, H. E., JR. 1963. An annotated checklist of cultivated palms. *Principes* 7: 119-182.
- . 1973. The major groups of palms and their distribution. *Gentes Herb.* 11: 27-140.
- RIDLEY, H. N. 1907. *Materials for a Flora of the Malayan Peninsula*. Vol. 2, p. 144-145. Methodist Publ. House, Singapore.
- SCHEFFER, R. H. C. C. 1876. *Sur quelques palmiers du groupe des Arecinees*. *Ann. Jard. Bot. Buitenz.* 1: 103-164.
- WENDLAND, H. 1878. *Index Generalis*. In O. De Kerchove, *Les Palmiers: Histoire Iconographique*. J. Rothschild, Paris.
- AND O. DRUDE. 1875. *Palmae Australasicae*. *Linnaea* 39: 155-238.
- WHITMORE, T. C. 1973. *Palms of Malaya*. 132 p. Oxford Univ. Press, London.