

A TAXONOMIC REVISION OF NEPHELIUM (SAPINDACEAE)

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SUMMARY

In the present revision of *Nephelium* 22 species are recognised, 6 of which are new (1 unnamed). *Nephelium cuspidatum* is subdivided into 6 varieties and 4 subvarieties; *N. lappaceum* comprises 3 varieties. The systematic connections within the genus are unclear.

INTRODUCTION

The present revision of *Nephelium*, like Radlkofer's (1932/33), is primarily or even exclusively based upon fruit- and leaf characters, however uncertain the reliability of these characters may seem at first sight. Starting from a first arrangement into microtaxa characterised by the same leaves and the same fruits and gradually combining those that showed only slight differences, it appeared that some characters were at least practically useful, if not systematically reliable. The most constant characters appeared to be primarily those of the fruit, secondarily leaf characters. Important fruit characters are presence or absence of a dense puberulous indument, and the kind of appendages, especially whether these can be divided into a broadened or swollen basal and a much narrower apical part or not. The main leaf characters are: the way in which the petiolule is grooved above and whether the midrib continues in the groove or not; in connection with this whether the midrib is raised or sunken on the upper side of the leaflet; the reticulation may be very dense or lax, rarely in between; the hairiness of the leaflets; and presence or absence of domatia. Additional characters appeared to be useful in individual taxa but did not play an important part in the genus as a whole.

On the basis of these leaf characters flowering material was gradually and very carefully added to the provisional taxa. As a matter of fact flower characters, and to a lesser degree characters of the inflorescence, turned out to be also reliable, but for identification unpractical because of variability and overlap. The inflorescence, mainly whether truly terminal or with a vegetative terminal bud (called pseudoterminal), might be characteristic, but in the herbarium a still minute vegetative bud is often difficult to recognise as such or may be caducous, and it is often not clear whether the main branch of the inflorescence is monopodial, and accordingly the inflores-

cence terminal, or sympodial, hence the inflorescence pseudoterminal. Moreover, in fruit the upper parts of the inflorescence are mostly broken off. The flower is not of much use either mainly because of the widespread and varied evolution, mainly reduction, in several parts. The coalescence of the calyx may be rather variable; only a few species have a complete and well developed corolla, the petals, when present, are often much reduced, variable in number, and caducous, and in at least 13 out of the 22 species the corolla is, or may be, completely lacking; the disk may be hairy or glabrous, which is variable in several species; the number of stamens is in most species variable; a constantly 1-merous pistil is characteristic for only 1 species (*N. maingayi*), occurs sporadically in a second one (*N. uncinatum*).

Notwithstanding these difficulties, on the basis of all these characters a reasonably acceptable taxonomy could be drafted, with some complexes that may include some separated but allied species, a key could be constructed with the help of which good fruiting material can mostly be identified, and even all but very few collections could be placed.

SYSTEMATICS

Still more difficult than the taxonomy is the systematics of *Nephelium*. The characters of leaf and fruit on which the taxonomy is based seem to be not correlated: hardly distinguishable leaves may occur with very different fruits, and the reverse. Accordingly, it appeared impossible to arrange the majority of the species into more or less coherent groups, if only phenetically. At most one gets the impression that the most variable, widest distributed, and most common species, viz. *N. cuspidatum*, *lappaceum*, and *ramboutan-ake*, form a central group in the genus. Some more species may be somewhere connected with this group, but most species remain isolated.

An approach towards a phylogenetic system was also rather unsuccessful. Actually, there are only four phylogenetic series which seem undisputable, all in the flower. These are: 1) coalescence of the calyx, from free to nearly completely connate sepals; 2) reduction of the corolla from 5 well developed petals to complete absence; 3) reduction of the number of stamens from about 8 to 4; 4) reduction of the pistil from 2(–4)-merous to 1-merous. On the basis of these series the most primitive species are *N. compressum* and *havidandii*; a fairly primitive group of species includes *N. costatum*, *daedaleum*, *hypoleucum*, *laurinum*, *macrophyllum*, *meduseum*, and *melliferum*; a central group is formed by *N. cuspidatum*, *hamulatum*, *juglandifolium*, *lappaceum*, *ramboutan-ake*, and *reticulatum*; rather advanced are *N. melanomiscum* and *subfalcatum*; connected with the latter seems to be *N. uncinatum*, and the highest evolved, that is most reduced flower occurs in *N. maingayi*. However, this is doubtless not one series. Apparently, there are at least three independent series, starting either with coalescence of the calyx, or with reduction of the corolla, or exceptionally with reduction of the number of stamens. Reduction of the pistil starts in *N. uncinatum* and is completed in *N. maingayi*, but even these two species do not seem to be more than distantly allied and they may terminate different series. The number of phylogenetic series, too small in comparison with the number of species, makes a

reasonable cladistic analysis impossible. Summarising, neither a phenetic, nor a phylogenetic subdivision of the genus into subgenera and/or sections seems to have sense either.

Geographically, it strikes that the most primitive species occur in Borneo. However, this may be a relict area rather than a centre of origin or of recent dispersal. As a whole the genus is centered in West Malesia with a few penetrations into continental Asia and the Philippines (and via the latter into East Malesia). This is in good agreement with the nearest allied, probably slightly more primitive genus *Xerospermum*, which occurs slightly farther in continental Asia, but does not occur in the Philippines. The whole alliance, to which also belong the genera *Cubilia*, *Dimocarpus*, *Otonephelium*, *Litchi*, and *Pometia*, seems to be centered in West Malesia and South-east Asia (see Leenhouts, *Blumea* 24, 1978: 396).

The present revision is based upon material from the following herbaria: A, B, BKF, BO, FI, K, KEP, L, M, NY, P, SAN, SING, U, and W. The author is grateful that these collections were put at his disposal, even for a much longer time than originally expected.

NEPHELIUM

Nephelium L., *Mant. Pl.* (1767) 18; Radlk. in Engl., *Pflanzenr.* 98 (1932/33) 950–983. – Type: *N. lappaceum* L.

Nephelium sect. *Macronephelium* Radlk., *Sapind. Holl.-Ind.* (1879) 79, nom. illeg. (I.C.B.N. Art. 22); in Engl., *Pflanzenr.* 98 (1932) 952. – Type: *N. lappaceum* L.

Nephelium sect. *Micronephelium* Radlk., *Sapind. Holl.-Ind.* (1879) 79; in Engl., *Pflanzenr.* 98 (1932) 954. – Syn types: *N. beccarianum*, *compressum*, *costatum*, *daedaleum*, *eripetalum*, *hypoleucum*, *laurinum*, *multinerve*, and *rubescens*.

Nephelium subsect. *Clathronephelium* Radlk., *Sapind. Holl.-Ind.* (1879) 79; in Engl., *Pflanzenr.* 98 (1932) 955. – Syn types: *N. beccarianum*, *compressum*, *daedaleum*, *eripetalum*, and *multinerve*.

Nephelium subsect. *Dictyonophelium* Radlk., *Sapind. Holl.-Ind.* (1879) 79; in Engl., *Pflanzenr.* 98 (1932) 954. – Syn types: *N. costatum*, *hypoleucum*, *laurinum*, and *rubescens*.

Nephelium subsect. *Eudictyonophelium* Radlk., *Sapind. Holl.-Ind.* (1879) 79; in Engl., *Pflanzenr.* 98 (1932) 953. – Syn types: *N. chryseum*, *lappaceum*, and *sufferrugineum*.

Nephelium subsect. *Euclathronephelium* Radlk., *Sapind. Holl.-Ind.* (1879) 79; in Engl., *Pflanzenr.* 98 (1932) 953. – Syn types: *N. juglandifolium*, *mutabile*, and *xanthioides*.

Nephelium sect. *Mesonephelium* Pierre, *Fl. Forest. Cochinch.* (1895) pl. 321. – Type: *N. cochinchinense*.

Medium-sized to tall trees or rarely shrubs. *Indumentum* consisting of solitary simple hairs; glandular scales absent and accordingly not sticky resinous. *Leaves* spirally arranged, paripinnate, (1-foliolate or) 1–5(–18)-jugate, without stipules; neither petiole nor rachis winged. *Leaflets* alternate to more rarely opposite, coriaceous to chartaceous, beneath mostly distinctly glaucous, nearly always hairy above on the midrib, beneath on midrib and nerves, in between the nerves often sparsely to densely minutely sericeous (sometimes only visible with at least 30 × magnification), rarely fully glabrous, domatia often present; base equalsided or sometimes oblique; margin

entire or rarely slightly repandous; nervation open except in *N. subfalcatum*. *Inflorescences* in some species all axillary, in most at least partly pseudoterminal, in some truly terminal, in *N. cuspidatum* also rami- and cauliflorous. Probably mostly dioecious, sometimes monoecious. *Flowers* actinomorphic. *Calyx* (4- or 5- (or 6-)merous (this may even vary in the same inflorescence), sepals free to more than halfway up connate, valvate or sometimes (when the sepals are free or nearly so) slightly imbricate, all equal, not petaloid, out- and inside hairy, outside more sparsely so and with shorter hairs than inside, not ciliate, without glands, entire. *Corolla* either with 5 (rarely 6) well developed petals, or with 4–1 reduced petal(s), or often completely lacking, always shorter than the calyx, if well developed the petals with a bilobed scale without appendages, always clawed, hairy on both sides, entire. *Disk* complete, often slightly lobed, without appendages, hairy or glabrous. *Stamens*: number rather unstable, varying from 4–10, exerted in male flowers, filament rather densely long hairy at least in the basal part, anther attached in the often rather deeply cleft base, nearly always with at least a few hairs, dehiscence latero-introrse lengthwise. *Pistil* always densely hairy and the ovary mostly warty; ovary short-stalked, 2- (sometimes 3- or very rarely 4-) or rarely 1-loculed; style usually well developed; stigmas fairly long, spreading to finally recoiled. *Ovules* 1 per locule, ascending, apotropous, campylotropous, half enveloped by an outgrowth of the placenta. *Fruits* 1-, exceptionally 2-lobed; stipe short to inconspicuous; body ellipsoid to subglobular, at first hairy, mostly soon glabrescent, sometimes remaining densely puberulous, the surface warty to spiny, exceptionally nearly smooth; pericarp thin- to thick-coriaceous or exceptionally corky to nearly woody, inside glabrous, apparently often at least in the apical part finally dehiscing loculicidally longitudinally, either rather irregularly or with two about equal valves. *Seed*: hilum nearly basal; micropylar wart subapical or sometimes apical; sarcotesta covering the whole seed mostly with the exception of the micropylar region or at least perforated in front of the micropyle, sometimes with a collar-like outgrowth around the hilum; inner testa tough or exceptionally rather

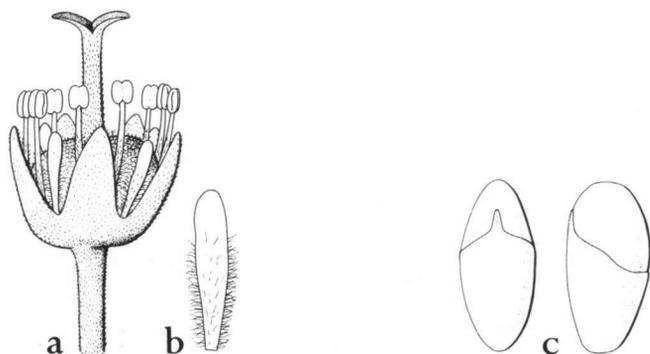


Fig. 1: a & b. *Nephelium laurinum* Blume. a. Female flower, $\times 6$; b. petal from outside, $\times 12$ (both KL 3055). – c. *N. meduseum* Leenh., embryo, natural size (BRUN 3302).

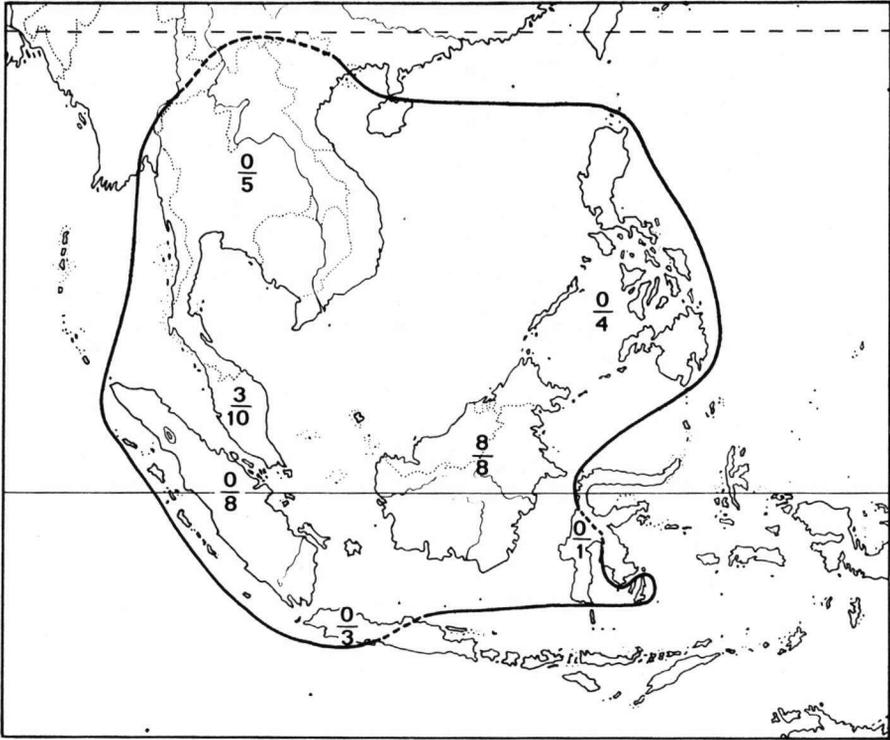


Fig. 2. Distribution of *Nephelium* L. Number of endemics above, number of non-endemics below the hyphen.

hard. *Embryo* varying from erect with the plumule at the micropylar end, equal cotyledons, a straight suture, and plumule and rootlet fully included, to transverse with the plumule lateral, cotyledons often very unequal (hilar one bigger), suture curved to sigmoid, and rootlet notorrhizal (fig. 1c). *Seedling* cryptocotylar, leaves from the first one on paripinnate.

Distribution. 22 species in Southeast Asia and Malesia, from Yunnan and Assam to Hainan and the Moluccas. Fig. 2.

Ecology. Middle storey of rain forests at low to medium altitudes, sometimes in deciduous or savannah forests. The fruits are mainly eaten by monkeys and fruit bats; the fruits of some species seem to be dispersed by water, however.

Uses. The sarcotesta of a few species is eaten, but only *N. lappaceum* is commonly cultivated as a fruit tree, *N. ramboutan-ake* is of more local importance. The timber is hardly of any importance.

Note. Identification is hardly possible without \pm mature fruits. Therefore, under many species differences with other comparable species of the same area have been mentioned.

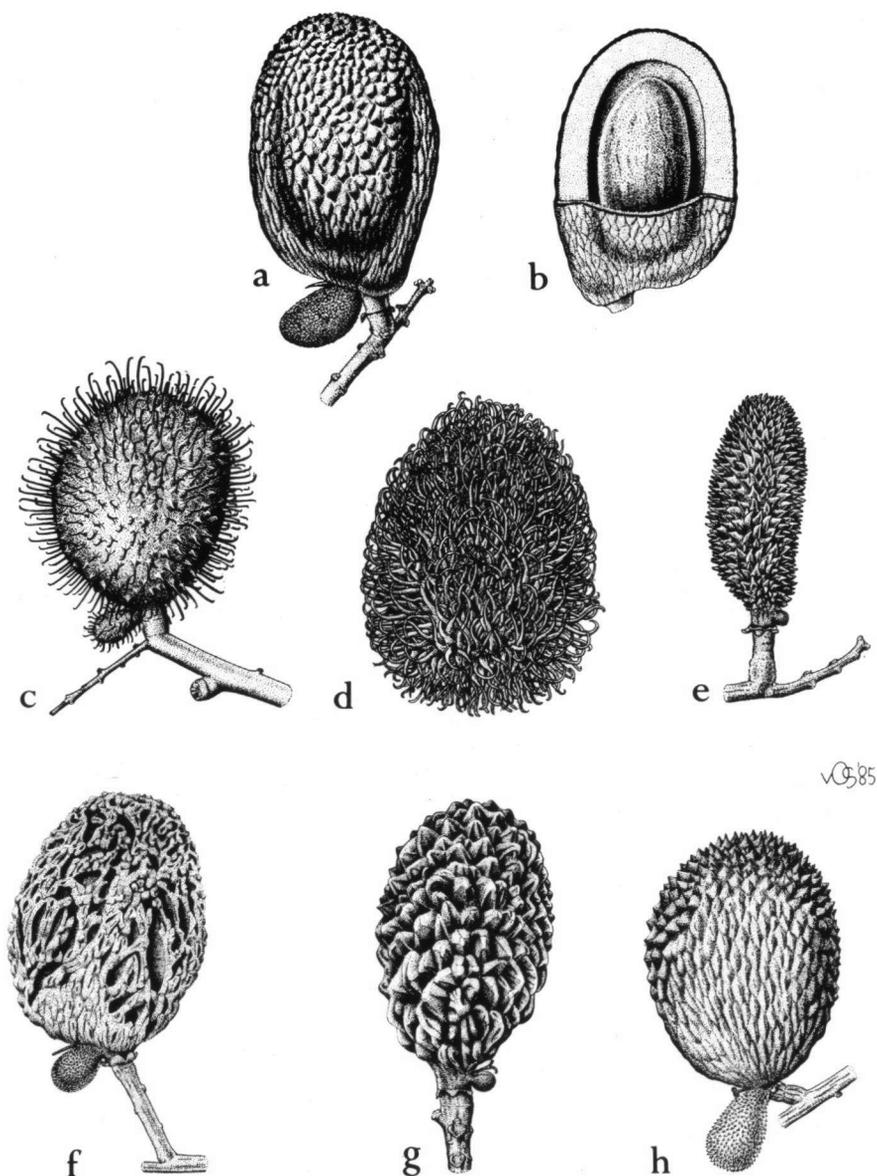


Fig. 3. Different kinds of fruits. – a & b. *Nephelium compressum* Radlk., in b the fruit wall partly removed (Beccari PB 1268). – c. *N. uncinatum* Leenh. (Hotta 12984). – d. *N. meduseum* Leenh. (Sarawak Forest Dept. S 32399). – e. *N. laurinum* Blume, young fruit (Griffith 996). – f. *N. daedaleum* Radlk., dry fruit (NBFD SAN 50490). – g. *N. juglandifolium* Blume (M. Shah s. n. in herb. L sh. nr. 7624). – h. *N. hypoleucum* Kurz (Geesink c. s. 6475). All natural size but for e which is $\times 1.5$.

KEY TO THE SPECIES

- 1 a. Pistil 1-merous 13. *N. maingayi*
 b. Pistil 2(–4)-merous (exceptionally a few flowers may have a 1-merous ovary) 2
- 2 a. Fruit wall hard, corky, 3–6 mm thick, the saccate base and the carina of the fruit solid (fig. 3 a & b) 2. *N. compressum*
 b. Fruit wall coriaceous or eggshell-like, rarely more than 1 mm (up to 7 mm) thick 3
- 3 a. Fruits warty, the warts without a distinct apical appendage (fig. 3 g & h)* 4
 b. Fruits not warty, the appendages usually distinctly divided into a broader or thicker basal and a narrower apical part (fig. 3 c & d) 9
- 4 a. Fruits glabrous 5
 b. At least the upper half of the fruit appendages densely puberulous 8
- 5 a. Leaflets mostly widest at about 1/3 above the base; reticulation on upper side of leaflets dense; fruits aculeate (fig. 3 h) 6
 b. Leaflets widest in or sometimes slightly below the middle; reticulation on upper side of leaflets lax; fruits tuberculate (fig. 3 g) 7
- 6 a. Leaflets not acuminate (fig. 4 a); veins reticulate; domatia mostly present. *Burma, Thailand, Indo-China* 8. *N. hypoleucum*
 b. Leaflets tapering into a long and broad acumen; veins especially on the lower side of the leaflets rather distinctly scalariform; no domatia. *Borneo*
 1. *N. aculeatum*
- 7 a. Leaves up to 7-jugate; leaflets mostly about parallelsided, abruptly rounded to the base, flat when dried; fruits coarsely warted, the warts ± arranged into longitudinal rows (fig. 3 g). *Malaya, Sumatra, Java* 9. *N. juglandifolium*
 b. Leaves 2- or 3-jugate; leaflets with strongly curved sides, tapering to the cuneate base, often curled or rolled up when dried; fruits densely knobby like a small *Pandanus* fruit head, the knobs not confluent. *Borneo*
 An unusual form of 18. *N. ramboutan-ake*
- 8 a. Leaf axes densely tomentellous, sometimes glabrescent; leaflets above originally hairy all over, soon glabrescent, sometimes the midrib excepted, beneath tomentose on midrib and nerves, densely sericeous in between; calyx 3 mm high 5. *N. daedaleum*
 b. Leaf axes sparsely puberulous to glabrous; leaflets above glabrous, beneath all over sparsely sericeous, sometimes glabrescent; calyx up to 1.75 mm high 15. *N. melanomiscum*
- 9 a. Fruits (sub)glabrous, exceptionally with a hair tuft on top of the appendages 10
 b. Fruit appendages all over distinctly puberulous 20
- 10 a. Domatia present 11
 b. Domatia absent 16
- 11 a. Reticulation on the upper side of the leaflets dense 12
 b. Reticulation on the upper side of the leaflets lax 14

* In a few cases this character may be difficult. In case of doubt try both ways.

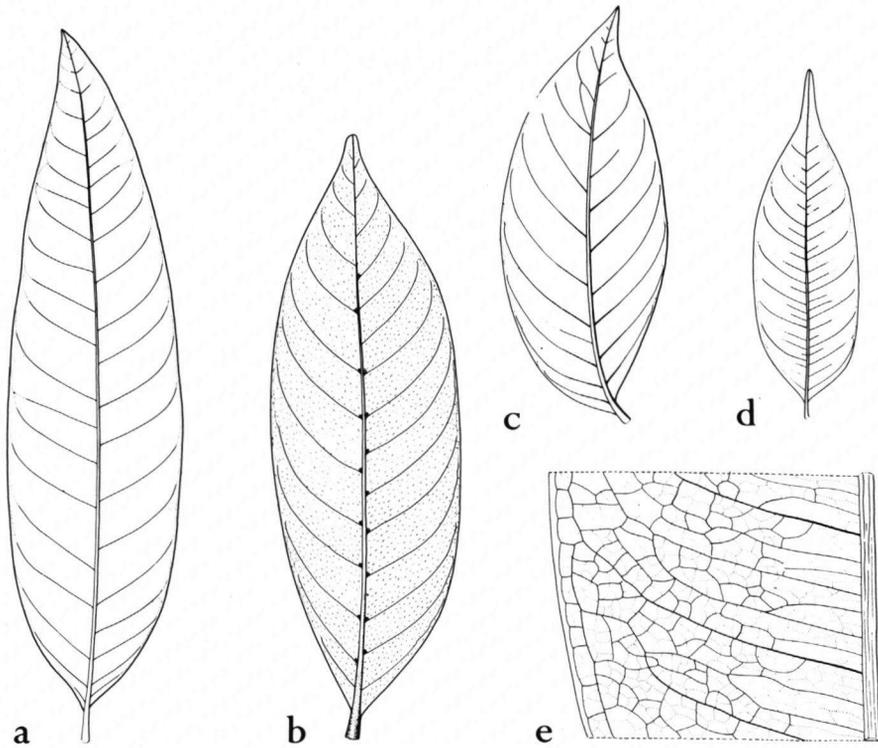


Fig. 4. Leaflets. — a. *Nephelium hypoleucum* Kurz (Dickason 6802), $\times 0.5$. — b. *N. uncinatum* Leenh., lower side, showing the indument and the domatia (Meijer 38905), natural size. — c. *N. macrophyllum* Radlk. (Sarawak For. Dept. S 25393), $\times 0.5$. — d & e. *N. subfalcatum* Radlk. (NBF SAN 15153), leaflet $\times 0.5$, detail of nervature $\times 2.5$.

- 21 a. Leaflets beneath densely tomentose on and along midrib and nerves, distinctly densely to moderately densely sericeous in between 6. *N. hamulatum**
- b. Leaflets beneath glabrous or nearly so 22
- 22 a. Veins and veinlets on both sides of the leaflets conspicuously rather laxly reticulate; leaflets drying green 19. *N. reticulatum*
- b. Veins and veinlets densely reticulate, above not very conspicuous, beneath inconspicuous; leaflets drying brown 23
- 23 a. Twigs and leaf axes glabrous; domatia mostly present; fruit appendages filiform, c. 7 mm long, sparsely puberulous. *Malaya* 3. *N. costatum*

* Compare also *N. daedaleum* if the fruit appendages are only doubtfully divided into a basal and an apical part.

- b. Twigs and leaf axes hairy, glabrescent; domatia absent; fruit appendages filiform, c. 15 mm long, densely puberulous (fig. 3 d). *Borneo*. 14. *N. meduseum*
- c. Twigs and leaf axes glabrous or nearly so; domatia absent; fruit appendages ligulate to strap-shaped, less than 10 mm long, variably puberulous. *Vietnam, Thailand, Malaya* 16. *N. melliferum*

1. *Nephelium aculeatum* Leenh., *spec. nov.*

Arbor mediocris. Ramuli 7 mm crassi, tomentelli, mature glabrati. Folia 4-jugata; petiolus 8–10 cm longus, 2 mm crassus, teres; petioluli 5–8 mm longi, supra anguste profunde sulcati, ecoscati; axes foliorum quasi glabri. Foliola 12–19 cm longa, 4,5–5,5 cm lata, oblongo-ovata, rigide pergamentacea, supra glabra, subtus costa nervisque puberulis, inter nervos sparse minute sericea; domatia absunt; basis rotundata ad obtusa; margo subrectus; apex gradatim acuminatus, acumina sat longo lato; costa supra sulcata; nervi secundarii inter sese ca. 1 cm distantes, oblique patentis, subrecti, supra vix prominuli; venae intercalares absunt; venae subdense scalariforme reticulatae, utrimque prominulae, venulae dense reticulatae, supra prominulae, subtus inconspicuae. Inflorescentiae probabiliter axillares. Pistillum bilobatum Fructus oblique ellipsoidei, 3 mm longi, 1,75–2 mm crassi, glabri, processis pyramidalibus ca. 2 mm altis subdense aculeati. – *T y p u s*: *W. Meijer NBFD SAN 48559*, Borneo, Sabah, Dist. Lamag, Ulu Karamuek and Tongod, Ulu Kinabatangan, -viii-1963, fr. (L; iso in K, SAN).

Medium-sized tree. *Twigs* 7 mm or more thick, tomentellous but early glabrescent. *Leaves* 4-jugate; petiole 8–10 cm long, 2 mm thick, terete; petiolules 5–8 mm long, above narrowly deeply grooved without a rib, axes subglabrous. *Leaflets* 12–19 by 4.5–5.5 cm, 3–3.5 times as long as wide, widest in (lower) to below (upper leaflets) the middle, stiff-pergamentaceous, above glabrous, beneath puberulous on midrib and nerves, in between fairly densely minutely sericeous; no domatia; base rounded to blunt, slightly attenuate; the sides partly straight, mainly in the lower two thirds; apex tapering acuminate, acumen fairly long and broad; midrib above grooved; nerves c. 1 cm distant along the midrib, above hardly prominulous; no intercalated veins; veins fairly densely scalariform, prominulous at both sides, veinlets finely reticulate, above prominulous, beneath only partly visible. *Inflorescences* probably axillary. *Flowers* unknown. *Fruits* oblique-ellipsoid, 3 by 2 by 1.75 cm, glabrous, fairly densely 2 mm long aculeate.

Distribution. Borneo (Sabah, known from the type only).

Ecology. Secondary forest. Fr. Aug.

Note. Though the present species resembles *N. hypoleucum* as well in leaf shape as in fruit I have the impression that it has no special relationship to that species.

2. *Nephelium compressum* Radlk. – Fig. 3 a, b.

N. compressum Radlk., Sapind. Holl.-Ind. (1879) 9, 28; in Engl., Pflanzenz. 98 (1933) 980. – *T y p e*: *Beccari PB 1268*, Borneo, Sarawak, Kuching, fr. (M; iso in BO, FI, K, NY).

Tree? *Twigs* 6–8 mm thick, tomentose, glabrescent. *Leaves* 3–5-jugate; petiole 4.5–12 cm long, 2–4 mm thick, above grooved or towards the apex slightly round-

ed; petiolules 2–5 mm long, above broadly and shallowly grooved with a strong median rib; axes tomentose, finally glabrescent. *Leaflets* 4.5–18 by 2.75–7.5 cm, 1.5–3 times as long as wide, widest in to above the middle, stiff-coriaceous, above tomentose on the midrib but soon mainly glabrescent, beneath densely tomentose on midrib, nerves, and intercalated veins, thinly so in between; no domatia; base rounded to (upper leaflets) blunt to acute, sides curved, margin repandous; apex apiculate or with a short, broad, acute to rounded acumen; midrib above prominent; nerves 0.5–1.25 cm distant along the midrib, above sunken; intercalated veins well developed; veins densely scalariform, above slightly grooved or not, beneath well visible, veinlets minutely reticulate, above visible only. *Inflorescence* a widely branched terminal or pseudoterminal thyrus. *Sepals* free or nearly so, 2–2.2 mm long. *Petals* 5, 1.25–1.8 by 1.1–1.4 mm, claw 0.3–0.4 mm long, plate with a scale 0.2–0.25 mm high, consisting of 2 connate, reflexed, rounded lobes, claw and outside main part of plate, inside sometimes base of plate woolly. *Disk* glabrous. *Stamens* 7 or 8. *Pistil* 2-merous. *Fruits* flattened ellipsoid, 4–4.5 by 2.5 by 1.25–1.75 cm, saccate at the abaxial side, tomentellous, partly glabrescent, rugose-warty; wall hard, corky, 3–6 mm thick, the saccate base and the carina solid.

Field notes. Petals and stamens white.

Distribution. Borneo (Sarawak, near Kuching).

Ecology. Fl. March; fr. December.

Notes. 1. As to flower characters, *N. compressum* is the most primitive species of the genus, with \pm free sepals, a complete and well developed corolla, 7 or 8 stamens, and a 2-merous pistil. Whether the very unusual fruit is also primitive is doubtful, however.

2. The present species is well characterised by its peculiar fruits which appear to be dispersed by water rather than by animals judged from the thick corky wall and the thin sarcotesta. Vegetatively, however, it is not fully separable from *N. cuspidatum* var. *eripetalum*. The best characters are the slightly bullate leaflets with above sunken nerves and mostly slightly sunken veins in the present species against hardly even bullate leaflets with narrowly grooved nerves and mostly prominent veins in var. *eripetalum*. The flowering collections added to the fruiting type on the basis of these characters appeared to be distinct from *eripetalum* by the rather large and widely branched, thyrusoid, terminal or pseudoterminal inflorescences (in *eripetalum* they are mainly axillary or sometimes even rami- or cauliflorous and consist of a few spikelike branches) and by the nearly free slightly imbricate sepals and the complete and well developed corolla (*eripetalum* has the sepals higher up connate and valvate and has none or only a few reduced petals).

Specimens studied:

BORNEO. Sarawak: Beccari PB 1268; Haviland 2270, 12-iii-1893, fl. (BM, L, M); = 2270, 6-iii-1893, fl. (BO, W); 3175, 18-iii-1893, fl. (K), all from near Kuching.

3. *Nephelium costatum* Hiern

N. costatum Hiern in J.D. Hook., Fl. Brit. India 1 (1875) 688; King, J. Asiat. Soc. Bengal 65, Pt. 2 Nat. Hist. (1896) 436 p.p.; Radlk. in Engl., Pflanzenr. 98 (1933) 972 p.p. – Lectotype (present author): *Maingay 3283* = *KD 440*, Malaya, Malacca, 24-iii-1868, fl. (K; iso in L, M).

N. longana (Lam.) Cambess. var. *hypoleuca* (Kurz) King, J. Asiat. Soc. Bengal 65, Pt. 2 Nat. Hist. (1896) 435, as for *Maingay 440* from Malaya.

Tree. Twigs 4–6 mm thick or more, glabrous. Leaves 2–4-jugate; petiole 3.5–12 cm long, 1.5–2.5 mm thick, semiterete to terete; petiolules 6–13 mm long, above grooved, with or without a median rib; axes glabrous. Leaflets 8–21 by 4–7 cm, 2–3 times as long as wide, widest slightly below to in the middle, coriaceous, glabrous or exceptionally sericeous beneath; mostly with pocket domatia; base rounded or sometimes blunt, slightly attenuate; sides curved; apex blunt to acute, sometimes slightly short, broad, rounded acuminate; midrib above a fine raised line; nerves 0.75–2 cm distant along the midrib, above slightly grooved; intercalated veins few; veins and veinlets not much different, ± densely reticulate, equally prominulous at both sides. Inflorescences terminal. Sepals free, 2–3 mm long. Petals 4 or 5, 0.6–1.8 by c. 1 mm, both sides at least in the lower half densely woolly. Disk glabrous. Stamens (6–)8. Pistil 2-merous. Fruits ellipsoid, bulging to one side, c. 2.5 by 2 cm, densely set with broad-based, curved, filamentous appendages c. 7 mm long, sparsely puberulous; wall coriaceous, thin.

Field notes. Tree up to 17.5 m high and 50 cm d.b.h. Bark smooth and slightly lenticellate or rough, blackish brown; inner bark reddish brown or brown; wood red brown or white. Leaflets above dark green, beneath pale. Fruit yellow and red.

Distribution. Malaya.

Ecology. Secondary forest, lowland. Fl. March and April; fr. August.

Notes. 1. Doubtless close to *N. meduseum* and *N. macrophyllum*, both from Borneo, and to *N. melliferum*, mainly from continental Asia.

2. Since King, l.c., the present species has been mixed up with *N. hamulatum*, mainly because the collections *Goodenough 1352* and *Scortechini 1992* have wrongly been identified with the present species. Therefore, notes on the timber published without any reference to collection numbers are untrustworthy.

3. A possible further collection is *KEP 22428* (Selangor, Fraser's Hill; K, SING), mainly different by the only 1- or 2-jugate leaves with a 2.5–4 cm long petiole and 5–7 mm long very broad petiolules, the leaflets 7.5–11 by 4–5.5 cm, only 2 times as long as broad, finally by the fruits with only 5 mm long, in the basal half pyramidal, in the apical part more flattened, densely puberulous appendages (but the fruits may be younger!).

Specimens studied:

MALAYA. *Maingay 1867* = *KD 454* (K, M). – Perak: *Scortechini 30* (K, L, SING). – Pahang: Corner s.n., S. Tahan (SING sh. nr. 23414); *KEP FRI 16920*, Tasek Berah For. Res. (K, L). – Negri Sembilan: *KEP FRI 25652*, at 12 miles road side to Kuala Pilah (L). – Malacca: *Maingay 3283* = *KD 440*.

Cultivated in Kuala Lumpur, Lake Gardens: *KEP 98852* (K).

4. *Nephelium cuspidatum* Blume

- N. cuspidatum* Blume, Rumphia 3 (1847) 110; Radlk. in Engl., Pflanzenr. 98 (1933) 977. – Type: *Korthals s. n.*, Borneo (L sh. nrs. 908.269-1369, 1389, 1470, and 1490).
- N. eriopetalum* Miq., Sumatra (1861) 198, 508; Radlk. in Engl., Pflanzenr. 98 (1933) 979. – Lectotype (present author): *Junghuhn s. n.*, Sumatra, Tapanuli, Hochankola, Tobing (L sh. nr. 908.269-1390).
- N. beccarianum* Radlk., Sapind. Holl.-Ind. (1879) 9, 27; in Engl., Pflanzenr. 98 (1933) 978. – Lectotype (present author): *Beccari PB 2279*, Borneo, Sarawak, G. Mattan, -xii-1866, fl. (FI).
- N. multinerve* Radlk., Sapind. Holl.-Ind. (1879) 9, 27; in Engl., Pflanzenr. 98 (1933) 979. – Type: *Beccari PB 2820*, Borneo, Sarawak, cult. (FI).
- N. ophiodes* Radlk., Sapind. Holl.-Ind. (1879) 77, 78; in Engl., Pflanzenr. 98 (1933) 965. – Type: *Maingay KD 543 p. p.*, Malaya (B, not seen; iso in K).
- N. bassacense* Pierre, Fl. Forest. Cochinch. (1894) pl. 319 B; Radlk. in Engl., Pflanzenr. 98 (1933) 965; Gagnepain, Fl. Indo-Chine Suppl. 1 (1950) 967, excl. *Poillane 20516* (= *Dimocarpus longan* Lour.). – Type: *Harmand 1427 = herb. Pierre 5690*, Vietnam, Cochinchina, Bassac, -iii-1877 (P; iso in K, M).
- N. dasyneurum* Radlk., Rec. Bot. Survey India 3 (1907) 353; in Engl., Pflanzenr. 98 (1933) 977. – Type: *Forbes 2842*, Sumatra, Palembang, R. Bliti, Tandjong Ning (CAL, not seen; iso in FI, L, P, SING).
- N. obliquinerve* Radlk., Rec. Bot. Survey India 3 (1907) 354; in Engl., Pflanzenr. 98 (1933) 978. – Syn types: *Goodenough 1304*, Malaya, Malacca, Kesang Tua (SING), 1782, ditto (L, SING).
- N. robustum* Radlk., Leaf. Philipp. Bot. 5 (1913) 1607; in Engl., Pflanzenr. 98 (1933) 966. – Type: *Elmer 12934*, Philippines, Palawan, Puerto Princesa, Mt Pulgar (M; iso in BO, FI, L, NY, U).
- N. chryseum* auct. non Blume: Merr., Pl. Elmer. Born. (1929) 174.
- N. sp.* Merr., Pl. Elmer. Born. (1929) 175.

Tree or rarely shrub. *Twigs* 2.5–15 mm thick, tomentellous, tomentose, or velvety, mostly only late glabrescent. *Leaves* (1–)2–9(–13)-jugate; petiole 2.5–21 cm long, 1–6 mm thick, terete to semiterete, in the latter case sometimes above with a longitudinal groove; petiolules 2–7.5(–15) mm long, above variably grooved or sometimes flat, with or without a median rib; axes mostly long remaining hairy. *Leaflets* 6–35 by 1.75–12.5 cm, 1.5–5 times as long as wide, widest in or about the middle, coriaceous or chartaceous, above glabrous to variably hairy along the midrib and on the lower nerves, rarely all over the surface, beneath variably hairy all over, between the nerves often minutely sericeous; no domatia; base acute to broadly rounded, exceptionally subcordate, mostly variably attenuate; sides curved to straight and parallel; apex rounded to acute, mostly acuminate, the acumen up to 2.5 cm long, slender to sometimes broad, acute to sometimes blunt; midrib above sunken to prominulous; nerves 0.5–2 cm distant along the midrib, above prominulous to slightly grooved; intercalated veins variably developed; veins and veinlets either together minutely or sometimes laxly reticulate, or the former \pm clearly scalariform, at least the veinlets beneath often hardly visible. *Inflorescences* mostly in the upper leaf axils, together pseudoterminal, sometimes terminal, also rami- or cauliflorous, often long pendulous racemes or spikes. *Sepals* hardly to up to halfway connate, 1.1–2.5 mm long. *Petals* mostly absent, if present often reduced in number and always

shorter than the calyx. *Disk* hairy or glabrous. *Stamens* (4–)7 or 8 (9). *Pistil* 2-merous. *Fruits* ellipsoid to sometimes globular, 2–4 by 2–3 cm, glabrous or sometimes slightly hairy at the tip of the appendages, mostly densely set with filiform to narrowly strap-shaped and up to 2 cm long, or sometimes ligulate and 5–6 mm long, straight or often curved or curled, at base globular, pyramidal, or triangular and in the latter case often connate appendages; wall coriaceous, thin.

Field notes. Tree or sometimes shrub, up to 40 m high and 80 cm d.b.h.; sometimes with buttresses up to 60 cm high, to 45 cm spreading, and to 5 cm thick. Bark smooth, sometimes slightly lenticellate, rugose, or flaky, brown, red- or dark brown, sometimes greyish to white and with green or white patches, thin, brittle, soft or hard; inner bark up to 7 mm thick, fibrous or laminated, reddish, brownish, or sometimes greyish, with some red to white sap, brittle; cambium red or sometimes brown or yellowish; sapwood white to cream or sometimes reddish; heartwood reddish to redbrown, rather hard and heavy but not resistant against beetles etc. Leaflets above glossy dark green, beneath often \pm glaucous or greyish, when young glossy brown. Flowers yellowish to white, greenish, brownish, or sometimes pinkish, faintly scented; filaments white or sometimes pinkish, anthers yellow; disk pink; pistil cream. Fruits red; aril fleshy, translucent white, sour to sweet.

Distribution. Burma, Thailand, Cambodia, Vietnam, Malaya, Sumatra, W. Java, Borneo, and Palawan.

Ecology. Usually a lower storey tree of primary or sometimes secondary rain forest on dry land, mainly on ridges and slopes, rarely on plains or river banks; preferably on fertile sandy loam derived from igneous rocks, rarely on sandstone or limestone; altitude 0–200(–800) m. Fl. mainly Nov.–March; fr. mainly May–Sept.

Note. In the delimitation presently accepted *N. cuspidatum* is a rather complex species. The extremes included, e.g. *N. robustum* and *N. dasyneurum*, seem very different. However, it appears that the common and widespread *N. eriopetalum* is connected directly or indirectly with all other forms and that either no separation is possible at all, or only on unessential characters (e.g. the coarsely reticulate venation of *N. robustum* and to a lesser degree of *N. bassacense* versus the very minute reticulum of the other forms) or untrustworthy ones (e.g. hairiness or the degree of reduction of the corolla). As far as could be derived from the field labels there are no clear ecological differences either; only geographically all but *N. eriopetalum* are rather restricted.

In order to enhance the accessibility of the group as a whole I have made a subdivision into six varieties, two of which have been divided into two subvarieties.

KEY TO THE VARIETIES

- 1 a. Venation laxly reticulate, prominent on both sides of the leaflet 2
- b. Venation on the upper side of the leaflets minutely reticulate, often inconspicuous to hardly visible 4
- 2 a. Very coarse: twigs up to 1.5 cm thick, leaves 4–9-jugate, leaflets 10–35 by 5–10 cm, linear. *Borneo, Palawan* f. var. *robustum*

- b. Not coarse: twigs 0.25–1 cm thick, leaves 1–5(–8)-jugate, leaflets up to c. 20 cm long by 2.5–8.5 cm broad, linear or elliptic 3
- 3a. Leaflets elliptic, not or sometimes slightly acuminate; nerves above prominulous to flat; intercalated veins hardly conspicuous. *Asian continent, Malaya*
 - a. var. *bassacense*
 - b. Leaflets linear with a long and slender acumen; nerves above grooved; intercalated veins well developed. *Malaya, Sumatra*
 - b-ii. var. *cuspidatum* subvar. *dasyneurum*
- 4a. Leaflets beneath fairly densely ± patently hairy, especially on the veins, the indument accordingly emphasizing the venation, in between glabrous or sometimes sparsely patently or loosely appressedly hairy 5
 - b. Leaflets beneath between the nerves either minutely sericeous, the indument blurring the venation, or ± glabrous 6
- 5a. Twigs thick, hairy as are the leaf axes. Biggest leaflets 20–35 cm long, relatively narrow (up to 5 times as long as wide); nervation not conspicuously dense, nerves in the central part of the leaflets along the midrib 0.5–2 cm distant. *Malaya, Sumatra, Borneo*
 - c. var. *eripetalum*
 - b. Twigs slender, early glabrescent as are the leaf axes. Leaflets up to 17 cm long, relatively broad (2–2.5 times as long as wide); nervation dense, nerves in the central part of the leaflet along the midrib 0.5–0.75 cm distant. *Borneo*
 - d. var. *multinerve*
- 6a. Petiole strongly flattened at base; leaflets stiff-pergamentaceous; leaf apex blunt to rounded, not or hardly acuminate. *Malaya, Sumatra*
 - e-ii. var. *ophiodes* subvar. *ophiodes*
 - b. Petiole terete nearly from the base on; leaflets flexible pergamentaceous or papyraceous when dried; leaf apex distinctly, mostly long, slender, acute acuminate 7
- 7a. Leaflets elliptic with gradually curved sides, beneath ± sericeous; twigs, leaf axes, and midrib beneath densely hairy. *Borneo*
 - e-i. var. *ophiodes* subvar. *beccarianum*
 - b. Leaflets linear with parallel sides, beneath glabrous or early glabrescent; twigs and leaves soon glabrous (*Borneo*) or hairy (*Malaya, Sumatra*) 8
- 8a. Fruit appendages straight, upper part 2–4 mm long. *Borneo*
 - b-i. var. *cuspidatum* subvar. *cuspidatum*
 - b. Fruit appendages curved, upper part c. 8–10 mm long. *Malaya, Sumatra*
 - b-ii. var. *cuspidatum* subvar. *dasyneurum*

a. var. *bassacense* (Pierre) Leenh., *stat. nov.*

N. bassacense Pierre, Fl. Forest. Cochinch. (1894) pl. 319 B.

Twigs 4–10 mm thick, densely tomentose but often rather early glabrescent. Petiolules 2–6 mm long, above broadly shallowly grooved, with or without a median rib. Leaflets 4–8.5 cm broad, 1.5–4 times as long as wide, the sides curved to nearly straight; midrib above prominulous to sunken, nerves above prominulous to flat, in-

tercalated veins mostly few and feeble, reticulum above rather lax. Inflorescences pseudoterminal to terminal. Sepals c. 10% connate, 1.3–2 mm long. Petals absent. Fruit appendages dense, filiform, broadened at base, up to 1.5 cm long.

Distribution. Burma, Cambodia, Vietnam, Malaya (Peninsular Thailand).

Note. The present variety resembles in its vegetative parts and its inflorescences *N. hypoleucum* from the same area. However, the latter species differs in its glabrous or early glabrescent twigs and leaves.

Specimens studied:

BURMA. Tenasserim: Kerr 21643, eastern Tenasserim; Parkinson 5198, Amherst Dist., Kaw-saing For.

CAMBODIA. Béjeaud 612.

VIETNAM. 4 collections.

MALAYA. Peninsular Thailand: Kerr 16434, Dist. Ranong, Lambing.

b. var. *cuspidatum*

i. subvar. *cuspidatum*

N. cuspidatum Blume

Twigs 3.5–6 mm thick, tomentellous, mostly soon glabrous. Petiolules 4–7.5 mm long, above narrowly shallowly grooved, sometimes with a faint median rib. Leaflets 1.75–5 cm broad, 2.5–5 times as long as wide, the sides (nearly) straight and parallel; midrib above sunken, often as a fine rib in a groove, nerves above flat to slightly grooved, intercalated veins often well developed, reticulum above dense. Inflorescences pseudoterminal. Sepals slightly connate, 1.1–1.2 mm long. Petals absent or a single reduced one present. Fruit appendages dense, ligulate-triangular, 5–6 mm long, slightly curved.

Distribution. Borneo.

Specimens studied:

BORNEO. Sarawak: Hewitt s.n., Kuching, -ix-1906 (K). – West Kalimantan: NIFS bb 7319, Simpang, Lubuk batu; NIFS bb 18638, Sanggau. – Northeast Kalimantan: Enderst 2285, W. Kutai, near Lihan Batu Beng; Leighton 152, E. Kutai, near Sengata and Mentoko R., 0°30' N 117°20' E (L). – Sabah: 7 collections.

ii. subvar. *dasyneurum* (Radlk.) Leenh., *stat. nov.*

N. dasyneurum Radlk., Rec. Bot. Survey India 3 (1907) 353. – *N. obliquinerve* Radlk.

Twigs 2.5–7.5 mm thick, tomentellous to tomentose, late glabrescent. Petiolules 3–7 mm long, above slightly to narrowly and deeply grooved, with lateral ribs and mostly a faint to strong median one. Leaflets 2.5–6 cm broad, 2.5–4.5 times as long as wide, the sides mostly nearly straight and parallel; midrib above slightly sunken, nerves above finely grooved, intercalated veins usually many, well developed, reticulum above dense to sometimes rather lax. Inflorescences axillary, together mostly

pseudoterminal, sometimes terminal. Sepals for up to 25% connate, 1.5–2 mm long. Petals absent or up to 5 reduced ones present. Fruit appendages dense, filiform to narrowly strap-shaped, at base broadened and often confluent, up to slightly more than 1 cm long, curved in their upper half.

Distribution. Malaya, Sumatra.

Note. Var. *cuspidatum* resembles *N. lappaceum* var. *pallens* but differs in the more-jugate leaves, the long and slender acumen, and the shorter and more stiff fruit appendages.

Specimens studied:

MALAYA. Selangor: Milsum 34548, Serdang (K, SING). – Malacca: 6 collections. – Johore: Mersing, Labis For. Res., KEP 105033, KEP FRI 16079.

SUMATRA. Indragiri: Meijer 4368, Taluk region, Hutan P. Lawas near Taratak Air Hitam (L). – Palembang: 5 collections.

c. var. eriopetalum (Miq.) Leenh., stat. nov.

N. eriopetalum Miq., Sumatra (1861) 198, 508.

Twigs 5–13 mm thick, tomentose, velvety, or sometimes woolly. Petiolules 2–10 mm long, variably grooved or sometimes terete, usually with a median rib. Leaflets 3–12.5 cm broad, 2–5 times as long as wide, the sides nearly straight and parallel to mostly only slightly curved; midrib above prominulous to sometimes slightly sunken, nerves above finely grooved or sometimes flat, intercalated veins often many and well developed, reticulum above dense. Inflorescences pseudoterminal and more rarely axillary. Sepals 20–40% connate, 1.8–2.5 mm long. Petals absent or sometimes up to 5 reduced ones present. Fruit appendages dense, strap-shaped to sometimes filiform, at base swollen, pyramidal, or broadened, 1–2 cm long, straight or sometimes curled if filiform.

Distribution. Malaya, Sumatra, W. Java, Borneo.

Note. Vegetatively, the present variety strongly resembles *N. compressum*; for differences see there.

Specimens studied:

MALAYA. 42 collections.

SUMATRA. 26 collections.

JAVA. West: Korthals s.n., G. Batoe (L sh. nrs. 909.90-776 & 791).

BORNEO. 29 collections.

d. var. multinerve (Radlk.) Leenh., stat. nov.

N. multinerve Radlk., Sapind. Holl.-Ind. (1879) 9, 27.

Twigs 7 mm or more thick, tomentose and early glabrescent or glabrous. Petiolules 5–12.5 mm long, above narrowly shallowly grooved without a median rib. Leaflets 6–8.5 cm broad, 2–2.5 times as long as wide, the sides curved; midrib above sunken in a narrow groove, nerves above prominulous, intercalated veins hardly

developed, reticulum above dense. Inflorescences unknown. Sepals probably for about 35% connate, c. 1.75 mm long. Petals not seen (present according to Radlkofer, 1933). Fruit appendages very dense, arranged in longitudinal rows, narrowly triangular to strap-shaped, c. 8 mm long.

Distribution. Borneo (Sarawak).

Note. The present variety strongly resembles two other taxa from Borneo, viz. *N. lappaceum* var. *xanthioides* and a form of *N. ramboutan-ake* mentioned in the notes under that species. The latter differs from both others by its leaflets, which are fully glabrous below; *N. lappaceum* var. *xanthioides* has the leaflets below puberulous on the midrib and very sparsely so on the nerves, whereas in between there are only very sparse appressed minute hairs; *N. cuspidatum* var. *multinerve* is on the lower side of the leaflets thinly tomentose on veins and veinlets, but the midrib and nerves are nearly glabrous. Further, there are slight differences in the nervature and in the fruit appendages. Moreover, *N. lappaceum* var. *xanthioides* has terminal inflorescences, whereas *N. ramboutan-ake* has axillary, together pseudoterminal inflorescences (and accordingly axillary infructescences).

Specimens studied:

BORNEO. Sarawak: Beccari PB 2820, cultivated; Sarawak For. Dept. S 29813, 1st Division, Padawan, Stabut.

e. var. ophiodes (Radlk.) Leenh., stat. nov.

N. ophiodes Radlk., Sapind. Holl.-Ind. (1879) 77, 78.

i. subvar. beccarianum (Radlk.) Leenh., stat. nov.

N. beccarianum Radlk., Sapind. Holl.-Ind. (1879) 9, 27.

Twigs 5–6 mm thick or more, tomentose. Petiolules 2–7 mm long, above broadly and shallowly grooved with a strong median rib. Leaflets 2–5 cm broad, 2.5–5 times as long as wide, the sides curved; midrib above slightly raised to slightly sunken, nerves above flat to slightly grooved, intercalated veins often rather strongly developed, reticulum above dense. Inflorescences axillary. Sepals hardly connate, 1.8 mm long. Petals absent (present according to Radlkofer, 1933). Fruit appendages dense, narrowly strap-shaped, bulbous-based, up to 1 cm long.

Distribution. Borneo.

Specimens studied:

BORNEO. Sarawak: 6 collections. – Sabah: Nbfd SAN 22253, Beaufort Dist., Pangie; Nbfd SAN 76389, Sandakan Dist., Mile 31 Ulu Dusun Agr. Station.

ii. subvar. ophiodes (Radlk.) Leenh., stat. nov.

N. ophiodes Radlk.

Twigs 2.5–10 mm thick, mostly tomentose and often rather early glabrescent. Petiolules 3–7.5 mm long, above flat to slightly broadly grooved with mostly 3 strong ribs. Leaflets 2.5–8 cm broad, 2.25–4 times as long as wide, the sides straight and nearly parallel to curved; midrib above raised as a fine rib to sometimes sunken, nerves above finely grooved to sometimes flat, intercalated veins hardly to sometimes clearly developed, reticulum above dense. Inflorescences pseudoterminal. Sepals 20–40% connate, 1.4–2 mm long. Petals absent or exceptionally a single reduced one present. Fruit appendages dense, filiform or narrowly strap-shaped, broadened to swollen at base, up to 1.5 cm long, curled.

Distribution. Malaya, Sumatra.

Specimens studied:

MALAYA. Griffith 1001 KD. – Peninsular Thailand: Nilphanit 356, Kuan Kalong, Satun (BKF, L). – Kedah: KEP 7504, G. Jerai Res.; SF 35140, Koh Mai For. Res. – Perak: Larut, King's coll. 5481 (FI, K, U), 7284 (M, Z). – Trengganu: KEP FRI 14823, along Sg. Pelong. – Pahang: KEP FRI 3551, near Kuala Lompat Krau Game Res.; KEP FRI 11878, Ulu Sg. Pukin, Lesong For. Res. – Malacca: 4 collections.

SUMATRA. East Coast: NIFS bb 5323, Simelungun, Besar Maligas.

f. var. robustum (Radlk.) Leenh., *stat. nov.*

N. robustum Radlk., *Leafl. Philipp. Bot.* 5 (1913) 1607.

Twigs 5–15 mm thick, tomentellous. Petiolules 7–15 mm long, above broadly or narrowly shallowly grooved without or with a strong median rib to flat. Leaflets up to 35 cm long and 5–10 cm broad, 2.5–5 times as long as wide, the sides straight and parallel to slightly curved; midrib above flat to sunken, nerves above prominent to slightly sunken, intercalated veins mostly hardly or only slightly developed, reticulum above lax. Inflorescences terminal. Sepals 25–50% connate, 1.3–1.8 mm long. Petals absent. Fruit appendages dense, narrowly strap-shaped to filiform, gradually thickened or broadened to the base, c. 1.5 cm long, curled.

Distribution. Borneo, Palawan.

Specimens studied:

BORNEO. Sarawak: Hewitt s.n. (K); Sarawak For. Dept. S 23359, Long Ta'ah, Dapoi, Tinjar. – Brunei: BRUN 3355, Ulu Senuko. – Northeast Kalimantan: NIFS bb 12146, Berouw, near Maran; NIFS bb 15788, W. Kutai, near Sebulu. – Sabah: 4 collections.

PHILIPPINES. Palawan: Elmer 12934, Puerto Princesa, Mt Pulgar.

5. *Nephelium daedaleum* Radlk. – Fig. 3f.

N. daedaleum Radlk., *Sapind. Holl.-Ind.* (1879) 9, 27; in Engl., *Pflanzenr.* 98 (1933) 980. – Type: *Beccari PB 2818*, Borneo, Sarawak, Ulu Sarawak, cult. (FI; iso in K).

Tree. Twigs 2–5 mm thick, tomentellous, glabrescent. *Leaves* 1–3(–5)-jugate; petiole 2–9.5 cm long, 1–2 mm thick, terete to semiterete; petiolules 5–9 mm long, above variably grooved, mostly with a median rib; axes tomentellous, sometimes glabrescent. *Leaflets* 6.5–18 by 2.5–7 cm, 2–3.5 times as long as wide, widest in the middle, pergamentaceous, above originally hairy all over, soon glabrescent the midrib

sometimes excepted, beneath tomentose on midrib and nerves, densely sericeous in between; no domatia; base acute to rounded; sides curved; apex not to abruptly acuminate, acumen short and broad to long and slender, blunt; midrib above prominulous; nerves 0.5–1.25 cm distant along the midrib, above slightly grooved; intercalated veins often well developed; reticulum above minute, inconspicuous or invisible, beneath mostly invisible, sometimes the veins prominulous, a bit scalariform. *Inflorescences* terminal. *Sepals* nearly free, c. 3 mm long. *Petals* 4 or 5, 1.75–2 by 1.5–2 mm, the claw up to 1 mm long, the plate auricled to funnel-shaped, at least claw and outside of plate densely woolly. Disk glabrous. Stamens 8 (sometimes less?). *Pistil* 2-merous. *Fruits* flattened-ellipsoid, bulging at base to the abaxial side, 4 by 2.25 by 1.5 cm, densely shortly pubescent, fairly densely set with pyramidal warts c. 1.5 mm high, deeply irregularly longitudinally fissured (possibly when fresh thin-fleshy and ruptured only when dry as after boiling the surface is closed again and as the fissures are glabrous inside); wall coriaceous, 2–2.5 mm thick.

Field notes. Tree up to 33 m high by up to 70 cm d.b.h.; buttresses if present up to 1.50 m high, 1.50 m spreading, and 7.5 cm thick. Bark lenticellate, flaky, or smooth, redbrown to sometimes greyish; inner bark redbrown to sometimes pink; sapwood white to pale ochre; wood medium hard. Leaflets green above, glaucous below, the veins below brown tomentose. Rachis of inflorescences red, the peduncles green. Calyx brown or green; anthers white; style green. Fruit said to be yellow green when young, yellow or brown or a bit grey when ripe. Aril cream.

Distribution. Borneo.

Ecology. Primary kerangas or Mixed Dipterocarp Forest on slopes or ridges. Soil sandstone, sandy clay, or loam. Altitude up to 100(–570) m. Fl. May, Sept.; fr. June, Aug., Sept., Nov.

Note. Identification may lead to *N. hamulatum*, which differs amongst others in the shorter petiolules that are above narrowly deeply grooved, in the smaller stiff-coriaceous leaflets, in the usually hardly developed intercalated veins, the far shorter sepals, and above all in the distinct differentiation of the fruit appendages into a broad basal and a narrowed apical part.

Specimens studied:

BORNEO. Sarawak: Sarawak For. Dept. S 25276, 1st Div., Bau-Lundu Rd., Sampadi For. Res.; S 32066, 4th Div., Bintulu, on boundary of Semilajau For. Res.; S 36914, 1st/2nd Div., G. Buri; S 37873, 4th Div., Sawai P. F. Suai. – Sabah: 20 collections from the Sandakan and Beaufort Districts, mainly from the Sepilok and Kebun China For. Res.

Cultivated in Sarawak (Beccari PB 2818) and in Sepilok Arboretum (NBFD SAN 93175).

6. *Nephelium hamulatum* Radlk.

N. hamulatum Radlk., Sapind. Holl.-Ind. (1879) 78, p.p. fruits only; in Engl., Pflanzenr. 98 (1933) 967 p.p. – Neotype (present author): *Maingay 1628 = KD 450 p.p.*, 21-vi-1867 (K; iso in L).

N. herveyi Ridley, J. Straits Branch Roy. Asiat. Soc. 82 (1920) 180; Radlk. in Engl., Pflanzenr. 98 (1933) 982. – Lectotype (present author): *Curtis 1389*, Malaya, Perak, Pangkor, boundary of the Dindings, fr. (SING; iso in K).

Tree. *Twigs* 2–4 mm thick, puberulous, late glabrescent. *Leaves* 1–4-jugate; petiole 1.5–5.5 cm long, 1–1.5 mm thick, terete to semiterete; petiolules 2–5 mm long, above narrowly and deeply grooved without a median rib; axes tomentellous or puberulous, variably glabrescent. *Leaflets* 5–12.5 by 2–4.5 cm, 2.25–3.5 times as long as wide, widest about to above the middle, stiff-coriaceous, above sparsely puberulous on the midrib to glabrous, beneath tomentellous on midrib and nerves, densely to thinly short-sericeous in between; no domatia; base rounded to acute; sides curved; apex with a short, broad, blunt to rounded acumen; midrib above a slender sunken rib; nerves 0.4–1 cm distant along the midrib, slightly grooved above; intercalated veins variable, few well developed; reticulum minute, beneath prominulous to invisible. *Inflorescences* pseudoterminal to probably terminal. *Sepals* slightly connate only, c. 1.5 mm long. *Petals* absent. *Disk* glabrous. *Stamens* 6 or 7. *Pistil* 2-merous. *Fruits* ellipsoid, at least 3 by 2 cm, densely aculeate, the appendages bulbous-based, flattened, acuminate triangular to acicular, straight or curved, blunt, 3–6 mm long, woody, at least the apical part densely ferruginous-puberulous; wall coriaceous, c. 0.5 mm thick.

Field notes. Tree up to 24 m high by 40 cm d.b.h.; bole straight or slightly twisted, at base with low buttresses; crown dense. Bark smooth to sometimes rough, brown to blackish; inner bark red to orange. Wood white to cream. Leaflets below glaucous with a golden sheen. Fruits red.

Distribution. Malaya.

Ecology. Primary and secondary forest on sandy soils; altitude below 100 m. Fl. Oct.; fr. Jan., June, and July.

Notes. 1. The typification of the present species gave great difficulties. Radlkofer based his original description on the Berlin sheet of *Maingay* KD 453, which consisted of a sterile branch and some loose fruits. There is no doubt that these elements did not belong together. The extensively described leaves may represent either *N. laplaceum* var. *pallens*, or *N. costatum*, or some form of *N. cuspidatum*. The fruits are the most important part, however, and the name is also based upon a fruit character. Lectotypification on the fruits only seems obvious. However, the muddle under *Maingay* KD 453 was still worse: not only the leaves and the fruits on which Radlkofer based *N. hamulatum* actually did not belong together, but also he described still a second species on the Berlin material under that same number, viz. *N. ophiodes*. All this Berlin material got lost during World War II. The Kew material of *Maingay* KD 453 apparently consists only of *N. ophiodes* and accordingly cannot be used as a lectotype. The only further collection clearly indicated in the monograph is *Maingay* KD 450 p.p. = 1628 from June 1867. The Kew sheet of that collection is marked by Radlkofer and bears fruits well in accordance with his description. However, even this collection is a mixture: as well the K sheet as the L sheet bear also a specimen of *N. ramboutan-ake*, resp. in flower and with young fruits. Still, I am of the opinion that the *N. hamulatum* part of this collection is the best neotype.

2. The typification of *N. herveyi* is also difficult. The description of the vegetative parts as well as that of the fruits is well in accordance with *N. hamulatum*; the flowers are different, however. They should have 5 petals and glabrous filaments, whereas the

flower buds of the *Hervey* syntype (the only syntype in flower available to me) lack petals and show woolly filaments, well in accordance with *N. hamulatum*. So, apparently, the at least 5 syntypes are not all conspecific and a choice of a lectotype seems desirable. As such I propose *Curtis 1389*, an unequivocal fruiting specimen.

3. The present species shows some resemblance to *N. melliferum*; for differences see under that species.

Specimens studied:

MALAYA. Perak: Curtis 1389, Pangkor, boundary of the Dindings, fr. (K, SING); Scortechini 1992 (K, L). – Pahang: KEP FRI 14301, boundary of Johore, E. boundary of Segamat Wild Life Res., NE. of Segamat; KEP FRI 16973, Tasek Bera For. Res.; KEP FRI 16988, ditto. – Selangor: KEP 4947, Carcosa, Kuala Lumpur; KEP 10528, Ayer Hitam Res. – Negri Sembilan: KEP FRI 15203, Sungai Menyala For. Res. – Malacca: Goodenough 1352, Sungei Udang (SING); Hervey s.n. (K).

7. *Nephelium havilandii* Leenh., *spec. nov.*

Descriptio typi: Arbor? Ramuli 2,5 mm crassi, glabri. Folia 1- vel 2-jugata; petiolus 2–4 cm longus, 1–1,5 mm crassus, supra applanatus; petioluli 3–5 mm longi, supra late satis profunde sulcati, ecostati; axes foliorum quasi glabri. Foliola 6–9 cm longa, 2–3,5 cm lata, oblongo-elliptica, coriacea, supra glabra, subtus sparse minute sericea; domatia adsunt; basis acuta; margo curvatus; apex non vel breve acuminatus, anguste rotundatus; costa gracilis, supra prominula; nervi secundarii inter sese 0,5–1,5 cm distantes, supra prominuli; venae intercalares plus minusve distinctae; venae venulaeque moderate laxe reticulatae, supra plus prominentes quam subtus. Inflorescentiae axillares. Pistillum bilobatum. Fructus ellipsoidei, ca. 2 cm longi, 1,25 cm crassi, glabri, processis curvatis 8–10 mm longis basi incrassatis dense obtecti; pericarpium ca. 0,5 mm crassum. – **T y p u s:** *Haviland 2241*, Borneo, Sarawak, near Kuching, -ii-1893, fr. (K; iso in L, SING).

Tree? Twigs 2.5 mm thick, glabrous. **Leaves** 1- or 2-jugate; petiole 2–4 cm long, 1–1.5 mm thick, semiterete and slightly hollowed above; petiolules 3–5 mm long, above broadly rather deeply grooved, often with a faint median rib; axes nearly glabrous. **Leaflets** 6–9 by 2–4.25 cm, about 2 times as long as wide, widest in the middle, coriaceous, above glabrous, beneath thinly minutely sericeous; domatia present or not; base acute, attenuate; sides curved; apex not to shortly acuminate, narrowly rounded; midrib above a slender prominulous rib; nerves 0.5–1.5 cm distant along the midrib, above prominulous; intercalated veins absent to mostly well developed; veins and veinlets above not different, moderately coarsely reticulate, distinctly prominulous, beneath different, less prominent. **Inflorescences** axillary. **Flowers** only male seen. **Sepals** free, 1.5–2.5 mm long. **Corolla** complete, petals elliptic to ovate, 0.8–1.75 mm long, short-stiped, without a scale, either outside glabrous, inside woolly in the lower half, or woolly at both sides, mainly in the lower half. **Disk** woolly. **Stamens** 7. **Pistil** 2-merous. **Fruits** ellipsoid, c. 2 by 1.25 cm, glabrous, appendages dense, bulbous based, triangular in cross section, curved, in total c. 8–10 mm long; wall c. 0.5 mm thick, coriaceous.

Field notes. Flowers white.

Distribution. Borneo.

Ecology. Fl. Oct.; fr. Febr.

Note. The present species seems to be allied with *N. laurinum*, which is mainly restricted to Malaya and Sumatra. Notwithstanding the resemblance in leaflets and fruits *N. havilandii* and *N. uncinatum* seem to be not closely allied: *N. havilandii* has a relatively primitive flower whereas that of *N. uncinatum* is one of the most derived in the genus.

Specimens studied:

BORNEO. Sarawak: near Kuching, Haviland 1800, 6-x-1892 (SING), 1862, -x-1892 (L, SING), 2241 (type), -ii-1893 (K, L).

8. *Nephelium hypoleucum* Kurz — Fig. 3h; 4a.

- N. hypoleucum* Kurz, J. Asiat. Soc. Bengal 40, Pt. 2 Nat. Hist. (1871) 50; Radlk. in Engl., Pflanzenz. 98 (1933) 975; Gagnepain, Notul. Syst. (Paris) 13 (1947) 69; Fl. Indo-Chine Suppl. 1 (1950) 968. — *N. longana* Cambess. var. *hypoleuca* King, J. Asiat. Soc. Bengal 65, Pt. 2 Nat. Hist. (1896) 435. — (Syn?) type: *Brandis 691*, Burma, Martaban, Yaitho (K; iso in M).
- N. cochinchinense* Pierre, Fl. Forest. Cochinch. (1895) text with pl. 321: A; Lecomte, Fl. Indo-Chine 1 (1912) 1050, f. 131: 2. — *Xerospermum cochinchinense* Pierre, Fl. Forest. Cochinch. (1895) sub pl. 321: A, nom. inval. (I.C.B.N. Art. 34.1(a)). — *Mesonephelium cochinchinense* Pierre, Fl. Forest. Cochinch. (1895) text with pl. 321: A, nom. inval. (I.C.B.N. Art. 34.1(d)). — Syn types: *Pierre 875*, S. Vietnam, Prov. Saigon, Thù duc, -i-1865, bud (M); ditto, Prov. Bien Hoa, Thu dan mot, -iv-1865, y. fr. (K, P); ditto, Prov. Sam rong tông, Mt Tamire, -v-1870, fr. (K, M); ditto, Prov. Gia Dinh, Thu drau mot, -ii-1872, fl. (K, L, M, NY, SING).
- Xerospermum laoticum* Gagnepain, Notul. Syst. (Paris) 13 (1947) 69; Fl. Indo-Chine Suppl. 1 (1950) 959, f. 120: 8–10. — Syn types: *Chevalier 31910*, Cambodia, Konpong-chnang et environs, y. fr. (P); *Harmand 232*, southern Laos, Sé Lamphau Basin (P); *256*, Laos, Mulu Prey, fl. (P); *390* (not seen); *Pierre 875*, Cambodia, Prov. Tpong, Mt Tamire, -v-1870, fr. (K, M); *Poilane 2503*, S. Vietnam, Prov. Bien hoà, Gia ray, fl. (K, L, P); *11697*, Laos, km 20 route Savainakhu à Quang-trim, fl. (K, P); *11961*, Laos, near Savannakhet, fl. (K, P); *12089*, ditto, y. fr. (K, L, P); *13287 bis*, Laos, between Lao-bao and M. hou, y. fr. (K, P); *23602*, S. Vietnam, Prov. Bien Hoa, Arboretum de Trang Bôm, fr. (P).
- N. rubescens* Hiern in J. D. Hook., Fl. Brit. India 1 (1875) 688 p.p., excl. type (only for *Wallich 8048 H*; see Radlk., Sapind. Holl.-Ind., 1879: 28).

Tree or rarely shrub. Twigs 2.5–8 mm thick, glabrous or puberulous and early glabrescent. Leaves 1–4(–5)-jugate; petiole 3–16 cm long, 1–3 mm thick, terete to semiterete; petiolules (3–)5–11 mm long, above grooved, with or without a median rib; axes fairly densely puberulous, early to late glabrescent. Leaflets 6.5–c. 30 by 2–8 cm, (1.5–)2–3(–4.5) times as long as wide, widest distinctly below to rarely in the middle, stiff-pergamentaceous, above glabrous or sparsely minutely hairy on the basal part of the midrib, beneath fairly densely minutely sericeous to glabrous; domatia common to sometimea absent; base rounded to acute; sides slightly curved to often straight, margin often repandous; apex not acuminate; midrib above prominulous to sunken; nerves 0.75–3 cm distant along the midrib, above prominulous to flat; intercalated veins often well developed; reticulum rather fine, above mostly slightly more raised than beneath. Inflorescences terminal and in the upper leaf axils; male and female flowers sometimes in the same inflorescence. Sepals slightly to sometimes halfway up connate, 1.3–2.6 mm long. Petals either absent or up to 6

present, these variably spathulate, 1.4–2 mm long, on both sides woolly. *Disk* glabrous. *Stamens* 7–10. *Pistil* 2- (or 3-)merous. *Fruits* ellipsoid, 2–3 by 1.5–2.25 cm, rather densely warty, the warts pyramidal or linear, up to 1.5 mm high, acute, glabrous; wall coriaceous, c. 0.5 mm thick.

Field notes. Tree up to 30 m high and 1.40 m d.b.h. with up to 1.50 m high buttresses, rarely shrub. Bark smooth. Wood soft or hard. Inflorescences with olive green axes and tan pedicels. Flowers white (yellowish or greenish), fragrant and rich in nectar; the calyx tan or green, the filaments whitish, the anthers light yellow, the disk orange, the ovary dark green with black hairs, style and stigma light yellow. Fruits red, aril hyaline white and sweet.

Distribution. Burma, Thailand, and Indo-China.

Ecology. Mostly in evergreen, sometimes in deciduous forest, also in savannahs, in hilly country, mainly on fertile sandy soils; mainly at low to medium altitude, up to 1200 m. Fl. Dec.–Febr.; fr. Febr.–June.

Notes. 1. The leaves may resemble those of *Dimocarpus longan* Lour., which, however, has hairtufts, though sometimes minute and only on the lower side of midrib and nerves. *Nephelium hypoleucum*, on the contrary, has mostly minute appressed hairs on the lower side of the leaflets between the nerves.

2. Vegetatively, the present species also strongly resembles *N. melliferum*. The main differences are that in *N. hypoleucum* the leaflets are mostly widest at about 1/3–1/4 above the base, and the veins and veinlets are beneath clearly different, are less densely reticulate, and the veinlets are less prominent, whereas in *N. melliferum* the leaflets are nearly always widest about halfway, and the veins and veinlets are beneath hardly different, are together densely reticulate, and all are prominent.

3. Another taxon occurring in the same area and vegetatively resembling *N. hypoleucum* is *N. cuspidatum* var. *bassacense*. The latter, however, has the twigs and leaves far more hairy and the reticulum on the upper side of the leaflets is distinctly more lax.

4. The only other species with the leaflets widest only slightly above the base is *N. laurinum*; for differences see there.

5. *K. Bunchuai* 1604 from NE. Thailand is mainly male flowering but has in the same inflorescence some female flowers, mainly on separate branches of the inflorescence.

Specimens studied:

BURMA. 16 collections from Lower Burma and Tenasserim.

THAILAND. 30 collections, incl. 2 from Peninsular Thailand: Kerr 16325 and 16343, both from Kraburi, resp. Klung Wa and Ranawng (K, L, resp. L).

INDO-CHINA. 33 collections from all parts.

9. *Nephelium juglandifolium* Blume – Fig. 3g.

N. juglandifolium Blume, Rumphia 3 (1847) 106; Radlk. in Engl., Pflanzenr. 98 (1933) 971; Backer & Bakh. f., Fl. Java 2 (1965) 138. – Type: *N. N. s. n.*, W. Java, fl. (L sh. nr. 908.270-181; iso in L several sheets, NY).

N. altissimum Teijsm. & Binnend., Natuurk. Tijdschr. Ned.-Indië 2 (1851) 306. — Type: *Bogor Botanic Garden III.E.25a*, West Java (BO, not seen; iso in L, M).

N. tuberculatum Radlk., Rec. Bot. Survey India 3 (1907) 352; Radlk. in Engl., Pflanzenr. 98 (1933) 970. — Syntypes: *King's coll. 7903*, Malaya, Perak, fr. (M); *Scortechini 1767*, Malaya, Perak, Kuala Dipong, male (K, M).

Tree. *Twigs* 4–12.5 mm thick, variably hairy, mostly early glabrescent. *Leaves* (1–)3–7-jugate; petiole 6–14 cm long, 2–4 mm thick, terete to semiterete or triangular in cross section; petiolules 4–10 mm long, above flat to slightly grooved, without or with a faint median rib; axes variably hairy, glabrescent. *Leaflets* 7.5–32 by 2.5–9.5 cm, 3(–5) times as long as wide, widest in or sometimes below the middle, thin-coriaceous to thin-pergamentaceous, glabrous or beneath sparsely short-hairy; domatia rare; base rounded, blunt, or acute; sides slightly curved or straight and parallel; apex blunt to rounded, mostly not, sometimes shortly, broadly, and bluntly acuminate; midrib above prominulous to slightly sunken; nerves 0.75–2.25 cm distant along the midrib, above prominulous to slightly grooved; intercalated veins none or few; veins and veinlets distinctly different, the former scalariform, reticulation coarse, above prominent, beneath inconspicuous. *Inflorescences* pseudoterminal. *Sepals* slightly or up to c. 35% connate, 1.5–2 mm long. *Petals* none. *Disk* hairy. *Stamens* 7 or 8. *Pistil* 2-merous. *Fruits* slightly flattened ellipsoid, 3.5–5 by 2.5 by 2 cm, glabrous, coarsely tuberculate, the warts ± arranged into longitudinal rows, ± blunt triangular, usually flattened, up to 4 mm high; wall coriaceous, c. 1 mm thick.

Field notes. Tree up to 30 m high and 90 cm d.b.h. Bark greybrown, rather rough, lenticellate and peeling off; inner bark bright brown; wood cream. Leaflets above dark green, beneath dull light green. Fruits waxy light green.

Distribution. Malaya, Sumatra, and Java.

Ecology. In rain forest and open jungle, mostly at low altitudes, up to 650 m. Fl. Febr., July–Aug.; fr. July.

Notes. 1. Vegetatively, the present species may resemble *N. lappaceum* var. *pal-lens*. The latter differs distinctly by its far more slender twigs and petioles, however.

2. Typical *N. juglandifolium* is only known from Java in a few collections. These differ from *N. tuberculatum* mainly in the narrower leaflets with shorter petiolules. From typical *N. juglandifolium* only very young fruits are known; these show already blunt tubercles like those of the mature fruits of *N. tuberculatum*, quite different from the filiform appendages already recognisable in the very young fruits of *N. lappaceum*.

Specimens studied:

MALAYA. Perak: King's coll. 7903 (M); Scortechini 1767, Kuala Dipong (K, M). — Kelantan: KEP FRI 19280, Ulu Kelantan, E. of Gua Musang, Galas For. Res. (K). — Pahang: SF 22107, Ulu Tembeling, S. Pertaling (K, NY).

SUMATRA. Simaloer: Achmad 1275 (L).

JAVA. West: Beumée A 380, Batavia, Tjigelung near Djasinga (BO); Bogor Botanic Garden III.H.20, Mt Salak (BO, M, NY); Koorders 38966, Res. Preanger, Afd. Sukabumi, Tjisolak (BO, M); mentioned by Teijsmann from Bantam, Duizendgebergte.

Cultivated in the Bogor Botanic Garden (III.E.16, III.E.16a, III.E.25a, III.H.20, Treub 20) and in the Singapore Botanic Gardens (Shah s.n., K, L).

10. *Nephelium lappaceum* L.

- N. lappaceum* L., Mant. Pl. 1 (1767) 125; Radlk. in Engl., Pflanzenr. 98 (1932) 957, f. 24. – *Euphoria nephelium* Poir., Dict. Sci. Nat. 27 (1823) 59, nom. illeg.; non Blanco, Fl. Filip. ed. 2 (1845) 200 (= *Shorea guiso* Blume, Dipterocarpaceae). – *Euphoria nephelium* DC., Prodr. 1 (1824) 612, nom. illeg. – Neotype (present author): *Bogor Botanic Garden III.H.10 = Carocci-Buzi 190 = Neddy 12 = Sutrisno 71* (L; iso in BO, L, M, NY, U).
- Dimocarpus crinita* Lour., Fl. Cochinch. (1790) 234. – *Scytalia crinita* Raeuschel, Nomencl. Bot. ed. 3 (1797) 113, nom. illeg. – *Euphoria crinita* Poir., Encycl. Suppl. 3 (1814) 478, nom. illeg. – Type: unknown.
- N. echinatum* Noronha, Verh. Batav. Genootsch. Kunsten 5 (1791) 21, nom. nud.
- N. glabrum* Noronha, Verh. Batav. Genootsch. Kunsten 5 (1791) 21, nom. nud. With authors on Malaya this is *N. maingayi*, with Hasskarl it is *N. ramboutan-ake*, and with authors on the Philippines it is *Dimocarpus longan* Lour.
- Litchi* ('Litsea') *ramboutan* Labill. in DC., Bull. Soc. Philomath. Paris 2 (1801) 161, nom. illeg. – *Euphoria ramboutan* Labill., Mém. Inst. Sci. divers Savans Sci. Math. 1 (1806) 472, pl. 1, nom. illeg. – *N. rambutan* Schnizl., Icon. 4 (1866) text with pl. 230, nom. illeg. – Type: the plate.
- N. glabrum* Reinw. ex Blume, Catalogus (1823) 111, nom. nud. – *Euphoria glabra* Blume, Bijdr. (1825) 233, nom. illeg. – *N. glabrum* Cambess., Mém. Mus. Hist. Nat. 18 (1829) 30. – *N. lappaceum* L. var. *glabrum* Blume, Rumphia 3 (1847) 104. – Syn types: *Anonymous in herb. L sh. nrs. 908.267-1068 & 1078* (L).
- Scytalia ramboutan* Roxb., Hort. Bengal. (1814) 29, nom. nud.; Fl. Ind. ed. 2, 2 (1832) 271, nom. illeg. – Type: unknown.
- N. chryseum* Blume, Rumphia 3 (1847) 105; Radlk. in Engl., Pflanzenr. 98 (1933) 962; non King, J. Asiat. Soc. Bengal 65, Pt. 2 Nat. Hist. (1896) 437, nor Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 66 (both = *N. ramboutan-ake*). – Lectotype (present author): *Kort-hals s.n.* in herb. L sh. nr. 908.269-1414, Borneo (L).
- N. mutabile* Blume var. *pallens* Hiern in J.D. Hook., Fl. Brit. India 1 (1875) 687. – *N. pallens* Radlk., Rec. Bot. Surv. India 3 (1907) 351; in Engl., Pflanzenr. 98 (1933) 961. – Lectotype (Radlkofer, 1907): *Maingay 1527 = KD 454 p.p.*, Malaya (K).
- N. xanthioides* Radlk., Sapind. Holl.-Ind. (1879) 9, 27; in Engl., Pflanzenr. 98 (1933) 966
Type: *Beccari PB 2849*, Borneo, Sarawak, Ulu Sarawak (FI).
- N. sufferrugineum* Radlk., Sapind. Holl.-Ind. (1879) 77; in Engl., Pflanzenr. 98 (1932) 956. – *N. glabrum* Noronha var. *sufferrugineum* Ridley, Fl. Malay Penins. 1 (1922) 499, nom. inval. (I.C.B.N. Art. 43.1). – Syn types: *Griffith KD 1000; Maingay 1526 = KD 449 p.p.*, Malaya, Malacca (K).
- Xerospermum topengii* Merr., Philipp. J. Sci. 23 (1923) 250; Radlk. in Engl., Pflanzenr. 98 (1932) 949. – *N. lappaceum* L. var. *topengii* How & Ho, Acta Phytotax. Sin. 3 (1955) 395; Anonymous, Icon. Corm. Sinic. ed. 2, 2 (1980) 720, f. 3170. – *N. topengii* H.S. Lo in Anonymous, Fl. Hainan 3 (1974) 85, 574, f. 583; Li, Bot. Mus. Leaflet. 25 (1977) 173. – *N. chryseum* Blume var. *topengii* Wu in Ming in Wu, Fl. Yunnan. 1 (1977) 274. – Type: *F.A. McClure C. C. C. 9455*, Hainan, Five Finger Mt (iso in K, P).
- N. ? spec.* Koord.-Schum., Syst. Verz. I Java (1912) Sapind. p. 8. – *N. maculatum* Radlk., Flora 118-119 (1925) 400; in Engl., Pflanzenr. 98 (1933) 981. – Type: *Koorders 38975*, West Java, Afd. Soekaboemi, Tjisalak (BO).
- N. obovatum* Ridley, Kew Bull. (1933) 191; Radlk. in Engl., Pflanzenr. 98 (1934) 1500
Type: *Haviland 2275*, Borneo, Sarawak, near Kuching (K; iso in BM, L, SING).

Tree or sometimes shrub. *Twigs* 1.5–10 mm or more thick, glabrous but for the terminal bud to long remaining hairy. *Leaves* 1-foliolate to 6-jugate; petiole 1.5–16 cm long, 1–3.5 mm thick, terete to semiterete and sometimes grooved above; petio-

lules 1.5–12 mm long, above broadly and shallowly grooved with or without a median rib and sometimes with strong lateral ribs to narrowly grooved or flat without any rib; axes variably hairy, early to late glabrescent. *Leaflets* 5–28 by 2–10.5 cm, 1.25–4.5 times as long as wide, widest above to below the middle, coriaceous, above glabrous or sometimes slightly hairy on the midrib, beneath variably hairy; domatia common to absent; base acute to rounded, attenuate or not; sides strongly curved to nearly straight and parallel; apex acute to truncate or slightly emarginate, acuminate or not; midrib above prominulous to slightly sunken; nerves 0.5–2 cm distant along the midrib, above prominulous to slightly sunken; intercalated veins mostly inconspicuous, veins and veinlets finely or coarsely reticulate, veins often tending to scalariform, often raised above. *Inflorescences* axillary, together pseudo-terminal, not rarely truly terminal. *Sepals* nearly free to more than halfway connate, 0.7–2.1 mm long. *Petals* mostly absent, sometimes up to 4 reduced ones present, these up to 1.6 mm long incl. the 1.1 mm long claw, the plate 0.5 mm long and wide, the margin infolded and connate towards the base, outside glabrous or with a few long hairs, long ciliate, inside woolly. *Disk* hairy or glabrous. *Stamens* (4–)5–8(–9). *Pistil* 2- or rarely 3-merous. *Fruits* hardly stalked, ellipsoid to subglobular, up to 6 by 3.5 cm, glabrous, rather thinly to mostly densely set with bulbous- or broadbased, tapering to strap-shaped or filiform, curved, 0.5–2 cm long appendages; wall coriaceous, up to 2.5 mm thick.

Distribution. Yunnan, Hainan, the Indo-Chinese Peninsula, Malaya, Sumatra, Java, Borneo, the Philippines, and Celebes.

Ecology. Lower or middle storey forest trees, mainly of low altitudes.

Note. The only 'good' difference between *N. lappaceum* and *N. ramboutan-ake* is in the fruit appendages. These consist in the present species of a small and inconspicuous basal part and a long filiformous upper part, whereas in *N. ramboutan-ake* the basal part is relatively big, triangular to ovate, tapering into a short and broad, often thick and stiff apical part.

KEY TO THE VARIETIES

- 1a. Leaflets relatively broad, mostly widest above the middle, the sides mostly strongly curved, the apex usually not acuminate, beneath usually hardly or not glaucous; the nerves widely spreading and strongly curved . . . a. var. *lappaceum*
- b. Leaflets often relatively narrow, mostly widest about or below the middle, the sides often nearly straight and parallel, the apex mostly acuminate, beneath mostly distinctly glaucous; the nerves fairly steep and only slightly curved . . . 2
- 2a. Leaflets narrow (mostly 3–4 cm wide, up to 4.5 times as long as wide), with slightly curved to nearly straight and parallel sides; midrib beneath often glabrous; veins and veinlets reticulate, the veins often tending to scalariform b. var. *pallens*
- b. Leaflets up to 10 cm wide, no more than 3.5 times as long as wide, with mostly curved sides; midrib beneath densely tomentellous; veins mostly distinctly densely scalariform, sometimes tending to coarsely reticulate, veinlets reticulate
c. var. *xanthioides*

a. var. lappaceum

N. lappaceum L. – *Dimocarpus crinita* Lour. – *N. echinatum* Noronha – *N. glabrum* Noronha – *Litchi ramboutan* Labill. – *N. glabrum* Reinw. ex Blume – *Scytalia ramboutan* Roxb. – *N. sufferrugineum* Radlk. – *N. maculatum* Radlk. – *N. obovatum* Ridley.

Tree or shrub. Twigs 3–9 mm thick, puberulous or tomentose, early glabrescent to long remaining hairy. Leaves 1-foliolate to 5-jugate, petiole 1.5–12 cm long, 1–3 mm thick, terete to semiterete; petiolules 2–10 mm long, mostly broadly and shallowly grooved with a strong to sometimes faint median rib; axes variably hairy, early to late glabrescent. Leaflets 5–22 by 2.5–10.5 cm, 1.25–3 times as long as wide, widest mostly above, sometimes in or below the middle, beneath hardly glaucous; above glabrous, beneath sparsely hairy on the midrib, still more sparsely so on the nerves, in between the nerves mostly glabrous, sometimes sparsely, rarely densely appressedly short-hairy; domatia present; base blunt to sometimes rounded; sides mostly strongly curved; apex obtuse, rounded, or sometimes truncate to slightly emarginate, sometimes apiculate or slightly acuminate, rarely tapering into a cuneate and acute acumen; nerves 0.75–2 cm distant mutually along the midrib, spreading and strongly curved; veins and veinlets above as well as beneath hardly to, especially beneath, distinctly different, coarsely to sometimes rather finely reticulate. Sepals 4 or 5(–7), mostly slightly connate, 1.1–2.1 mm long, outside mostly thinly to densely appressedly short-hairy, inside mostly densely appressedly long-hairy to woolly. Stamens 5–8. Fruits big and with a thin wall.

Field notes. Tree, up to 27 m high by 70 cm d.b.h., or shrub; bole terete, crooked or straight; buttresses up to 1.50 m high, 90 cm spreading, and 2.5 cm thick. Bark smooth or lenticellate, thin, usually dark brown to grey, sometimes yellowish, reddish, or greenish, inner bark fibrous, reddish to brownish, sometimes cream or orange, with a little clear sap; sapwood whitish or sometimes yellowish, reddish, or brownish; heartwood soft to hard and heavy, white to brownish. Leaflets above dull or glossy dark green, beneath glaucous, bluish, or greyish green with yellowish (in the herbarium mostly purplish) midrib and nerves. Inflorescences green with brown hairs. Flowers white to yellowish or greenish, odourless or fragrant; calyx outside green, inside whitish; disk light yellow; filaments white, anthers yellow to orange; ovary white, stigmas yellowish green. Fruits young green, mature red or sometimes yellow; aril whitish, juicy, sweet, in wild forms often rather sour.

Distribution. Thailand, Malaya, Sumatra, Java, Borneo, the Philippines (Palawan, Basilan), and possibly Ceram. Commonly cultivated, also in other parts of the Tropics, and doubtless not rarely escaped and sometimes naturalised.

Ecology. In different types of primary and secondary forest, as well on slopes as on flat land, as well on ridges as in ravines, along rivers or roads, on dry land as well as in swamps, preferably on fertile clay but also on peat, tuff, podsolised sand, or limestone; altitude up to 600(–1300) m. Fl. mainly Aug.–March; fr. May–July and Dec. See Brüinig, Heidewald Sarawak Brunei (1968) 373 (*N. sufferrugineum*). The fruits are eaten by Flying Foxes and Fruitbats (Ridley, Dispers. Pl., 1930: 339).

Uses. Commonly cultivated as a fruit tree. See Heyne, Nutt. Pl. Ned.-Ind. ed. 2 (1927) 997; Ochse, Ind. Vrucht. (1927) 248, f. 120–122; Ochse & Bakh., Fruits Fruitcult. (1931) 139, pl. 54 & 55; Burk., Dict. (1935) 1545; Anonymous, Wealth of India. Raw Materials 7 (1966) 13, f. 8.

Vernacular names. The common and general name is *rambutan*. For the many combinations of this name with one or two 'epithets', usually referring to different cultivated forms, and for a great number of local names may be referred to Ochse & Bakh., l.c.

Notes. 1. The combinations under *Euphoria* and *Scytalia* are illegitimate as in both cases when the genus was published the older and legitimate name *Litchi* was mentioned as a synonym.

2. *Litchi ramboutan* Labill., and consequently *N. rambutan* Schnizl., is illegitimate as the older and legitimate name *N. lappaceum* L. was cited as synonymous.

3. As with many commonly cultivated plants it is difficult to decide what is its natural area of distribution and where it is naturalised. I have the impression that var. *lappaceum* is native in Thailand and West Malesia, though especially many of the collections from Java are doubtful, being either collected near kampongs or in cultivated areas, or they lack sufficient information. The Philippine material may be of truly wild origin: var. *lappaceum* is common on Borneo, Palawan has a strong Bornean element in its flora, and Basilan is not far from Palawan. On the other hand I strongly doubt the nativeness on Ceram, separated by a rather wide gap from the rest of the area, and from which only one old collection is known without any details on the label.

4. *Nephelium hypoleucum* may resemble the present variety, differs, however, mainly in being glabrous or nearly so and by its mostly distinctly ovate leaflets with a densely reticulate, not very conspicuous venation; in the present variety at least the upper leaflets are mostly obovate with a cuneate base and the reticulation is mostly very lax and on both sides prominent. The fruits are distinctly different.

5. *Nephelium lappaceum* var. *lappaceum* and *N. ramboutan-ake* may resemble each other vegetatively. However, typical *N. ramboutan-ake* differs also clearly in its leaflets from the present variety, as follows: the leaflets are elliptic with the angle of base and apex about the same, they are thin-pergamentaceous, in the herbarium often curled or rolled up, glaucous beneath, the apex is nearly always distinctly acuminate, they have rather many widely spreading nerves light brown beneath in the dried leaflets, and the nervation is faint on both sides. In *N. lappaceum* var. *lappaceum* the leaflets tend to be obovate (especially the upper ones) with the base distinctly more acute than the apex, they are coriaceous and when dried flat, hardly or not glaucous, the apex is rounded or sometimes slightly acuminate, with few steep nerves which are gradually curved upwards and are mostly dark purplish brown to nearly black in the dried leaflet; the venation is distinctly prominent on both sides.

Specimens studied:

THAILAND. Southeast: Chite 204, Chanthaburi, Makam (BKF).

MALAYA. 41 collections from Peninsular Thailand, Kedah, Perak, Kelantan, Pahang, Selangor, Negri Sembilan, Malacca, P. Penang, and Singapore.

SUMATRA. 30 collections from Atjeh, Tapanuli, West and East Coast, Indragiri, Benkulen, Palembang, and Banka.

JAVA. 37 collections from West and Central Java.

BORNEO. 61 collections from all over the island.

PHILIPPINES. Palawan: 5 collections. – Basilan: according to W. H. Brown, Useful Pl. Philipp. 2 (1950) 366.

MOLUCCAS. Ceram: Unknown coll. s.n. in herb. L sh. nrs. 908.272-61 & 62; this is an old collection, probably from before 1850.

b. var. pallens (Hiern) Leenh., comb. nov.

N. mutabile Blume var. *pallens* Hiern in J.D. Hook., Fl. Brit. India 1 (1875) 687. – *N. chryseum* Blume – *Xerospermum topengii* Merr. – *N. lappaceum* auct. non L.: Merr., Lingnan Sci. J. 5 (1927) 118; Hu, Bull. Fan Mem. Inst. Biol. 1 (1929) 28; Gagnepain, Fl. Indo-Chine Suppl. 1 (1950) 968; Lo in Anonymous, Fl. Hainan 3 (1974) 85.

Tree or sometimes shrub. Twigs 1.5–7 mm thick, glabrous with the exception of the terminal bud or densely puberulous or tomentellous and early to sometimes late glabrescent. Leaves (1–)3–5(–8)-jugate; petiole 2.5–12 cm long, 1–2.5 mm thick, terete to sometimes ± semiterete; petiolules (1.5–)3–8 mm long, above broadly and shallowly grooved with or without a median rib and sometimes strong lateral ribs to narrowly grooved without any rib; axes densely short-hairy to glabrous. Leaflets 5.5–12 (–20) by (2–)3–4(–7) cm, 2.5–3.75(–4.5) times as long as wide, widest about or somewhat below the middle, sometimes slightly falcate, beneath mostly distinctly glaucous, above glabrous or sometimes slightly puberulous on the midrib, beneath midrib and nerves mostly glabrous, between the nerves mostly minutely sericeous, glabrescent or not; domatia common to absent; base acute to sometimes blunt or rounded; sides slightly curved to nearly straight and parallel; apex either narrowly rounded to sometimes acute, or tapering into a mostly fairly short and broad, rounded or acute acumen; nerves 0.5–1(–2) cm distant mutually along the midrib, slightly curved; veins and veinlets rather finely to rather coarsely reticulate, the veins often tending to scalariform. Sepals 4 or 5, rarely 6, up to halfway connate, 1–2 mm long, outside sparsely to densely appressedly short-hairy, inside densely velutinous. Stamens (4–)5–8(–9). Fruits up to 5 by 3.5 cm, wall 1.5–2.5 mm thick.

Field notes. Tree up to 44 m high and 1.25 m d.b.h. with up to 4 m high and 1.30 m spreading buttresses, sometimes shrub. Bark smooth or sometimes lenticellate or a bit scaly, dark to red brown or greyish or sometimes whitish, greenish, or blackish, with a bit red or white sap; inner bark brown to red to orange or white, soft; sapwood white or sometimes brownish or reddish, medium hard; heartwood dark red brown with very dark semilunar bands, hard and tough. Leaflets glossy dark green above, pale, greyish, or glaucous beneath. Flowers pale or yellowish green to white; filaments white, anthers red. Fruits red; aril 1–2 mm thick, fleshy, grey-white or yellow, sweet.

Distribution. China (Yunnan, Hainan), Thailand, Indo-China, Malaya, Sumatra, Borneo, the southern Philippines, and Celebes.

Ecology. In primary or sometimes old secondary rain forest, sometimes in mixed

peat swamp forest, on ridges and slopes as well as on flat land, in ravines, on river banks, sometimes along roads or in open places, mostly on sand, also on loam or clay, sometimes on ultrabasic; altitude up to 400(–1350) m. Fl. mainly Febr.–July; fr. May–Sept.

Notes. 1. There is a gradual shift in the variation of some characters from West to East. In continental Asia, Malaya, and Sumatra the leaves are up to 5-jugate, in Borneo they are sometimes 6-jugate, in the Sulu Islands they may be 7-jugate, and in Celebes they are up to 8-jugate. Domatia are common in the continental Asian forms, more rare in material from Malaya and Sumatra, and rare to absent further East.

2. The present variety may be confused with *N. cuspidatum* var. *cuspidatum*, with *N. juglandifolium*, and with *N. ramboutan-ake*. For differences see under these taxa.

Specimens studied:

CHINA. Yunnan: according to Wu in Ming in Wu l.c. (*N. chryseum* var. *topengii*). – Hainan: 13 collections.

THAILAND. Southeast: Chite 131, Chanthaburi, Buan Ang (L).

INDO-CHINA. Cambodia: Béjaud 653 bis, Forêt de Phnom Penh (P). – Laos: Poilane 26234, Prov. Ht. Mékong, between M. long-nam-tha and M. sing (K); 26379, Prov. Ht. Mékong, Vienpankha (P). – Vietnam: 10 collections, all from Tonkin.

MALAYA. 21 collections from Peninsular Thailand, Perak, Pahang, Selangor, Malacca, and Johore.

SUMATRA. Atjeh: De Wilde & De Wilde-Duyfjes 13884, G. Leuser Nat. Res. (L). – Tapanuli: Junghuhn Pl. Ined. 203, Tobing. – West Coast: HB 14524, Lubu Alung; NIFS bb 6459, Sidjungdjung, Tanah Badantung. – East Coast: 4 collections. – Indragiri: NIFS bb 23875, Kuantan Districten, Muara Pantai; NIFS bb 27477, Muara Pedjangki. – Djambi: NIFS bb 13636, Danau Lama. – Palembang: 4 collections. – Banka: Kostermans & Anta 517, Lobok-besar. – Billiton: Van Rossum 18 (BO, L).

BORNEO. 42 collections from all over the island, but mainly from Sabah.

PHILIPPINES. Palawan: Elmer 12799, 12882, Puerto Princesa, Mt Pulgar. – Sulu Islands: FB 31152, Sulu (NY); Wester 2, Jolo (L).

CELEBES. Central: 8 collections. – Southwest: NIFS bb 2989, Bonthain, Sindjai, Balang Pesoang. – P. Muna: NIFS bb 6044, 21735. – P. Buton: NIFS bb 6040, Muara.

c. var. xanthioides (Radlk.) Leenh., stat. nov.

N. xanthioides Radlk., Sapind. Holl.-Ind. (1879) 9, 27. – *N. lappaceum* auct. non L.: Airy-Shaw, Kew Bull. (1940) 258.

Tree. Twigs 6–10 mm or more thick, tomentellous. Leaves 2–5-jugate; petiole 10–16 cm long, (1.5–)2.5–3.5 mm thick, above rounded to flat and sometimes grooved; petiolules 5–12 mm long, above fairly broadly and shallowly grooved to rather flat, without or sometimes with lateral ribs, without a median rib; axes tomentellous. Leaflets 9–28 by 3–10 cm, 2.5–3.5 times as long as wide, widest about the middle (upper leaflets often slightly above, lower ones slightly below the middle), beneath variably glaucous, above glabrous or sometimes in the basal half of the midrib very sparsely puberulous, beneath densely tomentellous on the midrib, more sparsely so or sometimes fairly densely appressedly short-hairy on the nerves, in between sparsely minutely hairy; domatia rare; base blunt to rounded; sides curved to some-

times nearly straight; apex tapering into a short to rather long, slender, rounded or sometimes acute acumen, nerves 0.6–1.75 cm distant along the midrib, fairly steep and only slightly curved; veins mostly densely scalariform, sometimes tending to coarsely reticulate, veinlets reticulate, beneath inconspicuous to hardly visible. Sepals 4 or 5, up to halfway connate, 0.7–1.6 mm long, on both sides densely hairy. Stamens 5 or 6. Fruits 3 by 2 by 1.25 cm, wall 1 mm thick.

Field notes. Tree up to 30 m high by 60 cm d.b.h. with buttresses up to 2 m high and up to 3 m spreading. Bark smooth or sometimes lenticellate, light, reddish, or sometimes dark brown; sapwood pale yellow, white, or pale brown, heartwood dark brown. Leaflets dark green above, yellow green below. Flowers greenish, whitish, or pinkish; anthers yellow. Young fruits green; the aril is edible and should be more juicy and sweeter than in var. *lappaceum* (but this may refer to the wild form of the latter).

Distribution. Borneo.

Ecology. In primary and secondary forest on slopes and ridges, sometimes also on flat land, sometimes on river banks and in marshes, on clay, loam, or sand, sometimes on limestone; altitude up to 600 m. Fl. March, July–Oct.; fr. Jan.–Aug.

Note. The present variety resembles *N. cuspidatum* var. *multinerve* and a Bornean form of *N. ramboutan-ake*; for differences see under the former.

Specimens studied:

BORNEO. Sarawak: Richards 2214, 4th Division, Mt Dulit, near Long Kapa (SING); Sarawak For. Dept. S 16197, Kuching, Bau, Tai Ton, Bt. Numpang. – West Kalimantan: Prawiroatmodjo & Maskuri 483, Bago Mt (K, L). – East Kalimantan: 7 collections. – Sabah: Nbfd SAN 75983, Dist. Kudat, Bengkoka For. Res.; 97262, Dist. Ranau, G. Mentapok.

11. *Nephelium laurinum* Blume – Fig. 1a, b; 3e.

N. laurinum Blume, Rumphia 3 (1847) 109; Radlk. in Engl., Pflanzenz. 98 (1933) 974; Backer & Bakh. f., Fl. Java 2 (1965) 138. – Type: *Korthals s. n.*, Sumatra, young fruits (L sh. nr. 908. 270-264; iso in L sh. nrs. 908.270-265, 276, 279, 284, & 294).

N. rubescens Hiern in J. D. Hook., Fl. Brit. India 1 (1875) 688 p.p.; Radlk. in Engl., Pflanzenz. 98 (1933) 974; Corner, Ways. Trees ed. 2 (1952) 593; Gard. Bull. Sing. Suppl. 1 (1978) 153; H. Keng, Gard. Bull. Sing. 35 (1982) 91. – Lectotype (present author): *Griffith KD 996*, Malaya, Malacca, fl. and fr. (K; iso in FI, L, M, NY, P).

N. herveyi Ridley, J. Straits Branch Roy. Asiat. Soc. 82 (1920) 180 p.p., excl. type.

N. caudifolium Ridley, Fl. Malay Penins. 1 (1922) 500; Radlk. in Engl., Pflanzenz. 98 (1933) 981. – Type: *KEP 4752*, Malaya, Selangor, Klang, Kelambu For. Res., male and female fl. (K; iso in SING).

Tree. Twigs 2–6 mm thick, puberulous and early glabrescent to glabrous. Leaves 1–6-jugate; petiole 2–10 cm long, 1–2.5 mm thick, terete to semiterete; petiolules 2–9 mm long, narrowly deeply grooved without a median rib or broadly grooved and sometimes with ± strongly developed lateral ribs or with a median rib; axes variably hairy or glabrous. Leaflets 5–18.5 by 1.5–4.25 cm, 2–5.5 times as long as wide, widest in to below the middle, stiff-pergamantaceous to coriaceous; above glabrous or sometimes very sparsely hairy on the midrib, beneath very sparsely to fairly dense-

ly puberulous on midrib and nerves, between the nerves fairly densely minutely sericeous to glabrous; domatia present; base rounded to acute, attenuate; sides straight and parallel to slightly curved; apex tapering into a short to long, broad to slender, rounded to emarginate or sometimes acute acumen; midrib above a slightly sunken or towards the apex prominulous slender rib; nerves 0.5–1.2 cm distant along the midrib, above prominulous to slightly sunken; intercalated veins well developed, nerve pattern regular and dense; veins and veinlets on both sides hardly or beneath \pm distinctly different, above mostly densely reticulate. *Inflorescences* mostly terminal, sometimes pseudoterminal, the lower branches axillary. *Sepals* up to c. 20% connate, 2–3 mm long. *Petals* 5–0, (obovate-)lanceolate, 1.6–2.3 mm long, at least the lower half woolly-ciliate. *Disk* glabrous. *Stamens* (7 or) 8. *Pistil* 2(–4)-merous. *Fruits* more often paired than in most species, slightly curved obovoid (especially when young) to ellipsoid, c. 2.5 by 1.5 by 1.25 cm, finally glabrous, fairly sparsely set with 2–3(–8) mm long triangular appendages with a short, curved, tongue-shaped apical part; wall coriaceous, hardly 1 mm thick.

Field notes. Tree up to 24 m high by up to 90 cm d.b.h. Bark smooth, grey to brown; inner bark brown, 0.5 cm thick; wood light brown, very hard. Leaflets light to middle green above, paler to glaucous beneath. Pedicels dull pinkish. Calyx dull pinkish; petals white to pinkish; stamens white. Fruits from green when young via yellow to red when ripe; aril thin, acid.

Distribution. Malaya, Sumatra, and Borneo. Blume (1847) mentions also West Java; neither material nor any later record from that area is known, however (see also Koord. & Valetton, Bijdr. Boomsoort. Java 9, 1903: 191).

Ecology. Dense jungle on wet ground, in fresh water swamps, and along rivers, locally common; altitude below 100 m. Fl. March–Aug.; fr. Jan.

Notes. 1. *Nephelium rubescens* was based upon three syntypes, viz. *Wallich 8048 G* and *H* and the *Griffith* collection cited above. As at least part of *Wallich 8048 G* represents *Litchi chinensis* Sonnerat and as *Wallich 8048 H* is *N. hypoleucum* I have lectotypified *N. rubescens* by *Griffith KD 996*.

2. The syntypes of *N. herveyi* were also a mixture; see under *N. hamulatum* note 2. The collections *Maingay 1630* and *3311* belong to the present species.

3. As the greatest width of the leaflets is often slightly above the base only, the present species may resemble *N. hypoleucum*. However, the latter species differs in the broader leaflets with a mostly rounded, sometimes tapering acuminate apex and with beneath prominent nerves; the leaflets of *N. laurinum* are mostly caudate-acuminate and the nerves are only slightly raised and inconspicuous beneath.

4. The present species is well characterised by the about parallelsided, long-acuminate leaflets and the fact that at least in the beginning relatively often both fruit lobes start developing. The leaflets of *N. subfalcatum* are of the same shape, but the venation is distinctly different: lax and stretched parallel to the nerves, whereas in *N. laurinum* it is dense, regular, and orthogonal.

Specimens studied:

MALAYA. 22 collections.

SUMATRA. Korthals s.n., incl. also Korthals in herb. Reinwardt 1696 (L). – East Coast:

Beguín 347, Bengkalis, Belakang, Bantan (M). – Indragiri: NIFS bb 30080, Muara Serange; Soepadmo 58, Pakanbaru, Tehajan R. (B, BO, L, NY). – Palembang: Kostermans 12071, Tjaban For. Res. near Muara Enim (L).

BORNEO. West Kalimantan: Hallier 2557, between G. Klam and S. Djemela (L, U).

12. *Nephelium macrophyllum* Radlk. – Fig. 4c.

N. macrophyllum Radlk., Sapind. Holl.-Ind. (1879) 9, 27; in Engl., Pflanzenr. 98 (1933) 973. – Type: Beccari PB 2500, Borneo, Sarawak, G. Mattan, fr. (FI; iso in M, NY).

Tree. Twigs 3–6 mm thick, sparsely puberulous to glabrous. Leaves 1- or 2-jugate; petiole 4–7 cm long, 1–2.5 mm thick, semiterete to above obtuse-angular; petiolules 1.5–7 mm long, thick, above slightly bulging; axes glabrous or sometimes very sparsely minutely puberulous. Leaflets 10–22.5 by 5–10 cm, c. 2–2.75 times as long as wide, widest about the middle, thick-coriaceous; above glabrous, beneath sparsely puberulous on midrib and nerves, in between fairly densely minutely sericeous; domatia present; base acute to rounded, slightly attenuate; sides curved; apex tapering into a short acute acumen; midrib above prominulous; nerves 1–3 cm distant along the midrib, above slightly sunken; few well developed intercalated veins; veins a bit tending to scalariform, above prominulous or sometimes hardly visible, beneath prominulous, veinlets finely reticulate, above prominulous to hardly visible, beneath hardly visible. Inflorescences pseudoterminal. Flowers known only from remains under the fruit. Sepals probably only slightly connate, c. 2 mm long. Petals present according to Radlkofer. Disk glabrous. Pistil 2-, rarely 3-merous. Fruits ellipsoid, c. 3.5 by 2 cm, appendages dense, bulbous-based, the upper part tongue-shaped, slightly curved, in total c. 7.5 mm long, densely ferruginous-puberulous; wall coriaceous, c. 2 mm thick.

Field notes. Tree 24 m high, d.b.h. up to 40 cm.

Distribution. Borneo.

Ecology. In primary lowland Dipterocarp forest on hill slope; alt. 90 m. Fr. Sept.

Notes. 1. I could not find a trace of petals, which were mentioned by Radlkofer, nor of stamens. However, in view of the systematic position of the present species presence of a complete or nearly complete corolla and of 8 or not much less stamens could be expected.

2. Superficially, the fruits of the present species may resemble those of *N. ramboutan-ake*. The latter species has glabrous fruits, however, and, moreover, it differs in the much thinner leaflets.

3. Vegetatively, the present species may show some resemblance to *N. melanomiscum*. As far as can be judged from the few specimens available of both species, *N. macrophyllum* is characterised by asymmetrical, slightly falcate leaflets, whereas *N. melanomiscum*, like most species of *Nephelium*, has symmetrical leaflets. The fruits of both species are distinctly different.

Specimens studied:

BORNEO. Sarawak: Beccari PB 2500, G. Mattan; Sarawak For. Dept. S 14978, Kuching Dist., Semengoh For. Res., Arboretum; S 25393, Kuching Dist., 12th mile Penrissen Road.

13. *Nephelium maingayi* Hiern — Fig. 5.

- N. maingayi* Hiern in J. D. Hook., Fl. Brit. India 1 (1875) 688 p.p., fruiting material only; Radlk., Sapind. Holl.-Ind. (1879) 69–70; in Engl., Pflanzenr. 98 (1933) 964. — *N. lappaceum* L. var. *maingayi* Valetton, Bull. Inst. Bot. Buitenzorg 15 (1902) 7, nom. inval. (I.C.B.N. Art. 34.1). — Type: to be chosen from *Maingay 1120, 1120A, 1524A*, and possibly some more fruiting *Maingay* collections, Malaya (K).
- N. lappaceum* auct. non L.: Radlk., Sapind. Holl.-Ind. (1879) 73 as to *Herb. Bogor n. 14459*.
- N. glabrum* auct. non Noronha: King, J. Asiat. Soc. Bengal 65, Pt. 2 Nat. Hist. (1896) 433; Ridley, Fl. Malay Penins. 1 (1922) 499, excl. var. *sufferrugineum* (= *N. lappaceum*); Corner, Gard. Bull. Sing. Suppl. 1 (1978) 153.
- N. lappaceum* L. var. *glabrum* auct. non Blume: Radlk., Sapind. Holl.-Ind. (1879) 73 as to *Herb. Bogor n. 14335*.
- Xerospermum* sp. Merr., Pl. Elmer. Born. (1929) 175, as to *Elmer 21703 & 21801*.

Tree. Twigs 2–7.5 mm thick, glabrous. Leaves 1-foliolate to 3(–5)-jugate; petiole 1–10 cm long, 1–3 mm thick, terete to semiterete; petiolules 4–17.5 mm long, above grooved, no ribs; axes early glabrescent or sometimes glabrous. Leaflets 5.75–22 by 2.75–9 cm, 1.5–3.5 times as long as wide, greatest width above to slightly below the middle, pergamentaceous; glabrous or beneath sometimes very sparsely hairy on midrib and nerves; no domatia; base rounded to acute, mostly attenuate; sides curved; apex without or with a blunt to acute acumen; midrib above sunken to prominulous; nerves 0.5–2.5 cm distant along the midrib, above slightly grooved to prominulous; no intercalated veins; veins and veinlets coarsely reticulate, prominulous on both sides. Inflorescences axillary to terminal. Sepals from less than halfway to nearly completely connate, 1–1.3 mm long. Petals absent. Disk hairy or glabrous. Stamens 4–6. Pistil 1-merous, style lateral, with 1 stigma. Fruits with a 2–3 mm long stipe, the body ± flattened ellipsoid, c. 2–2.75 by 1.25–1.75 by 1–1.25 cm, style remnant a small point or hook just above the stipe, the surface variably warty, slightly puberulous around and especially beneath the style remnant, furthermore glabrous; wall coriaceous, 1–1.5 mm thick.

Field notes. Tree up to 40 m high and 90 cm d.b.h., without or with up to 1.40 m high, 3 m spreading, and 5 cm thick buttresses. Bark smooth, rather inconspicuously lenticellate, sometimes fissured or flaking in large, thin, papery pieces, usually greyish to white, sometimes brownish or reddish, up to 8 mm thick; inner bark light brown to pinkish or sometimes pale yellow, powdery, soft to rather hard, mostly with a red resinous sap. Sapwood white (yellowish, pinkish, light brown), soft to hard; heartwood brown to red, with a sweet smell, usually hard. Leaves glossy dark green above, dull yellowish green beneath. Flowers pale green to yellowish or white. Fruits red, brown, or black when rip; aril white, sweet.

Distribution. Malaya, Sumatra, and Borneo.

Ecology. Primary and secondary forests on flat land (often peat swamps and periodically flooded river banks), slopes, and ridges, apart from peat often on sandy or clay soils, mostly at low to medium altitudes, exceptionally at 1000–1600 m. Fl. mainly Jan.–April, also July–Oct.; fr. March–April and Aug.–Nov.

Notes. 1. Hiern's *N. maingayi* was a mixture. The description was mainly based



Fig. 5. *Nephelium maingayi* Hiern. a. Part of twig with female inflorescences, $\times 0.5$; b. female flower, $\times 12.5$; c. fruit, natural size (a & b from NBFD SAN 65365, c from NBFD SAN 38799).

upon flowering material, which represents *Xerospermum noronhianum* Blume; very briefly immature fruits have been mentioned. Radlkofer (1879) already realised that under the name *N. maingayi* very different plants were combined, and he typified the name with the fruiting material, that is the *Nephelium* part. Later on, in Malaya the name *N. glabrum* was consistently used, going back to Noronha. However, Noronha's name is a *nomen nudum* and refers to all probability to a form of *N. lappaceum* cultivated in Java. Accordingly, the correct name for the present species is *N. maingayi* Hiern as emended by Radlkofer.

2. *Nephelium maingayi* is the most derived species of the genus as far as the flower characters are concerned: a highly connate calyx, no petals, 4–6 stamens only, and a 1-merous pistil.

3. At first sight it seems possible to distinguish between two taxa, the one characterised by rather broad, hardly or not acuminate, coarsely reticulate leaflets, the calyx less than halfway connate, disk annular and glabrous, and fruits smooth, the other one by usually narrower, more distinctly acuminate leaflets with more dense nerves and a finer reticulation, the calyx more than halfway connate, disk consisting of mostly hairy knobs between the stamens, and warty fruits. Furthermore, in Borneo the first kind has more often 1-jugate, the latter 2- or 3-jugate leaves. However, there is neither a good correlation between these characters, nor any correlation with ecology or geography, and accordingly a sharp delimitation between two taxa is not possible.

Specimens studied:

MALAYA. 56 collections.

SUMATRA. 30 collections from different parts of the island, incl. also Simalur, Banka, Billiton, and the Riouw and Lingga Archipelago.

BORNEO. About 100 collections from all over the island.

14. *Nephelium meduseum* Leenh., *spec. nov.* — Fig. 2c; 3d.

Descriptio typi: Arbor mediocris. Ramuli 4 mm crassi, puberuli, glabrati. Folia 2- vel 3-jugata; petiolus 2–4 cm longus, 1,5–2 mm crassus, supra applanatus; petioluli 4–6 mm longi, supra sulcati, costati vel ecostati; axes foliorum sparse puberuli vel glabri. Foliola 5–12 cm longa, 2,5–4,5 cm lata, oblonga, coriacea, costa supra puberula, glabrata, subtus costa nervisque sparse pilosa, inter nervos sparse minute scircea, glabrata; domatia absunt; basis acuta ad obtusa; margo curvatus; apex subacuminatus, acumine lato obtuso; costa gracilis, supra vix prominens; nervi secundarii inter sese 0,75–1 cm distantes, supra paulo immersi; venae intercalares paucae, distinctae; reticulum venarum venularumque subtile, supra vix prominens, subtus inconspicuum. Inflorescentiae terminales. Sepala confluentia. Pistillum bilobatum. Fructus ellipsoidei 4 cm longi, 2,5 cm crassi, processis filiformibus curvatis ca. 15 mm longis fulvo-puberulis basi incrassatis dense obtecti. — **Typus:** Sarawak Forest Dept. *S 41142*, Borneo, Sarawak, 1st Division, G. Gahru, Sabal For. Res., Mile 72 Kuching–Simanggang Rd., fr. (K; iso in L).

Tree. Twigs 3–5 mm thick, tomentellous, fairly early glabrescent. **Leaves** 2–5-jugate; petiole 2–7 cm long, 1.5–2 mm thick, semiterete; petiolules 3–12 mm long, broadly shallowly grooved, mostly with a broad but not very strong median rib; axes puberulous, glabrescent. **Leaflets** 5–12.5 by 2.5–5 cm, 2–3 times as long as wide, widest in the middle, thin-coriaceous to stiff-pergamentaceous; above puberulous

along the midrib, mostly early glabrescent, beneath on midrib and nerves rather long-hairy, mainly glabrescent, further glabrous or nearly so; no domatia; base acute to obtuse, slightly attenuate; sides curved; apex either tapering acuminate with a fairly long, broad, blunt acumen, or acutely apiculate, or not acuminate at all; midrib above a slender prominulous rib; nerves 0.75–1 cm distant along the midrib, above slightly sunken; intercalated veins mostly well developed though usually only few per leaflet; veins and veinlets above together finely reticulate, prominulous, beneath veins coarsely reticulate to scalariform, veinlets as above to inconspicuous. *Inflorescences* terminal. *Flowers* based upon old ones and the remains under the fruit. *Sepals* hardly connate. *Petals* at least 3 present, 1.6 mm long, claw slender, 1 mm long, plate ovate, 0.7 mm wide, the margin in the basal half of the plate incurved, sparsely woolly but for the apex and the inside of the plate. *Disk* glabrous. *Pistil* 2-merous. *Fruits* ellipsoid to subglobular, 3.25–4 by 2.5–3 cm, densely fulvous puberulous, densely set with filiform, curled, c. 15 mm long, at base swollen appendages; wall coriaceous, c. 1 mm thick.

Field notes. Tree up to 21.5 m high by 40 cm d.b.h. with buttresses up to 1.20 m high, 2.40 m wide, and 4 cm thick. Bark smooth, greybrown, sometimes orange- or redbrown, mottled, thin and hard; inner bark redbrown to brown, soft or hard; sapwood pale yellow to deep yellow pink, soft to medium hard. Leaves glaucous beneath. Fruits green over yellow to red; the aril edible and sweet.

Distribution. Borneo.

Ecology. In primary (Mixed Dipterocarp) forest on hills, ridges, and slopes, on yellow sandy clay; altitude up to 450 m. Fr. Jan., Oct.

Notes. 1. The number of stamens is unknown, but in view of the relatively primitive flower it seems reasonable to suppose that this will be about 7 or 8.

2. In contrast to all other *Nepheliums* studied by me the embryo does not fill up the seed completely; the sclerotesta is relatively thick and very hard, inside fibrous, and an inner layer seems to split off and surrounds the embryo. Whether this is natural or is caused by the drying of a soft inner layer is not clear.

3. The present species seems nearest to *N. costatum* and *N. melliferum*; see under the former species.

4. The leaves strongly resemble those of *N. daedaleum* and *N. hamulatum*; the latter two differ, however, by the dense indumentum on the lower side of the leaflets.

Specimens studied

BORNEO. Sarawak: Sarawak For. Dept. S 32399, 5th Division, Ulu Medamit, Limbang; S 37985, 1st Division, Semengoh Arboretum; S 41142 (type), 1st Division, G. Gahru, Sabal For. Res. – Brunei: BRUN 584, s.5930, Andulau For. Res.; 873, base of Bt. Badawan; 3302, Bt. Patoi. – West Kalimantan: NIFS bb 18635, Sanggau.

15. *Nephelium melanomiscum* Radlk.

N. melanomiscum Radlk., Sapind. Holl.-Ind. (1879) 74; in Engl., Pflanzenz. 98 (1933) 972; non W. Meijer, Bot. Bull. Herb. San. 10 (1968) plate between p. 138 and 139 (= *N. subfalcatum*).
– Type: *Beccari PB 3918*, Borneo, Sarawak, Igan R., Rejan, fl. (FI).

N. xerospermoides Radlk., *Leafl. Philipp. Bot.* 5 (1913) 1608; in Engl., *Pflanzenr.* 98 (1933) 976.
 — *Syn types*: *Elmer 11205*, Philippines, Mindanao, Dist. of Davao, Todaya, Mt Apo, Sibulan R. (BO, FI, K, L, M, NY, U, WRSL); *FB 15215*, Philippines, Mindanao, Dist. of Zamboanga, Port Banga (K, M).

Tree. *Twigs* 2–4.5 mm thick, when young puberulous or tomentellous, soon glabrous. *Leaves* 1-foliolate to 5-jugate; petiole 1–6 cm long, 1–2 mm thick, terete to semiterete, sometimes grooved above; petiolules 3–8 mm long, above broadly to narrowly deeply grooved, with or without a median rib; axes sparsely puberulous to glabrous. *Leaflets* 3.5–14 by 1.5–6 cm, 1.75–4.5 times as long as wide, widest in or sometimes slightly above or below the middle, pergamentaceous; above glabrous or puberulous on the base of the midrib, beneath sparsely minutely sericeous all over, sometimes glabrescent; Philippine material with, Bornean with or without domatia; base acute (to rounded), slightly attenuate; sides curved; apex rounded to emarginate or tapering into a short to long, narrow to broad, acute to rounded acumen; midrib above prominulous (to sunken); nerves 0.75–1.5 cm distant along the midrib, above prominulous to grooved; intercalated veins mostly well developed; veins and veinlets mostly well differentiated, especially beneath, ± finely reticulate, above often more prominent than beneath. *Inflorescences* terminal, probably also sometimes pseudoterminal. *Sepals* variably connate (less than 30% up to c. 65%), 1.3–1.75 mm long. *Petals* not seen (according to Radlkofer 2 or 3 reduced ones present). *Disk* glabrous. *Stamens* 6. *Pistil* 2- or rarely 3-merous. *Fruits* ellipsoid, c. 3.75 by 2.5 cm, densely fulvous puberulous, at least in the upper half of the appendages, these dense, 1.5–2 mm high, not differentiated into a basal and an apical part, to the base of the fruit forming longitudinal ribs, in the central part of the fruit triangles, to the apex pyramidal warts; wall fairly hard, c. 0.75 mm thick.

Field notes. Tree up to 20 m high and 36 cm d.b.h. with up to 1.20 m high thin buttresses. Bark smooth, or scaly, or with small warty lenticels, either orange brown, or grey and white mottled, thin and hard; inner bark thin, deep brown or reddish, fibrous; sapwood yellow pink or ochre, heartwood reddish, moderately hard. Leaflets above deep green and lucid, beneath glaucescent, midrib yellowish. Fruits pink to red, edible, sour.

Distribution. Borneo and the Philippines (Mindanao).

Ecology. Primary and old secondary forest on slopes, river banks, and hill tops, on fertile alluvial soil; altitude up to 375(–1350) m. Fl. Oct.; fr. Jan.

Notes. 1. The present species may resemble *N. macrophyllum*; for differences see there.

2. A collection that may belong to the present species is *Carr SF 26694* from Mt Kinabalu, Menetendok-Kinataki Divide at about 1000 m a.s.l. This collection resembles more the Philippine than the Bornean material of the present species. It differs from both mainly in the following characters: leaves up to 6-jugate, the petiole up to 10 cm long and 2.5 mm thick, the petiolules up to 1 cm long and hardly or not grooved, leaflets up to 16 cm long, the sides slightly curved only, the intercalated veins hardly developed, the veins and veinlets hardly different, and the fruit appendages hardly confluent.

Specimens studied:

BORNEO. Sarawak: Beccari PB 3918, Igan R., Rejan. – Brunei: BRUN 869, Ulu Supon. – West Kalimantan: NIFS bb 28328, Melawi, B. Melaban ketjit. – Sabah: Nbfd 4866, Sandakan Dist., Kabili For. Res.; Nbfd SAN 28292, Ranau Dist., Kundasang; Nbfd SAN 61090, Sandakan Dist., Bt. Tangkunan.

PHILIPPINES. Mindanao: Elmer 11205, Dist. of Davao, Todaya, Mt. Apo, Sibulan R.; FB 15215, Dist. of Zamboanga, Port Banga.

16. *Nephelium melliferum* Gagnepain

N. melliferum Gagnepain, Notul. Syst. (Paris) 13 (1947) 35; Fl. Indo-Chine Suppl. 1 (1950) 969, f. 122: 8–13. – Lectotype (present author): *Poilane 29554*, Vietnam, Annam, Quang Nam Prov., Poste 6 (P; iso in K).

N. parviflorum Gagnepain, Notul. Syst. (Paris) 13 (1947) 36, nom. illeg., non Walp. (1845); Fl. Indo-Chine Suppl. 1 (1950) 968, f. 122: 1–7. – Type: *Poilane 29448*, Vietnam, Annam, Quang Nam Prov., Poste 6 (P).

Tree. Twigs 2.5–7 mm thick, (sub)glabrous. Leaves 1–5-jugate; petiole 2–7.5 cm long, 1.25–2 mm thick, semiterete to sometimes terete; petiolules 3–9 mm long, either narrowly and deeply grooved without, or broadly and shallowly grooved with a faint to strong median rib; axes (sub)glabrous. Leaflets 4.5–16 by 2–6 cm, 1.5–4.5 times as long as wide, widest above to below the middle, pergamentaceous; above sparsely puberulous on the midrib to glabrous, beneath the same and sometimes \pm sparsely minutely sericeous all over; no domatia; base acute to blunt or sometimes rounded, sometimes attenuate; sides curved to nearly straight; apex mostly rounded, sometimes either emarginate, or acute to slightly acuminate; midrib above either prominulous or sunken; nerves 0.5–1.5 cm distant along the midrib, above prominulous to sunken; intercalated veins strongly developed, making the nerve pattern rather irregular; veins and veinlets above hardly, beneath sometimes distinctly different, above densely reticulate, prominulous on both sides. Inflorescences pseudoterminal to terminal. Sepals nearly free, 1–1.8 mm long. Petals 5–2, elliptic, narrowed at the base, 0.8–1.3 mm long, both sides woolly, no scale. Disk glabrous. Stamens (7 or) 8. Pistil 2-merous. Fruits ellipsoid, 3.25–4 by 2.25 cm, the appendages fairly dense to dense, at base triangular, pyramidal, or conical, tapering into a tongue- or strap-shaped curved upper part, in total up to 6 (rarely up to 9) mm long, \pm densely golden brown puberulous; wall coriaceous, thin.

Field notes. Tree up to 27 m high and 60 cm d.b.h. Bark smooth, grey and fawn dippled; inner bark firm, finely textured, brown with faint paler markings; wood pale brown. Flowers white, sometimes creamy, fragrant, rich in nectar. Fruits red when ripe.

Distribution. Thailand, Vietnam, and Malaya.

Ecology. In evergreen or sometimes deciduous forests, on steep ridges, on sandstone; altitude up to 800 m. Fl. March, June, and Dec.; fr. April–July.

Notes. 1. The two collections from the Malay Peninsula differ slightly from those of the Indochinese Peninsula by the broader, blunt to rounded base of the leaflets and the more sparse and shorter (1.5–2 mm) fruit appendages.

2. The present species seems nearest to *N. hypoleucum* and *N. laurinum*. It differs from both in the absence of domatia and in the hairy fruit appendages. Furthermore, *N. hypoleucum* differs in the only minutely warty fruits and the \pm ovate leaflets; *N. melliferum* has at most a few leaflets with the greatest width just below the middle. *Nephelium laurinum* differs also in the mostly about parallelsided, often long-acuminate leaflets. One of the two collections of Malaya, *KEP FRI 20336*, has the slightly curved oblong fruits which are typical for *N. laurinum*, but the appendages are densely hairy. The type of *N. laurinum* from Sumatra, on the other hand, bears very young fruits that resemble those of *N. melliferum*, but the appendages are already nearly glabrous. These three species, which show also a geographical overlap, are doubtless closely allied and the separation rests only on the assumption that hairy or glabrous fruits, the kind of fruit-appendages, and minor details of leaf shape and venation are specific characters.

3. *Nephelium hamulatum* shows also some resemblance to *N. melliferum*, but is easily distinguishable by the mostly rather dense indument on the lower side of the leaflets.

4. Sterile and flowering material of the present species may show a strong resemblance to *Mischocarpus pentapetalus* Radlk. The latter differs amongst others by the more lax and far more distinct venation and by the longer, to the apex more petal-like sepals, which are thinly strigose hairy, whereas in the present species they are densely puberulous.

Specimens studied:

THAILAND. 6 collections.

VIETNAM. 8 collections, all from Annam.

MALAYA. Peninsular Thailand: Kerr 15869, Dist. Songkhla, Klawng Samawng. — Trengganu: *KEP FRI 20336*, G. Kerbat, above Kuala Petang.

17. *Nephelium papillatum* Leenh., *spec. nov.* — Fig. 6.

Descriptio typi: Arbor sat alta. Ramuli 3–4 mm crassi, glabri. Folia 2–4-jugata; petiolus 2,5–5 cm longus, 1–1,5 mm crassus, subteres; petioluli ca. 5 mm longi, supra anguste profunde sulcati, ecostati; axes foliorum glabri. Foliola 5–8 cm longa, 2–3,5 cm lata, elliptico-oblonga, rigide pergamentacea, glabra; domatia absunt; basis acuta ad obtusa; margo curvatus; apex vix acuminatus acumine obtuso; costa supra paulo sulcata ad plana; nervi secundarii inter sese 0,5–1,25 cm distantes, curvati, supra vix prominentes; venae intercalares distinctae; venae venulaeque satis laxe reticulatae, supra plus prominentes quam subtus. Inflorescentiae pseudoterminales. Pistillum bilobatum. Fructus ellipsoidei 2,25 cm longi, 1,75 cm crassi glabri, processis pyramidalibus papillatis ca. 3 mm altis subdense obtecti; pericarpium subligneum 1 mm crassum. — *Typus*: *NBFD SAN 41845*, Borneo, Sabah, Dist. Tambunan, Mt Trusmadi above Sg. Kidukaruke (L; iso in SAN).

Tree. *Twigs* 1.5–3.5 mm thick, glabrous. *Leaves* 1–3-jugate; petiole 2–5 cm long, 1–1.5 mm thick, semiterete; petiolules 5–8 mm long, above narrowly deeply grooved without a median rib; axes glabrous. *Leaflets* 4.5–10.5 by 2.5–4.5 cm, c. 2 times as long as wide, widest about the middle, stiff-pergamentaceous; glabrous; no domatia; base acute to obtuse, attenuate; sides curved; apex hardly blunt-acuminate; midrib above slightly sunken to flat; nerves 0.5–1.25 cm distant along the midrib, pro-



Fig. 6. *Nephelium papillatum* Leenh., part of twig with leaves and fruits, $\times 0.66$ (Nbfd SAN 41845).

minulous above; intercalated veins well developed, making the nervation \pm irregular; veins and veinlets rather coarsely reticulate, slightly more prominent above than beneath. *Inflorescences* axillary, together partly pseudoterminal. *Flowers* known only from remains under the fruit. *Sepals* 5, outside at least sparsely puberulous. *Disk* glabrous. *Stamens* 7. *Pistil* 2-merous. *Fruits* ellipsoid, 2.25 by 1.75 cm, glabrous, appendages fairly dense, pyramidal with a nipple-like appendage up to 2 mm long, in total c. 3 mm high; wall rather woody, 1 mm thick.

Field notes. Tree up to 36 m high and 60 cm d.b.h. with buttresses up to 2 m high, 75 cm spreading, and 10 cm thick; bark smooth, outer pale red, hard, inner pale yellowish, cambium very thin, yellowish to white; sapwood white; sap at first clear, turning red.

Distribution. Borneo.

Ecology. Primary hill and mountain forest at 1350–1950 m altitude on sandstone. Fr. Nov.

Specimens studied:

BORNEO. Sabah: Nbfd SAN 38659, Dist. Ranau, Kinabalu, above Sosopodon, bud (L); Nbfd SAN 38723, Dist. Ranau, Jalan Iering tembus ladang (SAN); Nbfd SAN 41845, Dist. Tambunan, Mt Trusmadi, above Sg. Kidukaruke (L, SAN).

18. *Nephelium ramboutan-ake* (Labill.) Leenh., *comb. nov.*

Litchi ramboutan-aké Labill. in DC., Bull. Soc. Philomath. Paris 2 (1801) 161 ('litsea'). – *Euphoria ramb-outan-aké* Labill., Mém. Inst. Sci. Divers Savans Sci. Math. 1 (1806) 474, pl. 2, nom. illeg. – Type: herb. Jussieu 11382 (P), IDC microfiche seen.

N. mutabile Blume, Rumphia 3 (1847) 104; Radlk. in Engl., Pflanzenr. 98 (1933) 967. – Lectotype (present author): *Blume s.n.* in herb. L 908.272-20, 29, 40, 48 & 925.250-624.

N. mutabile Blume var. *rigida* Blume, Rumphia 3 (1847) 104. – Syn types: *NN.* in herb. L 908.272-17 & 37.

N. mutabile Blume var. *trigyna* Blume, Rumphia 3 (1847) 104. – Type: *NN.* in herb. L 908.272-6 & 57.

N. glabrum Noronha var. *rubrum* Hassk., Pl. Jav. Rar. (1848) 290, nom. inval. (I.C.B.N. Art. 43.1). – Type: unknown.

N. glabrum Noronha var. *nigrum* Hassk., Pl. Jav. Rar. (1848) 290, nom. inval. (I.C.B.N. Art. 43.1). – Type: unknown.

N. glabrum Noronha var. *album* Hassk., Pl. Jav. Rar. (1848) 290, nom. inval. (I.C.B.N. Art. 43.1). – Type: unknown.

N. griffithianum Kurz, J. Asiat. Soc. Bengal. 41, Pt. 2 Nat. Hist. (1872) 303. – Lectotype (present author): Griff., Ic. Pl. Asiat. 4 (1854) pl. 599: I.

N. intermedium Radlk. in Perkins, Fragm. Fl. Philipp. 1 (1904) 61; in Engl., Pflanzenr. 98 (1933) 963; non Elmer, Leaf. Philipp. Bot. 10 (1939) 3803 (= *Dimocarpus fumatus* Leenh. subsp. *philippinensis* Leenh.). – Syn types: *Ahern 204*, Luzon, Prov. Camarines Sur, Pasacao (M); *Warburg 116 72*, Luzon, Malunu (M); *12007*, Luzon, Prov. Isabela, Digamai (not seen), *14287*, Mindanao, Davao Sibulan, Mt Dagatpan (not seen); *14918*, Jolo I. (M); not *13109* (= *Dimocarpus longan* Lour. subsp. *malesianus* Leenh.).

N. philippense Monsalud et al., Philipp. J. Sci. 95 (1966) 541, nom. inval. (I.C.B.N. Arts. 34.1 (b) and 36.1).

Euphoria longana auct. non Lam.: Blume, Bijdr. (1825) 233.

N. glabrum auct. non Noronha: Hassk., Pl. Jav. Rar. (1848) 290.

Sapindaea sp. Griff., Not. Pl. Asiat. 4 (1854) 550; Ic. Pl. Asiat. 4 (1854) pl. 599: I.

Cubilia blancoi auct. non Blume: Vidal, Rev. Pl. Vasc. Filip. (1886) 96; Ceron, Cat. Pl. Herb. Manila (1892) 54.

N. sp. Ceron, Cat. Pl. Herb. Manila (1892) 55 (*Vidal 215*).

N. chryseum auct. non Blume: King, J. Asiat. Soc. Bengal 65, Pt. 2 Nat. Hist. (1896) 437; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 66.

Tree. Twigs 1.5–7 mm thick, puberulous or tomentellous, either long remaining so or early glabrescent to sometimes glabrous nearly from the beginning. Leaves (1-foliolate or) 1–7-jugate; petiole 0.75–11.5 cm long, 0.75–2.5 mm thick, terete to semiterete; petiolules 3–8 (in the Philippines up to 12.5) mm long, mostly narrowly and deeply grooved without or with only a faint median rib, sometimes very broadly

and shallowly so and with a stronger rib; axes densely hairy to glabrous. *Leaflets* 4–20 by 1.75–11 cm, 1.75–4.5 times as long as wide, widest in or especially in the Philippines more often slightly below the middle, thin-pergamentaceous to thin-coriaceous; above puberulous on the midrib to glabrous, beneath sparsely puberulous on the base of the midrib, furthermore all over the surface densely minutely sericeous, to sometimes glabrous; domatia mostly common, sometimes scarce or absent; base acute or (especially on the Asian continent and in the Philippines) in lower leaflets blunt to rounded, attenuate; sides mostly curved, sometimes nearly straight; apex mostly acuminate, the acumen usually short, broad, obtuse; midrib above prominulous to exceptionally slightly sunken, usually a slender rib, in the Philippines often broader and more rounded; nerves 0.5–2 cm distant along the midrib, above slightly sunken to sometimes prominulous; intercalated veins variable; venation mostly laxly reticulate, \pm tending to scalariform, sometimes conspicuously and rather densely scalariform, either above prominulous, beneath hardly visible, or in the eastern races prominulous on both sides. *Inflorescences* axillary, partly together pseudoterminal. *Sepals* slightly or up to halfway connate, 1–2.75 mm long. *Petals* absent. *Disk* glabrous. *Stamens* 5–8. *Pistil* 2- (rarely 3-)merous. *Fruits* ellipsoid to subglobular, 4–6.5 by 2.5–5 cm, glabrous, densely coarsely spiny, the spines bulbous-based and often confluent at the base, or sometimes knobby with short tongue-shaped appendages, the spines up to 1.5 cm long; wall coriaceous, up to 7 mm thick.

Field notes. Tree or exceptionally shrub, mostly less than 10 m, sometimes up to 36 m high, d.b.h. up to 60 cm, bole straight or crooked, sometimes fluted or knobby, with up to 2.40 m high, to 2.10 m spreading, and to 7.5 cm thick, sometimes branching buttresses. Bark mostly smooth or lenticellate, not rarely scaly, sometimes rough, reddish, brownish, or greyish, more rarely black or white, inner bark reddish, brownish, or yellow, sometimes whitish, greyish, greenish, or orange, fibrous or granular, with some sap; cambium white, yellow, brown, or red; sapwood white, yellowish, or brownish; heartwood pinkish to dark brown, rather hard. Leaflets dark green above, beneath glaucous. Flowers slightly fragrant; calyx pale green or white; disk ochre; filaments white; anthers light yellow. Fruits yellow, red, or black when ripe; aril whitish, sweet.

Distribution. Assam, Burma, Malaya, Sumatra, Java (doubtful), Borneo, the Philippines, and the Moluccas (original?).

Ecology. Primary or sometimes secondary forest on flats as well as on slopes, often on river banks but rarely in swamps, usually on sand or clay, more rarely on rocky soil, then mostly sandstone or basalt, rarely limestone; altitude 0–200 (–1950) m. Fl. mainly Febr.–April and July–Sept.; fr. May–July and Oct.–Dec.

Uses. Cultivated as a fruit tree. See Heyne, *Nutt. Pl. Ned.-Ind.* ed. 2 (1927) 999; Ochse, *Ind. Vrucht.* (1927) 256, f. 123 & 124; Ochse & Bakh., *Fruits Fruitcult.* (1931) 143, pl. 56; Burkill, *Dict.* (1935) 1547.

Vernacular names. Among the many names recorded the most common are (*ka*)*pulasan* in Malaya, Sumatra, and Java, *meritam* or *maritam* in Borneo (especially Sarawak and Sabah), and *bulala* in the Philippines.

Notes. 1. The present author regrets very much the unavoidable change of the

well known and commonly used name *N. mutabile* into *N. ramboutan-ake*. The latter name, though 46 years older than *mutabile*, well described and reasonably well figured, has been forgotten for some 180 years and should have lost its right of priority. However, under the present rules there seems to be no possibility to avoid absurdities like these, even though they are contrary to the stability in nomenclature which should be the prime aim of the code.

The nomenclature of Labillardière's name itself is also rather confused. The first publication is a summary, signed D.C., doubtless A. P. DeCandolle, apparently of a lecture by Labillardière on two species of *Litchi* from the Moluccas. However, erroneously, and contrary to the title, the combination *Litsea ramboutan-aké* is given. In that same paper the genus *Nephelium* L. 1767 is reduced to *Litchi* Sonnerat 1782, and as it is made clear that *Litchi ramboutan-aké* belongs to the *Nephelium* part of *Litchi* this combination could be considered illegitimate. The complete 'Mémoire' was only published in 1806, under the same title. Here the combination *Euphoria ramb-outan-aké* was proposed, also illegitimate as *Euphoria* Jussieu 1789 was a superfluous new name for *Litchi*.

2. The present species is rather a variable one, as already expressed by Blume in his specific epithet *mutabile*. Typical material, as it is commonly found in Malaya, Sumatra, Java, and Borneo is characterised by thin-pergamentaceous leaflets which are commonly rolled up in the herbarium, contrary to most other species of *Nephelium*; they are reddish brown above and glaucous beneath; the midrib is above slightly raised and slender, the nerves are obliquely patent, rather steep, and distinctly curved; domatia are common; the reticulation is fairly lax and mainly visible above.

The most conspicuous deviating form is restricted to Borneo and is characterised by 1–3-jugate leaves, relatively big, thin-coriaceous leaflets which are glabrous above and often so beneath, lack domatia, the midrib is above hardly raised to slightly sunken and more rounded, the nerves are dense, steep, and nearly straight, the veins and veinlets are clearly different, the former mostly rather densely scalariform and raised on both sides, the latter more vaguely laxly reticulate. This form resembles *N. lappaceum* var. *xanthioides* but differs by the leaflets, which are nearly glabrous beneath at least on the midrib, by the midrib, which is at least at the base slightly raised above, and by the mainly axillary inflorescences and especially infructescences; *N. lappaceum* var. *xanthioides* has the midrib beneath densely hairy, above at base slightly sunken, and has terminal inflorescences and infructescences. The Philippine material lies more or less in between the typical form and the deviating Bornean one.

Nephelium intermedium represents a morphologically extreme population from the Philippines, mainly characterised by the relatively long and slender fruit appendages. The only character given by Radlkofer which does not fit in with *N. ramboutan-ake* is the hairiness of the disk. I could not check this in the very fragmentary type material left; comparable Philippine collections have a glabrous disk. However, one of the syntypes of *N. intermedium*, viz. *Warburg 13109*, represents *Dimocarpus longan* Lour. subsp. *malesianus* Leenh. and this flowering specimen has a hairy disk, so this may be the source of the mistake. Apparently, with the name *intermedium* Radlkofer

intended to express that this species took a position in between *N. ramboutan-ake* and *N. lappaceum* var. *pallens*, in general appearance as well as in some characters.

Nephelium griffithianum seems at first sight different from *N. ramboutan-ake*. However, *Rock 2081* from Burma seems on the one hand conspecific with *Reporter Economic Products 11068* from Assam, typical *N. griffithianum* in the opinion of the present author, on the other hand connected with some rather extreme populations of true *N. ramboutan-ake*. However, this conclusion cannot yet be definite as these areas are only very poorly represented among the material available.

Quite unusual are the fruits of *Kostermans 13333* (E. Kalimantan, Sangkulirang Dist., Mt Medadem, N. of Sangkulirang): the appendages are very dense, thick knobby, c. 5 mm high, and lack an apical part; they resemble small fruit heads of a *Pandanus*.

3. It is difficult to say whether the rather few and mostly old collections from Java are gathered from wild trees, even though at least West Java lies within the natural area of the species. The occurrence in the Moluccas does not seem natural: phytogeographically it lies distinctly outside the area of the species, the collections seen by me represent the typical western, not the Philippine form, and at least the collections made by Labillardière in the early 1790's were derived from cultivated trees, which were said to have been imported by Chinese.

4. The present species may easily be confused with *Dimocarpus longan* Lour. var. *echinatus* Leenh. because of a sometimes strong resemblance in the leaves, whereas the fruits are nearly identical. In principle, both species are clearly different in the kind of hairs they bear; the former has solitary hairs, the latter stellate hair tufts. However, both may be nearly glabrous, in which case *N. ramboutan-ake* has only very sparse minute appressed hairs on the lower leaf side, whereas *Dimocarpus longan* var. *echinatus* has a few minute hair tufts on the lower side of the nerves only. Not only are the hairs in both cases very scarce, moreover they may be so minute that even at 10 × magnification they are hardly visible. A good additional character is that the bark of the twigs is usually white in *Dimocarpus longan*, brownish in *N. ramboutan-ake*.

5. The fruits of the present species may resemble those of *N. macrophyllum*; for differences between these two species see there.

6. *Nephelium lappaceum* var. *pallens* may distinctly resemble the present species. Good characters in which the former differs from the latter are amongst others the midrib which is above flat to sunken instead of mostly raised, the veins and veinlets that are above slightly raised instead of inconspicuous, the reticulation which is rather dense instead of lax, the absence of domatia, and the velutinous disk.

Specimens studied:

INDIA. Assam: Reporter on economic products to the Government of India 11068, Dekho Valley (K).

BURMA. Upper Burma: *Rock 2081*, SE. Shan States, Keng Tung Territory, valley of the Meh Len between Muang Hpyak and Pang Sop Lao (K).

MALAYA. Peninsular Thailand: Lakshnakara 675, Ban Pari, Toh Moh (K, L, P). – Perak: King's coll. 6478, Larut; 8675, near Ulu Selangor. – Kelantan: KEP FRI 7129, SE., Ulu Sungai

Lebir Kechil, near Trengganu border; FRI 17733, Ulu Kelantan, Ulu Lebir For. Res. – Trengganu: KEP FRI 10648, Ulu Trengganu, Ulu S. Trenggan between K. Biwa and K. Taat; FRI 11814, Ulu Trengganu, Bt. Langut For. Res.; SF 33491, Kuala Berang. – Pahang: 4 collections. – Selangor: 8 collections. – Malacca: Alvins 837 & 899, Gaong Jalan (SING). – P. Penang: Cantley's coll. 3158 (SING). – Singapore: 8 collections.

SUMATRA. Forbes 2836. – Atjeh: NIFS bb 9785, Tamijang, near Kg. Perupuk. – West Coast: Meijer 5991, Pajakumbuh region, Sibabu-kabu (L); NIFS bb 6658, Agam, near Kg. Malalak; NIFS S.W.K. I-28. – East Coast: Lörzing 17406, Medan; Yates 2240, Asahan, Bunut. – Palembang: 5 collections.

JAVA. Blume, the types of *N. mutabile*, *N. mutabile* var. *rigida* and var. *trigyna* cited above; Junghuhn 68. – West: Boerlage s.n., kampong near Kedung halang (L); Hallier s.n., near Buitenzorg (BO).

BORNEO. About 150 collections from all over the island.

PHILIPPINES. Palawan: FB 31329, Aboado (NY). – Mindoro: BS 40692, Mt Halcion (K); BS 41074, Pinamalayan (K); PNH 3598, Mt Halcion. – Luzon: 34 collections. – Samar: Ramos Philippine Plants 1631; Sablaya 70, Catubig R. (K). – Leyte: FB 12887 (M); Wenzel 527, 535, 655. – Sulu Islands: Warburg 14918, Joló (M). – Mindanao: FB 21645, Surigao Prov. (K); Santos 4151, Basilan City (L); Williams 2948, Davao Prov., Santa Cruz (K, NY).

MOLUCCAS. Batjan: NIFS bb 23167; de Vogel 3905, 3928 (L).

Cultivated in Indonesia, Bogor Botanic Gardens (III.H.8, III.H.19, Neddy 13), in Java, Buitenzorg (Backer 37639; Bakhuizen van den Brink fil. 1405; Koorders 37549, 37571); in Sabah, Sandakan (NBFID A 3044); in Porto Rico, Trujillo Plant Station (Britton 9962).

19. *Nephelium reticulatum* Radlk.

N. reticulatum Radlk., Sapind. Holl.-Ind. (1879) 9, 27; in Engl., Pflanzenz. 98 (1932) 955. – Type: *Beccari PB 2819*, Sarawak, Ulu Sarawak, fr. (FI).

Tree. Twigs 4–5 mm thick, the youngest parts puberulous, furthermore glabrous. Leaves 4(–7)-jugate; petiole 6–18.5 cm long, 1.5–3 mm thick, terete to slightly hollowed above; petiolules 2–10 mm long, narrowly and deeply to broadly and shallowly grooved, without any or with 3 ribs; axes thinly puberulous, glabrescent. Leaflets 6.5–20 by 2.5–5.5 cm, 2–4 times as long as wide, widest in or sometimes below the middle, pergamentaceous; glabrous or sometimes beneath sparsely puberulous on the midrib and with few scattered, appressed, minute hairs all over the surface; no domatia; base rounded to acute, attenuate; sides slightly curved; apex abruptly to tapering acuminate, acumen short to fairly long, cuneate, acute; midrib above a slightly sunken fine rib; nerves 0.75–1.25(–1.5) cm distant along the midrib, above prominent; intercalated veins variably developed; veins and veinlets conspicuously moderately coarsely reticulate, prominent on both sides. Inflorescences terminal and axillary. Flowers often male and female in the same inflorescence. Sepals nearly free or up to c. 40% connate, 1–1.2 mm long. Petals 5–0, up to 1.8 mm long, claw 1 mm, plate 1.5 mm wide, outside sparsely, inside densely hairy but for the upper half of the plate. Disk glabrous. Stamens 5–8. Pistil 2-merous. Fruits ellipsoid, 4 by 2.5 cm, the appendages thin-puberulous, possibly glabrescent, appendages dense, narrowly strap-shaped, at base bulbous to triangular, curved, up to c. 1 cm long; wall coriaceous, c. 1 mm thick.

Field notes. Tree up to 25 m high by 70 cm d.b.h., sometimes with up to 75 cm high buttresses; once said to be a climber but this seems doubtful. Bark smooth, whitish, greyish brown, or reddish brown; inner bark reddish. Inflorescence axes reddish. Flowers pale yellow, weakly to strongly sweet scented; calyx green; petals greenish white; disk pale yellow; filaments white; anthers pale yellow; style yolk yellow. Fruit red. Aril sweet, edible.

Distribution. Borneo.

Ecology. Primary forest on flat or hilly country; soil sandy; altitude up to c. 400 m. Fl. May, July, Aug., Oct.; fr. Jan.

Notes. 1. Conspicuous characters of the present species are the relatively many-jugate leaves with leaflets that in the herbarium are bright green (brown in nearly all other species) and with the reticulation distinctly raised on both sides.

2. Two collections resembling the present species but different in some characters are: 1) *Griffith s.n.*, Malacca (K): twigs 2.5–3 mm thick, leaves 1- or 2-jugate, petiole 3.5–5 cm long, leaflets above puberulous on the basal half of the midrib, beneath on midrib and very sparsely on the lower nerves, domatia common, acumen broad and rounded, midrib above slightly raised; only old female flowers known. 2) *Haviland & Hose 3369E*, Sarawak, near Kuching (BO, L): twigs 2.5–3 mm thick, glabrous, leaves glabrous, acumen broad and rounded, nerves dense, 5–7.5 mm distant along the midrib, sepals 1.8 mm long. This second collection is \pm intermediate between the first one and *N. reticulatum* as accepted here.

Specimens studied:

BORNEO. Sarawak: Beccari PB 2819; S.C. Chin 2794 (L); Haviland & Hose 3369; Jacobs 5333 (B, L); Sarawak Forest Dept. S 31133. – S. Kalimantan: Nooteboom 4693, Bt. Raya (L). – SE. Kalimantan: NIFS bb 12256, Ma. Teweh, near Ma. Pari. – Sabah: Nbfd SAN 65951, Kuala Panyu Dist., Kepyau.

20. *Nephelium subfalcatum* Radlk. – Fig. 4d, e.

N. subfalcatum Radlk., Rec. Bot. Surv. India 3 (1907) 353; in Engl., Pflanzenr. 98 (1933) 973. – Type: *Forbes 3092*, Sumatra, Palembang, R. Rawas, Mura Mengkulem (M; iso in K, L, SING).

Tree. Twigs 1.5–5 mm thick, puberulous, mostly early glabrescent. Leaves 1-foliate to 5-jugate; petiole 1.5–7 cm long, 0.75–1.5 mm thick, terete to semiterete; petiolules 3–10 mm long, above mostly narrowly and deeply, sometimes only slightly grooved, without a median rib but mostly with swollen lateral ribs; axes sparsely puberulous and mostly glabrescent, or glabrous from the beginning. Leaflets 4–15 by 1.5–5 cm, 2.25–4.75 times as long as wide, widest below to in the middle, thin-pergamentaceous to coriaceous; glabrous or sometimes beneath along the midrib with a few minute appressed hairs; no domatia; base acute to rounded, attenuate; sides mostly slightly, sometimes strongly curved, sometimes nearly parallel; apex blunt or rounded or tapering acuminate, the acumen short, broad, and rounded to long, slender, and acute; midrib above sunken to sometimes prominulous; nerves 0.5–1.5 cm distant along the midrib, above prominulous, \pm distinctly looped and joined near the margin; nervation rather irregular because of the often great number of variably

developed intercalated veins; veins clearly differentiated from veinlets, reticulation very coarse, prominulous at both sides. *Inflorescences* axillary, pseudoterminal, or terminal. *Sepals* variably but mostly rather high up connate, 1–2 mm long. *Petals* absent. *Disk* glabrous. *Stamens* (6–)8. *Pistil* 2-merous. *Fruits* ellipsoid, 3.25–3.75 by 2.5 cm, glabrous, ± densely set with strap-shaped to filiform, at base bulbous to triangular, confluent or not, up to c. 15 mm long, curved appendages; wall hard coriaceous, up to c. 3 mm thick.

Field notes. Tree up to 35 m high and 60 cm d.b.h., bole straight, sometimes deeply fluted, with up to 2 m high and up to 7.5 cm thick branching buttresses. Bark smooth or sometimes slightly fissured, dippled, or lenticellate, white or sometimes light greyish, brownish, or orange; inner bark red or pink to redbrown with some reddish sap; wood white or sometimes yellow orange, hard. Leaflets not glaucous beneath. Peduncles red; flower buds green. Fruits when ripe red with soft green spines.

Distribution. Malaya, Sumatra, and Borneo.

Ecology. Primary Mixed Dipterocarp Forest on slopes and ridges, on sandy and loam soils; altitude up to 500(–975) m. Fl. Aug.; fr. Dec.–Febr.

Notes. 1. At first sight, the material from Borneo seems rather different from that of Malaya and Sumatra. Finally, however, the main differences appear to be that the Bornean material is more glabrous, the margin of the petiolules is not swollen, the apex of the leaflets is long-, slender-, and acute-acuminate, and the fruit appendages are somewhat longer. And even these differences are not sharp, they won't do for all Bornean specimens, and, on the other hand, *KEP FRI 13331* from Malaya agrees nearly completely with the Bornean form. Accordingly, a subdivision seems unwarranted.

2. The leaves of the present species resemble in shape strongly those of *N. laurinum*; for differences see under that species.

3. Especially the Bornean form of the present species comes close to *N. uncinatum*. For differences see there.

Specimens studied:

MALAYA. Perak: *KEP FRI 13331*, Bintang Hijau For. Res.; 13932, G. Bubu Massif near Kg. Ayer. – Pahang: *KEP FRI 9093*, Fraser's Hill, Bt. Jeriau. – Johore: *KEP FRI 7720*, G. Panti For. Res.; *SF 36838*, Sungai Sedili. – Kemaman: Corner s.n., B. Kajang, 8-xi-1935 (*SING sh. nr. 23416*).

SUMATRA. Tapanuli: *NIFS bb 26389*, Angkola & Sipirok, Panobasan. – Indragiri: *NIFS bb 27649*, Kwala Belilas; 28599, Sungai Akar. – Palembang: *Forbes 3092*, R. Rawas, Mura Mengkulem; *NIFS 65.E.2.P.688* (also Endert or Thorenaar), Banjuasin and Kubustreken; *NIFS 65.E.2.P.712* (= *T 712*), ditto.

BORNEO. Sarawak & Brunei: 9 collections. – Sabah: *NBFD SAN 15153*, Sipitang Dist., Sibubu R., Mengalong For. Res.; *SAN 43207*, Sipitang Dist., Ulu Moyah, 2 miles upstream of Kg. Mendalong.

21. *Nephelium uncinatum* Radlk. ex Leenh., *spec. nov.* – Fig. 3c; 4b.

N. uncinatum Radlk. in Merr., Pl. Elmer. Born. (1929) 175, nom. nud.; in Engl., Pflanzenr. 98 (1933) 983; W. Meijer, Bot. News Bull. 9 (1967) 75.

Descriptio typi: Arbor mediocris. Ramuli 3,5–4,5 mm crassi, fulvo-puberuli, denique glabrati. Folia 3- vel 4-jugata; petiolus 3,5–6 cm longus, 1–1,5 mm crassus, teres; petioluli 1,5–4 mm longi, supra late tenuē sulcati, valde costati; axes foliorum puberuli. Foliola 7–9 cm longa, 2,5–3,5 cm lata, lanceolata, subfalcata, pergamentacea, supra in base costae minute puberula, costa nervisque subtus sparse crinitis, inter nervos minute sericea; in axillis nervorum barbata; basis acuta; margo subcurvatus; apex satis abrupte acuminatus, acumine brevi late obtuso; costa supra prominens; nervi secundarii inter sese 5–8 mm distantes, subpatentes, supra vix prominens; venae intercalares distinctae; venae venulaeque reticulatae, subtus inconspicuae. Infructescentiae terminales lateralesque. Pistillum bilobatum. Fructus ellipsoidei, 2,5 cm longi, 1,5–2 cm crassi, glabri, processis filiformibus curvatis usque ad 7,5 mm longis basi incrassatis subsparse obtecti; pericarpium coriaceum 1–2 mm crassum. – **T y p u s:** *Elmer 21708*, Borneo, Sabah, Elphinstone Prov., Tawao (M; iso in BO, L, NY, SING, U).

Tree. *Twigs* 2.5–4.5 mm thick, puberulous, late glabrescent. *Leaves* (1-foliolate to) 3–7(–9, rarely up to c. 18)-jugate; petiole 3–9 cm long, 1–1.5 mm thick, terete; petiolules (1–)2–4 mm long, above broadly shallowly grooved with a strong median rib; axes densely minutely hairy, rarely fully glabrescent. *Leaflets* 4.75–11 by 1.5–3.5 cm, 2.5–5(–6) times as long as wide, sometimes slightly falcate, widest in or above the middle, pergamentaceous; above puberulous in the basal part of the midrib to subglabrous, beneath sparsely hairy on midrib and nerves, in between minutely sericeous; domatia present; base acute, decurrent; sides slightly curved; apex tapering to fairly abruptly acuminate, acumen short (to long), broad, blunt (to acute); midrib above raised; nerves 3–8 mm distant along the midrib, nearly patent, above prominulous; intercalated veins well developed; veins and veinlets clearly different, coarsely reticulate, prominulous but rather inconspicuous on both sides. *Inflorescences* terminal or pseudoterminal and in the upper leaf axils. *Sepals* c. 25% to nearly 50% connate, in male flowers 1–1.1 mm, in female ones 1.4–1.5 mm long. *Petals* absent. *Disk* in male flowers fairly strongly developed, the lobes protruding between the stamens, in female flowers less conspicuous, glabrous or with some hairs. *Stamens* 5 or 6. *Pistil* 2-merous, sometimes in the same specimen also 1-merous. *Fruits* ellipsoid to subglobular, 2.75–3 by 2–2.25 cm, glabrous, fairly sparsely set with thick warts tapering into or more abruptly terminated by an up to 7.5 mm long, filiform, curved appendage; wall coriaceous, 1–2 mm thick.

Field notes. Tree up to 24(–40?) m high and 45 cm d.b.h., bole slightly fluted, with up to 1.5 m high, 5 m spreading, and 4–7.5 cm thick buttresses. Bark smooth or sometimes slightly flaky or lenticellate, mostly whitish or grey, sometimes reddish or dark brown to yellowish or greenish, 0.5–1 mm thick, with some red or sometimes yellowish sap; inner bark 2–10 mm thick, reddish to brownish, sometimes grey or white; sapwood white to creamy, sometimes reddish or brownish; wood hard. Leaflets beneath glaucous or grey-green. Inflorescence axes green. Flowers yellowish to greenish; calyx yellow; disk yellow; filaments white, anthers yellow; style pink. Fruits red when ripe; aril white, sour or sweet, edible.

Distribution. Malaya, Sumatra, and Borneo.

Ecology. Primary and sometimes old secondary forest mainly on hill slopes and

ridges on well drained soils, rarely along a swamp, mostly on sand, sometimes on sandy loam, exceptionally on rocky soil; altitude up to 330 m. Fl. mainly April–June, sometimes Aug.–Oct. and Dec.; fr. Dec., March.

Notes. 1. *Nephelium uncinatum* is in its flower characters one of the most derived species of the genus, second to *N. maingayi* only, with the sepals often rather highly connate, no petals, 5 or 6 stamens only, and exceptionally even reduction of the pistil to 1-merous. Notwithstanding this, the two species do not seem to be closely allied.

2. Contrary to most *Nepheliums* the present species is extremely uniform. It is doubtless nearest to *N. subfalcatum*, which differs mainly by the long and slender, narrowly grooved and not ribbed petiolules, the glabrous leaflets without domatia, the flat to sunken midrib, and the flowers with normally 7 or 8 stamens.

Specimens studied:

MALAYA. Selangor: KEP 12498, 20th mile Ulu Gombak (SING).

SUMATRA. Indragiri: NIFS bb 26478, Kuantan Dist., Djake (L).

BORNEO. Sarawak & Brunei: BRUN 680; Hose 602; Hotta 12984; Sarawak For. Dept. S 23935, 31738, 37949. – Southeast Kalimantan: NIFS bb 10223, Sampit, near Tehang; bb 16228, W. Kutai; bb 34914, Balikpapan, Mentawir; Sauveur I 12, ditto (K, L, SING). – East Kalimantan: Ender 5050, 5069; Kostermans 6376, 6527, 7160; Leighton 816; Wiriadinata 1217. – Sabah: Elmer 21277, 21330, 21560, 21708, 21774; Nbfd 3177, 3185; Nbfd A 1743; Nbfd SAN 29497, 29585, 30335, 30612, 36963, 38905, 39232, 41497, 43259, 43290, 43736, 43740, 51204, 51675, 62962, 63881, 66271, 69295, 72480, 76309, 78506, 87576, 92755, 93764, 96083, 96096, 97096.

22. *Nephelium spec. nov.*

Tree. Twigs 3 mm thick, puberulous but mostly early glabrescent. Leaves 1–3-jugate; petiole 2–5 cm long, 1–1.5 mm thick, terete to semiterete; petiolules 3–4 mm long, above narrowly deeply grooved; axes puberulous, glabrescent. Leaflets 5–10.5 by 1.5–3.25 cm, about 3 times as long as wide, widest in to sometimes distinctly below the middle, pergamentaceous; above glabrous or sometimes slightly puberulous in the basal part of the midrib, beneath sparsely hairy on midrib and nerves, fairly densely minutely sericeous in between, glabrescent; domatia common; base oblique, acute, slightly to not attenuate; sides curved; apex acute to tapering acute-acuminate; midrib above sunken in a narrow groove; nerves 0.5–1 cm distant along the midrib, above prominulous to flat; intercalated veins often well developed, making the nervation a bit irregular; veins and veinlets above hardly different, beneath veinlets inconspicuous, reticulation above rather dense, prominent. Inflorescences pseudoterminal or terminal. Flowers only old female ones available. Sepals 5, for about 10–20% connate, c. 2 mm long, densely hairy on both sides. Petals absent or some reduced ones present. Disk glabrous. Stamens unknown. Pistil 2-merous, often both lobes at least in the beginning equally developed, densely warty with an indument of caducous long hairs and densely puberulous. Fruits probably warty and puberulous.

Field notes. Tree up to 45 m high and 1.30 m d.b.h., with steep buttresses up to 1.50 m high. Bark smooth, lenticellate, brownish to brownish grey; inner bark reddish brown; wood pale yellow. Fruits red when ripe.

Distribution. Malaya.

Ecology. Primary forest on slope at c. 1750 m altitude. Fl. April.

Note. The present species, incompletely known from a few specimens all from one locality only, seems different from all other accepted species. As neither the flowers, nor the fruits are well known naming it seems premature. Moreover, its alliance is not clear to me, even though this holds true for most *Nepheliums*.

Specimens studied:

MALAYA. Perak: Tapah Hills, Padang Batang, KEP FRI 19143, 19144, 19145 (all K, L).

DUBIOUS NAMES*

- D 1. *N. rimosum* G. Don, Gen. Hist. 1 (1831) 671, nom. nud. – *Scytalia rimosa* Roxb., Hort. Bengal. (1814) 29, nom. nud.; Fl. Ind. ed. 2, 2 (1832) 272, nom. illeg. 'Polygamous. Leaflets three or four pair, subopposite, lanceolate. Panicles axillary and terminal. Corol none. Berries oblong, rimose, tubercled. – *Tengoori* is the vernacular name in Silhet, where the tree is indigenous and grows to a large size; flowers in March and April, and the fruit which is generally eaten, ripens in August.' This can be some *Nephelium* but it is difficult to interpret this short diagnosis.
- D 2. *N. toong* Sagot (& Raoul), Manuel pratique des culture tropicales et des plantations des pays chauds (1893) 281, nom. nud.; Crevost & Lemarié, Cat. Prod. Indochine 1 (1917) 226; Radlk. in Engl., Pflanzenz. 98 (1933) 982. Sagot (1893): '*N. Toong. Toong*, espèce nouvelle, Indochine. La variété blanche est plus douce que la rouge.' Crevost & Lemarié (1917) suggest identity with either *Euphoria pallens* Pierre, or *N. mutabile* Blume var. *pallens* Hook., or *Xerospermum macrophyllum* Pierre. Radlkofer knew only the name as published by Crevost & Lemarié. Possibly *N. lappaceum* or an allied species.
- D 3. *N. variable* Wall. ex Voigt, Hort. Suburb. Calcutt. (1845) 95, nom. nud. I could not find any further indication regarding its identity.

EXCLUDED TAXA*

- E 1. *Nephelium* sect. *Cnemidiscus* Pierre ex Lecomte, Fl. Indo-Chine 1 (1912) 1052. – *Cnemidiscus* Pierre, Fl. Forest. Cochinch. (1894) text with pl. 320: A = *Glennia* Hook. f.; see Leenh., Blumea 22 (1975) 411.

* Names under *Scytalia* and *Euphoria* are illegitimate as *Scytalia* Gaertn. (1788) as well as *Euphoria* Juss. (1789) were published with the legitimate name *Litchi* Sonnerat (1782) in the synonymy.

- E 2. *N. acuminatum* Hook. f., Trans. Linn. Soc. London 23 (1860) 164 = *Pometia pinnata* J.R. & G. Forster f. *acuminata* M. Jacobs, Reinwardtia 6 (1962) 128.
- E 3. *N. beckleri* Benth., Fl. Austral. 1 (1863) 467 = *Arytera divaricata* F. Muell.; see Radlk. in Engl., Pflanzenr. 98 (1933) 1279.
- E 4. *N. bengalense* G. Don, Gen. Hist. 1 (1831) 670 = *Dimocarpus longan* Lour. var. *longan*; see Leenh., Blumea 19 (1971) 122, 125.
- E 5. *N. bifoliolatum* Thwaites, En. Pl. Zeyl. (1858) 57 = *Lepisanthes senegalensis* (Poir.) Leenh., Blumea 17 (1969) 85.
- E 6. *N. callarrie* J. F. Bailey, Queensland Agric. J. 5 (1899) 396 = *Castanospora alphanthii* (F. Muell.) F. Muell.; see S. T. Reynolds, Austrobaileya 2 (1984) 34.
- E 7. *N. capense* Baillon, Hist. Pl. 5 (1874/5) 351, f. 359 & 360. — *Baccaurea capensis* Sprengel, Flora 12, 1 (1829) Beilage p. 3, nom. nud. = *Pappea capensis* Ecklon & Zeyher, Enum. Pl. Afr. Austr. 1 (1834) 53; see Radlk. in Engl., Pflanzenr. 98 (1933) 1013.
- E 8. *N. chinense* Druce, Bot. Exch. Club Brit. Isles Rep. 1916, 2nd Suppl. (1917) 637. — *Scyotalia chinensis* Gaertn., Fruct. Sem. Pl. 1 (1788) 197, pl. 42, nom. illeg. = *Litchi chinensis* Sonnerat, Voy. Ind. Or. Chine 2 (1782) 230, pl. 129; see Radlk. in Engl., Pflanzenr. 98 (1932) 918.
- E 9. *N. connatum* F. Muell. ex Benth., Fl. Austral. 1 (1863) 465. — *Spanoghea connata* F. Muell., Trans. Philos. Inst. Victoria 3 (1859) 26 = *Alectryon connatus* Radlk., Sitzungsber. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. München 8 (1878) 299, 307; see S. T. Reynolds, Austrobaileya 1 (1982) 473.
- E 10. *N. coriaceum* Benth., Fl. Austral. 1 (1863) 466 = *Alectryon coriaceus* Radlk., Sapind. Holl.-Ind. (1879) 48; see S. T. Reynolds, Austrobaileya 1 (1982) 474.
- E 11. *N. danura* G. Don, Gen. Hist. 1 (1831) 671, nom. nud.; Walp., Repert. 5 (1845/6) 365. — *Scyotalia danura* Roxb., Hort. Beng. (1814) 29, nom. nud.; Fl. Ind. ed. 2, 2 (1832) 274, nom. illeg. = *Lepisanthes senegalensis* Leenh., Blumea 17 (1969) 85.
- E 12. *N. didymum* Craib, Fl. Siam. 1 (1926) 329. — *Euphoria didyma* Blanco, Fl. Filip. (1837) 288, nom. illeg. = *Litchi chinensis* Sonnerat subsp. *philippinensis* Leenh., Blumea 19 (1971) 129.

- E 13. *N. diplocardia* F. Muell., Descr. Notes Papuan Pl. 1 (1876) 21. – *Irina diplocardia* Blume, Rumphia 3 (1847) 115 = *Pometia pinnata* J.R. & G. Forster f. *pinnata*; see M. Jacobs, Reinwardtia 6 (1962) 124.
- E 14. *N. distyle* F. Muell., Fragm. 9 (1875) 99. – *Ratonia distylis* F. Muell. ex Benth., Fl. Austral. 1 (1863) 462 = *Arytera distylis* Radlk., Sapind. Holl.-Ind. (1879) 44.
- E 15. *N. divaricatum* F. Muell. ex Benth., Fl. Austral. 1 (1863) 467 = *Arytera divaricata* F. Muell., Trans. & Proc. Philos. Inst. Victoria 3 (1859) 25.
- E 16. *N. diversifolium* F. Muell., Fragm. 10 (1876/7) 82 = *Heterodendrum diversifolium* F. Muell., Hooker's J. Bot. Kew Gard. Misc. 9 (1857) 197; see S. T. Reynolds, Austrobaileya 1 (1982) 484.
- E 17. *N. echinulatum* Ridley, Fl. Malay Penins. 1 (1922) 503. – *Euphoria echinulata* Radlk., Rec. Bot. Surv. India 3 (1907) 347, nom. illeg. = *Dimocarpus longan* Lour. var. *longan*; see Leenh., Blumea 19 (1971) 123.
- E 18. *N. erectum* Thwaites, En. Pl. Zeyl. (1858) 57 = *Lepisanthes erecta* Leenh., Blumea 17 (1969) 69.
- E 19. *N. eximium* Thwaites, En. Pl. Zeyl. (1858) 57. – *Eccremanthus eximius* Thwaites, Hooker's J. Bot. Kew Gard. Misc. 7 (1855) 272, pl. 9 = *Pometia pinnata* J.R. & G. Forster f. *tomentosa* M. Jacobs, Reinwardtia 6 (1962) 130.
- E 20. *N. ferrugineum* F. Muell., Descr. Notes Papuan Pl. 1 (1876) 21. – *Spanoghea ferruginea* Blume, Rumphia 3 (1847) 173 = *Alectryon ferrugineus* Radlk., Sapind. Holl.-Ind. (1879) 14, 93.
- E 21. *N. forbesii* E. G. Baker, J. Bot. 62, Suppl. (1924) 25 = *Paranephelium xestophyllum* Miq.; see M. Davids, Blumea 29 (1984) 437.
- E 22. *N. forsythii* Maiden & Betche, Proc. Linn. Soc. New South Wales 26 (1901) 81 = *Alectryon forsythii* Radlk. in Engl. & Prantl, Nat. Pflanzenfam. Nachtr. 3 (1907) 205.
- E 23. *N. foveolatum* F. Muell. ex Benth., Fl. Austral. 1 (1863) 466 = *Arytera foveolata* F. Muell., Trans. & Proc. Philos. Inst. Victoria 3 (1859) 24; see Radlk. in Engl., Pflanzenr. 98 (1933) 1279.
- E 24. *N. fumatum* Blume, Rumphia 3 (1847) 111 = *Dimocarpus fumatus* Leenh. subsp. *fumatus* Leenh., Blumea 19 (1971) 119.

- E 25. *N. fuscatum* Thwaites, En. Pl. Zeyl. (1858) 58 = *Glenniea unijuga* Radlk.; see Leenh., *Blumea* 22 (1975) 413.
- E 26. *N. gardneri* Thwaites, En. Pl. Zeyl. (1858) 58 = *Dimocarpus gardneri* Leenh., *Blumea* 19 (1971) 121.
- E 27. *N. hosei* Ridley, Kew Bull. (1933) 191 = *Mischocarpus pentapetalus* Radlk.; see Van der Ham, *Blumea* 23 (1977) 272.
- E 28. *N. informe* Cambess., Mém. Mus. Hist. Nat. 18 (1829) 30. — *Dimocarpus informis* Lour., Fl. Cochinch. (1790) 234. See Leenh., *Blumea* 28 (1983) 399.
- E 29. *N. lautererianum* F. M. Bailey, Bot. Bull. Dept. Agric. 4 (1891) 8 = *Arytera lautereriana* Radlk., Feddes Repert. Spec. Nov. Regni Veg. 20 (1924) 37; see Van der Ham, *Blumea* 23 (1977) 291.
- E 30. *N. leichhardtii* F. Muell., Austral. Veg. (1867) 25 (not seen). — *Euphoria leichhardtii* Benth., Fl. Austral. 1 (1863) 468, nom. illeg. — *Dimocarpus leichhardtii* S. T. Reynolds, *Austrobaileya* 1 (1982) 495.
- E 31. *N. leiocarpum* F. Muell. ex Benth., Fl. Austral. 1 (1863) 467, nom. illeg. — *Spanoghea nephelioides* F. Muell., Trans. & Proc. Philos. Inst. Victoria 3 (1859) 25 = *Alectryon subcinereus* Radlk., Sapind. Holl.-Ind. (1879) 47; see S. T. Reynolds, *Austrobaileya* 1 (1982) 475.
The name *N. leiocarpum* is illegitimate as the older legitimate epithet *nephelioides* should have been used.
- E 32. *N. lit-chi* Cambess., Mém. Mus. Hist. Nat. 18 (1829) 30, nom. illeg. — *Sapindus edulis* Aiton, Hort. Kew. 2 (1789) 36 = *Litchi chinensis* Sonnerat subsp. *chinensis*.
The name *N. lit-chi* is illegitimate as the older legitimate epithet *edulis* should have been used.
- E 33. *N. longan* Hook., Bot. Mag. N. S. 17 (1844) pl. 4096 = *Dimocarpus longan* Lour. var. *longan*.
- E 34. *N. longana* Cambess., Mém. Mus. Hist. Nat. 18 (1829) 30. — *Euphoria longana* Lam., Encycl. 3 (1792) 574, nom. illeg. = *Dimocarpus longan* Lour. var. *longan*; see Leenh., *Blumea* 19 (1971) 122.
- E 35. *N. longana* Cambess. var. *pallida* Trimen, Fl. Ceyl. 1 (1893) 309 = *Dimocarpus longan* Lour. var. *longan*; see Leenh., *Blumea* 19 (1971) 123.

- E 36. *N. long-yan* Blume, Rumphia 3 (1847) 108 = *Dimocarpus longan* Lour. var. *longan*; see Leenh., Blumea 19 (1971) 122.
- E 37. *N. malaiense* Griff., Not. Pl. Asiat. 4 (1854) 549 = *Dimocarpus longan* Lour. var. *malesianus* Leenh., Blumea 19 (1971) 126.
- E 38. *N. microphyllum* Benth., Fl. Austral. 1 (1863) 468 = *Arytera microphylla* Radlk., Sapind. Holl.-Ind. (1879) 44.
- E 39. *N. multijugum* J.D. Hook., Trans. Linn. Soc. London 23 (1860) 164 = *Lepisanthes multijuga* Leenh., Blumea 17 (1969) 73.
- E 40. *N. muricatum* Griff., Cat. (1865) 9, nom. nud. = *Xerospermum noronhianum* Blume; see Leenh., Blumea 28 (1983) 395.
- E 41. *N. noronhianum* Cambess., Mém. Mus. Hist. Nat. 18 (1829) 30. – *Euphoria noronhiana* Blume, Bijdr. (1825) 234, nom. illeg. = *Xerospermum noronhianum* Blume; see Leenh., Blumea 28 (1983) 394.
- E 42. *N. oleifolium* F. Muell., Fragm. 10 (1876) 82 = *Heterodendrum oleifolium* Desf., Mém. Mus. Hist. Nat. 4 (1818) 8, pl. 3; see S. T. Reynolds, Austrobaileya 1 (1982) 482.
- E 43. *N. oppositifolium* G. Don, Gen. Hist. 1 (1831) 671, nom. inval.; Walp., Repert. 5 (1845) 365. – *Scytalia oppositifolia* Roxb., Hort. Bengal. (1814) 88, nom. nud.; Fl. Ind. ed. 2, 2 (1832) 273, nom. illeg. Apparently no *Sapindaceae*.
- E 44. *N. oppositifolium* Cordem., Fl. Réunion (1895) 379, nom. illeg. (I.C.B.N. Art. 64.1) = *Stadmannia oppositifolia* Poirét, Encycl. 7 (1806) 376.
The name *Stadmannia sideroxylon* DC., Prodr. 1 (1824) 615, commonly accepted as correct, is illegitimate as it is based upon *S. oppositifolia* Poirét and as there was no nomenclatural reason to change the epithet.
- E 45. *N. parviflorum* G. Don, Gen. Hist. 1 (1831) 671, nom. inval.; Walp., Repert. 5 (1845) 365. – *Scytalia parviflora* Roxb., Hort. Bengal. (1814) 88, nom. nud.; Fl. Ind. ed. 2, 2 (1832) 273, nom. illeg. = *Allophylus cobbe* Raeusch.?
- E 46. *N. pinnatum* Cambess., Mém. Mus. Hist. Nat. 18 (1829) 30 = *Pometia pinnata* J. R. & G. Forster, Char. Gen. Pl. (1775) 55, pl. 55.
- E 47. *N. pubescens* Ridley, J. Straits Branch Roy. Asiat. Soc. 59 (1911) 88 = *Sisyrolepis muricata* Leenh., Blumea 23 (1977) 336.

- E 48. *N. pupillum* Wight, Illustr. 1 (1840) 141. – *Dimocarpus pupilla* Moon, Cat. Pl. Ceylon (1824) 31, nom. nud. = *Dimocarpus longan* Lour. var. *longan*; see Leenh., Blumea 19 (1971) 122.
- E 49. *N. rubrum* G. Don, Gen. Hist. 1 (1831) 671, nom. nud.; Wight, Icon. (1838) pl. 24 & 25. – *Scytalia rubra* Roxb., Hort. Bengal. (1814) 29, nom. nud.; Fl. Ind. ed. 2, 2 (1832) 272, nom. illeg. = *Lepisanthes senegalensis* Leenh., Blumea 17 (1969) 85.
- E 50. *N. schneideri* Merr., Philipp. J. Sci. Bot. 13 (1918) 23 = *Dimocarpus longan* Lour. var. *echinatus* Leenh., Blumea 19 (1971) 128.
- E 51. *N. semicinereum* F. Muell., Fragm. 4 (1864) 158 = *Alectryon coriaceus* Radlk.; see S. T. Reynolds, Austrobaileya 1 (1982) 474.
- E 52. *N. semiglaucum* F. Muell., Fragm. 4 (1864) 158. – *Arytera semiglauca* F. Muell., Trans. & Proc. Philos. Inst. Victoria 3 (1859) 25 = *Guioa semiglauca* Radlk.; see S. T. Reynolds, Austrobaileya 2 (1984) 38.
- E 53. *N. setosum* Ridley, Fl. Malay Penins. 1 (1922) 503. – *Euphoria setosa* Radlk., Rec. Bot. Surv. India 3 (1907) 347, nom. illeg. = *Dimocarpus longan* Lour. var. *malesianus* Leenh., Blumea 19 (1971) 126.
- E 54. *N. simplicifolium* Thwaites, Enum. Pl. Zeyl. (1858) 57 = *Lepisanthes simplicifolia* Leenh., Blumea 17 (1969) 70.
- E 55. *N. stipulaceum* Bedd., Trans. Linn. Soc. London 25 (1865) 212 = *Otonephelium stipulaceum* Radlk. in Engl. & Prantl, Nat. Pflanzenfam. 3, 5 (1895) 329.
- E 56. *N. subdentatum* Benth., Fl. Austral. 1 (1863) 465 = *Alectryon subdentatus* Radlk., Sapind. Holl.-Ind. (1879) 47.
- E 57. *N. ternatum* Cuzent, Tahiti (1860) 229. – *Aporetica ternata* J. R. & G. Forster, Char. Gen. Pl. (1775) 66, pl. 66 = *Allophylus cobbe* Rausch.
- E 58. *N. thorelii* Lecomte, Fl. Indo-Chine 1 (1912) 1052. – *Cnemidiscus thorelii* Pierre, Fl. Forest. Cochinch. (1894) pl. 320: A = *Glenniea thorelii* Leenh., Blumea 22 (1975) 412.
- E 59. *N. tomentosum* F. Muell., Trans. & Proc. Philos. Inst. Victoria 2 (1858) 64 = *Alectryon tomentosus* Radlk., Sapind. Holl.-Ind. (1879) 47; see S. T. Reynolds, Austrobaileya 1 (1982) 478.

- E 60. *N. verticillatum* G. Don, Gen. Hist. 1 (1831) 670. – *Euphoria verticillata* Lindley, Edwards's Bot. Reg. (1827) pl. 1059 = *Lepisanthes senegalensis* Leenh., Blumea 17 (1969) 85.
- E 61. *N. winterianum* F. M. Bailey, Queensland Agric. J. 3 (1898) 283 = *Guioa acutifolia* Radlk.; see S. T. Reynolds, Austrobaileya 2 (1984) 37.
- E 62. *N. xerocarpum* Cambess., Mém. Mus. Hist. Nat. 18 (1829) 30. – *Euphoria xerocarpa* Blume, Bijdr. (1825) 234 p.p., nom. illeg. = *Xerospermum noronhianum* Blume; see Leenh., Blumea 28 (1983) 395, 398.

INDEX TO COLLECTION NUMBERS

The numbers refer to the following taxa of the genus *Nephelium*:

- | | |
|--|-------------------------------------|
| 1. <i>N. aculeatum</i> Leenh. | 9. <i>N. juglandifolium</i> Blume |
| 2. <i>N. compressum</i> Radlk. | 10. <i>N. lappaceum</i> L. |
| 3. <i>N. costatum</i> Hiern | 10a. var. <i>lappaceum</i> |
| 4. <i>N. cuspidatum</i> Blume | 10b. var. <i>pallens</i> Leenh. |
| 4a. var. <i>bassacense</i> Leenh. | 10c. var. <i>xanthioides</i> Leenh. |
| 4b. var. <i>cuspidatum</i> | 11. <i>N. laurinum</i> Blume |
| 4bi. subvar. <i>cuspidatum</i> | 12. <i>N. macrophyllum</i> Radlk. |
| 4bii. subvar. <i>dasyneurum</i> Leenh. | 13. <i>N. maingayi</i> Hiern |
| 4c. var. <i>eripetalum</i> Leenh. | 14. <i>N. meduseum</i> Leenh. |
| 4d. var. <i>multinerve</i> Leenh. | 15. <i>N. melanomiscum</i> Radlk. |
| 4e. var. <i>ophiodes</i> Leenh. | 16. <i>N. melliferum</i> Gagnepain |
| 4ei. subvar. <i>beccarianum</i> Leenh. | 17. <i>N. papillatum</i> Leenh. |
| 4eii. subvar. <i>ophiodes</i> Leenh. | 18. <i>N. ramboutan-ake</i> Leenh. |
| 4f. var. <i>robustum</i> Leenh. | 19. <i>N. reticulatum</i> Radlk. |
| 5. <i>N. daedaleum</i> Radlk. | 20. <i>N. subfalcatum</i> Radlk. |
| 6. <i>N. hamulatum</i> Radlk. | 21. <i>N. uncinatum</i> Leenh. |
| 7. <i>N. havilandii</i> Leenh. | 22. <i>N. nov. sp.</i> |
| 8. <i>N. hypoleucum</i> Kurz | |

Achmad 70: 13; 1243: 13; 1255: 13; 1275: 9; 1352: 13; 1486: 13; 1505: 13 – Ahern 204Q: 18 – d'Alleizette 1421: 16 – Alvins 310: 4; 617: 4c; 837: 18; 899: 18; 1200: 4c; 2145: 4c – Amdjah 116: 18 – J.A.R. Anderson 4615: 18 – T. Anderson 26: 10a; 38: 18.

Backer 1063: 10a; 10461: 10a; 10473: 10a; 37638: 10a; 37639: 18 – Bakhuisen van den Brink jr. 1405: 18 – Balansa 3418: 10b; 3426: 10b – Bartlett 7024: 10a – Beccari PB 574: 10c; PB 1268: 2; PB 2103: 4ei; PB 2279: 4ei; PB 2282: 10b; PB 2500: 12; PB 2808: 4ei; PB 2813: 10b; PB 2818: 5; PB 2819: 19; PB 2820: 4d; PB 2849: 10c; PB 2906: 4ei; PB 3073: 10c; PB 3752: 10a; PB 3913: 18; PB 3918: 15 – Beguin 347: 11; 566: 10a – Béjaud 314: 8; 606: 8; 612: 4a; 653: 8; 653 bis: 10b; 682: 8 – Beumée A380: 9 – van Beusekom & Phengklai 376: 16 – BKF 6286: 8; 32082: 8 – Bogor Botanic Gardens III.E.16: 9; III.E.16a: 9; III.E.25a: 9; III.H.4: 10a; III.H.5: 10a; III.H.6: 10a; III.H.7: 10a; III.H.8: 18; III.H.9: 10a; III.H.10: 10a; III.H.11: 10a; III.H.12: 10a; III.H.19: 18; III.H.20: 9; III.H.24: 18; III.I.25: 4c – Brandis 485: 8; 691: 8 – Brinkman 812: 10a – N.L. & E.G. Britton 9962: 18 – Bruinier 298: 10a – BRUN 584: 14; 680: 21; 869: 15; 873: 14; 3302: 14; 3355: 4f; 3358: 4 aff. c;

- 3363: 20; 3368: 20; 5173: 18; 5415: 13; 5418: 18; 5532: 10a; s.5878: 10a; s.5899: 13; s.5930: 14 – BS 2126: 18; 3269: 18; 17922: 18; 20605: 18; 40692: 18; 41074: 18; 47168: 18 – Bunchuai 15: 8; 1604: 8 – Bunnap 372: 4 – Bunpon 1149: 10a – Buurman van Vreeden 200: 4bii – Buwalda 2954: 10a; 7931: 10a.
- Cantley 27: 10a – Cantley's coll. 107: 4c; 1659: 10a; 2927: 4c; 3018: 18; 3107: 4c; 3158: 18 – Carocci-Buzi 190: 10a – Chevalier 30132: 10b; 31910: 8; 31918: 8; 32172: 10b; 36947: 8; 36972: 8; 37010: 16; 37935: 10b; 37937: 10b – Chew Wee Lek 635: 13 – Chin See Chung 2725: 18; 2730: 18; 2731: 18; 2774: 4c; 2794: 19; 2905: 18 – Chite 131: 10b – Chitr 204: 10a – Clemens 21067: 10c; 21507: 18; 26511: 10b; 30875: 18 – Collins 739: 8; 740: 8 – Curtis 1389: 6; 3030: 4c.
- Derry 26: 10a; 60: 13; 593: 4c; 1094: 4; 1171: 13 – Dickason 6802: 8; 6861: 8.
- Eberhardt 2729: 16; 2754: 16 – Edeling HB 14418: 10a; HB 14421: 10a – Elmer 9322: 18; 11205: 15; 12866: 10a; 12882: 10b; 12934: 4f; 13062: 10a; 13069: 10a; 15592: 18; 15641: 18; 16202: 18; 17505: 18; 21277: 21; 21330: 21; 21443: 18; 21517: 4; 21560: 21; 21621: 4c; 21703: 13; 21708: 21; 21730: 18; 21774: 21; 21785: 4; 21801: 13 – Endert 65.E.2.P.688: 20; 2285: 4bi; 2420: 18; 2456: 4c; 3317: 18; 3420: 18; 3499: 13; 4137: 13; 4867: 4c; 4977: 4; 5050: 21; 5069: 21 – Evangelista 790: 18.
- Falconer 376: 8 – FB 1119: 18; 2904: 18; 3085: 18; 12887: 18; 15215: 15; 20142: 18; 20397: 18; 20448: 18; 21645: 18; 25425: 18; 25980: 18; 25989: 18; 27158: 18; 30903: 18; 31152: 10b; 31329: 18; 31330: 10a – Forbes 2836: 18; 2841: 4bii; 2842: 4bii; 3092: 20 – Fuchs 21359: 18 – Fung 20104: 10b.
- Gaudichaud 64: 10a – Geesink, Hattink & Phengkai 6475: 8 – Gianni 250: 10a; 539: 4c – Goodenough 1304: 4bii; 1352: 6; 1356: 13; 1549: 13; 1782: 4bii – Grashoff 43: 4c; 679: 10b; 723: 4c; 829: 18; 829a: 18; 888: 13; 933: 13; 933a: 13; 934: 4bii; 998: 10a; 1075: 4c – Griffith 165: 8; 385: 8; KD 989/1: 8; KD 995: 13; KD 996: 11; KD 997: 10a; KD 997/1: 10b; KD 1000: 10a; KD 1001: 4eii – Groff 5666: 10c – Gusdorf 31: 10a.
- Hallier 2182: 13; 2338: 13; 2433: 13; 2557: 11 – Hamid CF tree 11: 4c; CF tree 325: 4c – Harmand 232: 8; 256: 8; 1427: 4a – Hassan & Kadim H 96: 10b – Haviland 1800: 7; 1862: 7; 2194: 10a; 2241: 7; 2270: 2; 2275: 10a; 2276: 13; 2277: 10a; 2879: 13; 3175: 2 – Haviland & Hose 3369: 19; 3369E: aff. 19; 3372: 13; 3372 O: 13 – HB 14418: 10a; 14421: 10a; 14425: 10a; 14524: 10b; 14593: 10a – Holmberg 749: 10b; 777: 4c – Horsfield 809: 10a – Hose 602: 21 – Hotta 12984: 21; 13960: 18 – Hullett 421: 18 – Hume 7526: 10b.
- Jacobs 5333: 19 – Jaheri 187: 4c – Junghuhn 10: 10a; 29: 10a; 68: 18; Pl. Ined. 203: 10b; Pl. Ined. 371: 10a.
- Kasim bin Rajab 496: 10a – KEP 11: 4c; 324: 18; 325: 4c; 363: 4c; 527: 13; 587: 13; 2613: 4c; 4004: 11; 4598: 13; 4705: 4c; 4750: 13; 4752: 11; 4947: 6; 7504: 4c; 7966: 10b; 10469: 13; 10528: 6; 10531: 13; 10629: 4c; 11277: 13; 12498: 21; 14851: 13; 17108: 11; 17582: 4c; 17866: 4c; 17944: 10a; 20256: 10b; 22428: 3?; 32558: 13; 54242: 18; 77856: 13; 79023: 10b; 94520: 13; 97838: 10b; 98554: 13; 98852: 3; 99135: 10a; 105033: 4bii; 105181: 13; FRI 1854: 10a; FRI 2266: 13; FRI 3423: 10b; FRI 3496: 10a; FRI 3551: 4eii; FRI 4361: 4c; FRI 4489: 4c; FRI 6170: 13; FRI 6506: 4c; FRI 7129: 18; FRI 7720: 20; FRI 7973: 4c; FRI 8583: 10b; FRI 9093: 20; FRI 10648: 18; FRI 11814: 18; FRI 11878: 4eii; FRI 13331: 20; FRI 13932: 20; FRI 13942: 13; FRI 14301: 6; FRI 14703: 10a; FRI 14823: 4eii; FRI 15203: 6; FRI 15318: 10a; FRI 16079: 4bii; FRI 16343: 4c; FRI 16920: 3; FRI 16973: 6; FRI 16988: 6; FRI 17733: 18; FRI 18018: 4c; FRI 19143: 22; FRI 19144: 22; FRI 19145: 22; FRI 19280: 9; FRI 20105: 10a; FRI 20336: 16; FRI 22169: 10a; FRI 25188: 10a; FRI 25630: 6; FRI 25649: 18; FRI 25652: 3; FRI 25682: 4bii; FRI 29656: 10a; FRI 32613: 18 – Kerr 4076: 10a; 4076 A: 10a; 6855: 16; 8292: 8; 9597: 8; 9794: 8; 9863: 8; 9913 A: 8; 10003: 8; 11590: 8; 11957: 10a; 15869: 16; 16325: 8; 16343: 8; 16434: 4a; 19129: 10b; 21375: 8; 21643: aff. 4a – King's coll. 1058: 13; 5346: 13; 5361: 10a; 5394: 13; 5481: 4eii; 5505: 10b; 5534: 10b; 6478: 18; 6523: 11; 6750: 11; 7140: 4eii; 7284: 4eii; 7903: 9; 8675: 18; 10621: 13 – KL 1629: 13; 2052: 13; 2630: 18; 2678: 10a; 3055: 11 – Ko 52257: 10b – Kokawa & Hotta 2616: 18 – Koorders 7420: 10a; 10419: 10a;

- 34287: 10a; 37549: 18; 37571: 18; 38966: 9; 38975: 10a; 42765: 10a – Kostermans 48: 10b; 5298: 18; 5375: 10c; 6376: 21; 6527: 21; 6674: 4c; 6838: 18; 6933: 10b; 7160: 21; 9303: 10a; 10706: 18; 10846: 18; 12014: 4bii; 12028: 4bii; 12071: 11; 12074: 4c; 12534b: 10c; 12537: 4c; 12596: 4c; 12598: 18; 12599: 21; 12621: 13; 12631: 13; 12652: 10c; 13305: 10c; 13333: 18; 13477: 4c; 13947: 10c; 19313: 10a – Kostermans & Anta 100: 4c; 517: 10b; 726: 4c; 1144: 4c – Künstler 5698: 13 – Kuntze 4366: 10a – Kurz 2035: 8 – Kyi 12270: 8.
- Lakshnakara 675: 18; 971: 8 – Lambach 1295: 10b – Lance 5001: 10a – Leenhouts 2329: 10a – Lei 431: 10b – Leighton 149: 4c; 152: 4bi; 816: 21; 892: 18 – Liang 61704: 10b; 64718: 10b; 64732: 10b; 64733: 10b; 64832: 10b; 64941: 10b; 65045: 10b – Loher 14899: 18 – Lörzing 3680: 10a; 11670: 10b; 11743: 10b; 11984: 10a; 11995: 10b; 14649: 10a; 17406: 18.
- MacClure C.C.C. 9455: 10b – Maingay 1111: 4c; 1116: 10b; 1118: 4c; 1373: 4ei; 1375: 10a; 1483: 13; 1523: 11; 1526: 10a; 1527: 10b; 1528: 13; 1530: 10a; 1530A: 13; 1628: 6; 1628A: 4bii; 1629: 10a; 1630: 11; 1801: 4c; 1867: 3; 3283: 3; 3311: 11; 3338: 13; KD 440: 3; KD 441: 13; KD 448: 4c; KD 449: 10a; KD 452: 11; KD 452/2: 11; KD 452/3: 11; KD 456: 10b; KD 457: 13; KD 1437: 4c – Marcan 1379: 8; 2012: 10a – M. Martin 464: 8 – Maskuri 179: 10a – J.F. Maxwell 76-8: 8; 76-21: 8; 76-36: 8; 76-339: 8; 80-126: 11; 82-94: 10a – W. Meijer 4368: 4bii; 4614: 4; 5991: 18; 7119: 4c – Milsum 34548: 4bii – Mogeia 4381: 4c – Mokim 440: 8 – Motley 781: 18; 785: 18; 1246: 10a – Murata, Kato & Mogeia B 2669: 10a.
- Nakkan 213: 8 – Nbfd 1702: 13; 1736: 18; 1925: 18; 1944: 18; 1950: 10a; 2119: 18; 2223: 18; 2225: 18; 2226: 10a; 2259: 13; 2310: 10a; 2375: 13; 2415: 10a; 2416: 10a; 2645: 10a; 2814: 18; 2867: 18; 3177: 21; 3185: 21; 3693: 10a; 4498: 18; 4555: 18; 4657: 13; 4852: aff. 4ei; 4864: 10b; 4866: 15; 4909: 13; 4920: 18; 4939: 18; 7001: aff. 4ei; 7059: 18; 7202: 10a; 7773: 18; 7790: 10b; 9869: 18; 10314: 18; A 28: 10a; A 90: 18; A 267: 10a; A 612: 4c; A 627: 13; A 688: 10a; A 887: 10a; A 1091: 18; A 1271: 10b; A 1321: 18; A 1743: 21; A 2671: 10a; A 2733: 18; A 3044: 18. For SAN numbers, see under SAN – Neddy 12: 10a – van Niel 4269: 10a; 4273: 13; 4351: 10a; 4359: 13 – NIFS 28 T 1 P 31: 4c; 28 T 1 P 193: 4c; 65 E 2 P 687: 10b; 65 E 2 P 712: 20; 143 T 1 P 186: 18; 144 T 1 P 187: 13; bb 2989: 10b; bb 4908: 10a; bb 5323: 4eii; bb 5345: 10b; bb 5620: 13; bb 6040: 10b; bb 6044: 10b; bb 6459: 10b; bb 6658: 18; bb 6782: 4c; bb 7319: 4bi; bb 7915: 13; bb 9377: 10a; bb 9400: 10b; bb 9593: 13; bb 9785: 18; bb 9907: 10b; bb 10158: 18; bb 10223: 21; bb 10243: 13; bb 10344: 4c; bb 10496: 18; bb 10956: 4c; bb 11101: aff. 4c; bb 12120: 18; bb 12146: 4f; bb 12256: 19; bb 12366: 10c; bb 12535: 18; bb 12585: 18; bb 12720: 4; bb 13159: 13; bb 13239: 10c; bb 13393: 18; bb 13636: 10b; bb 13638: 13; bb 13691: 13; bb 14742: 18; bb 14836: 10c; bb 15114: 13; bb 15788: 4f; bb 16228: 21; bb 16234: 18; bb 16633: 4c; bb 17766: 18; bb 18274: 13; bb 18635: 14; bb 18638: 4bi; bb 18836: 10b; bb 19485: 4; bb 20690: 10b; bb 20741: 10b; bb 20893: 10b; bb 21735: 10b; bb 23167: 18; bb 23875: 10b; bb 24040: 13; bb 24058: 4c; bb 24809: 13; bb 25247: 10a; bb 26060: 13; bb 26193: 13; bb 26389: 20; bb 26478: 21; bb 26866: 13; bb 27477: 10b; bb 27649: 20; bb 27687: 13; bb 28328: 15; bb 28452: 13; bb 28569: 10a; bb 28599: 20; bb 29069: 10a; bb 29989: 10a; bb 30055: 10a; bb 30101: 10a; bb 30106: 4c; bb 31407: 4c; bb 31725: 4; bb 31819: 10b; bb 32013: 10b; bb 32105: 10a; bb 34182: 4c; bb 34711: 13; bb 34782: 13; bb 34914: 21; Cel./IV-102: 10b; Cel./IV-169: 10b; Cel./IV-170: 10b; Cel./IV-171: 10b; Cel./IV-172: 10b; Cel./V-196: 10b; Ja 1968: 10a; Ja 1977: 10a; Ja 3969: 10a; Ja 6168: 10a; S.W.K./I-7: 10a; S.W.K./I-28: 18; T.1.P.716: 10a; T 505: 18; T 712: 20; T 730: 13; T 911: 10a – Nilphanit 3561: 4eii – Noe 48: 8; 65: 16.
- Olivier 5: 10a.
- Parker 2584: 8 – Parkinson 5182: 8; 5198: 4a; 5239: 8 – Pételot 1003: 10b; 4797: 10b; 5696: 10b – Phusomsaeng et al. 1615: 10b – Pierre 875: 8; 2773: 10a; 4109: 18; 4111: 10a; 4117: 8; 4130: 8; 5690: 4a – PNH 3598: 18; 9547: 18; 22808: 18; 22998: 10a; 33459: 18; 33503: 18; 38525: 18; 78093: 18 – Poilane 2503: 8; 11697: 8; 11698: 8; 11941: 8; 11961: 8; 12089: 8; 12238: 4a; 13287 bis: 8; 23602: 8; 25372: 4a; 26234: 10b; 26379: 10b; 29440: 8;

- 29448: 16; 29494: 16; 29500: 16; 29554: 16; 29991: 8 – U Po Khant 1291: 8 – Poore 1361: 10b – Popta 00547/100 B: 10a – Prawiroatmodjo 259: 10a – Prawiroatmodjo & Maskuri 483: 10c – Pringgo Atmodjo 446: 10a – Put 658: 8; 3570: 16.
- Rahmat si Boeca 5206: 10a; 5249: 10a; 5320: 10a; 5498: 10a; 8245: 10a; 8880: 13; 8902: 13; 9652: 13 – Ramos Philippine Plants 1631: 18 – Reinwardt 1696: 11 – Reporter on economic products to the government of India 11068: 18 – Richards 2214: 10c – Ridley 278: 13; 407: 18; 2572: 10a; 2633: 18; 3624 a: 10a; 4584: 4c; 6071: 13; 6210: 13; 6211: 11; 6212: 13; 6369: 4c; 6374: 18; 6531: 13; 6667: 18; 6780: 18; 10165: 18; 13532: 13; 15442: 13 – Rock 1879: 8; 2081: 18 – Rojo 44: 18 – van Rossum 18: 10b; 65: 4c – Rottler 2: 10a – A. van Roijen 10: 10a – Rutten 250: 10a.
- Sablaya 70: 18 – SAN (Sandakan Forestry Department; see also Nbfd) 15153: 20; 15898: 7?; 16176: 18; 16228: 18; 16373: 13; 16631: 13; 16801: 13; 17696: 13; 18724: 18; 19344: 18; 19373: 18; 19646: 4f; 20856: 5; 20946: 5; 21765: 18; 22251: 18; 22253: 4ei; 22409: 10b; 23491: 10; 23790: 5; 24263: 4c; 24442: 13; 24651: 18; 24713: 13; 25074: 18; 26185: 4bi; 26734: 10a; 27006: 18; 28104: 5; 28292: 15; 29497: 21; 29585: 21; 30335: 21; 30361: 4c; 30612: 21; 33506: 13; 33606: 13; 33616: 13; 33630: 10a; 34190: 4f; 34251: 5; 34308: 18; 34340: 5; 34868: 18; 35500: 18; 35806: 18; 35848: 4c; 36088: 18; 36302: 18; 36320: 18; 36621: 5; 36621(a): 5; 36733: 18; 36870: 5; 36886: 5; 36963: 21; 37068: 4bi; 37504: 18; 38147: 18; 38659: 17; 38723: 17; 38799: 13; 38905: 21; 38916: 4; 39120: 18; 39162: 18; 39169: 13; 39232: 21; 39467: 18; 39469: 4c; 39601: 5; 39613: aff. 4c; 39648: 5; 39689: 13; 39703: 13; 39723: 18; 39752: 10b; 39800: 5; 39938: 18; 40324: 18; 40868: 13; 41497: 21; 41800: 18; 41820: 18; 41845: 17; 41887: 18; 42730: 5; 43201: 10b; 43207: 20; 43217: 10b; 43259: 21; 43290: 21; 43510: 18; 43718: 18; 43736: 21; 43740: 21; 44035: 10b; 44044: 4c; 44177: 18; 44648: 10b; 44698: 18; 44843: 13; 46958: 13; 46972: 5; 47467: 13; 47643: 10b; 48415: 13; 48559: 1; 49238: 10b; 49241: 18; 50342: 13; 50490: 5; 50805: 13; 50971: 13; 51204: 21; 51675: 21; 53025: 13; 53117: 13; 53326: 13; 53610: 13; 54322: 18; 55384: 18; 55586: 13; 55602: 13; 55620: 13; 55851: 10a; 57055: 18; 58005: 18; 58012: 18; 58110: 18; 58488: 13; 59034: 18; 59288: 5; 59680: 13; 59752: 13; 60511: 5; 60897: 10a; 60898: 10a; 61090: 15; 61377: 4bi; 61660: aff. 4c; 61862: 10b; 61966: 13; 62962: 21; 62971: 10b; 63604: 5; 63792: 18; 63881: 21; 64325: 10b; 64364: 18; 64378: 10a; 64510: 18; 64778: 18; 64785: 4c; 65354: 13; 65365: 13; 65388: 13; 65405: 13; 65635: 13; 65659: 18?; 65951: 19; 65959: 4c; 66049: 10b; 66179: 13; 66271: 21; 69283: 4bi; 69295: 21; 70229: 18; 70234: 13; 70550: 4c; 70725: 10b; 72480: 21; 72578: aff. 4eii; 72601: 10b; 72603: 18; 73060: 18; 73230: 13; 73357: 10b; 73835: 13; 73943: 18; 74287: 10b; 75483: 18; 75983: 4; 76096: 10b; 76309: 21; 76388: 18; 76389: 4ei; 76819: 18; 77040: 4c; 77048: 18; 77370: 18; 77371: 18; 77383: 10b; 77384: 18; 77450: 18; 78288: 13; 78407: 4c; 78504: 18; 78506: 21; 78601: 18; 78617: 18; 78618: 4; 78619: 4f; 81056: aff. 4eii; 81549: 4c; 82133: 18?; 82872: 18; 82882: 18; 84172: 4; 86616: 4bi; 87030: 18; 87536: 18; 87538: 13; 87539: 18; 87543: 13; 87576: 21; 87865: 18; 88052: 13; 88053: 18; 88054: 18; 88277: 18; 88801: 18; 88802: 18; 88808: 18; 89003: 13; 89092: 18; 89304: 4c; 89790: 13; 89835: 18; 89853: 4c; 90916: 18; 91046: 10b; 92580: 13; 92755: 21; 93175: 5; 93764: 21; 93782: 10a; 93783: 10a; 93784: 10a; 93785: 10a; 93788: 21?; 94064: 13; 94549: 4c; 95928: 4bi; 96083: 21; 96096: 21; 96195: 4; 96746: 18; 97096: 21; 97259: 10b; 97262: 10c; 97265: 18 – Sangkhachand 1363: 10a – Santos 4151: 18 – Sarawak For. Dept. S 0489: 7?; S 0852: 13; S 1563: 13; S 2234: 10a; S 2637: 7?; S 2737: 7?; S 3475: 10a; S 3606: 13; S 3848: 13; S 4398: 13; S 5203: 13; S 9710: 13; S 9970: 13; S 12096: 10a; S 12857: 13; S 13115: 13; S 13355: 10a; S 14748: 10b; S 14978: 12; S 15062: 10a; S 15513: 10b; S 15557: 20; S 15884: 20; S 16197: 10c; S 16217: 13; S 16227: 10a; S 18209: 18; S 18627: 4; S 22151: 18?; S 22162: 4; S 22397: 18; S 22420: 13; S 22537: 18; S 23356: 18; S 23359: 4f; S 23935: 21; S 23984: 4; S 25276: 5; S 25393: 12; S 25801: 13; S 25991: 20; S 28788: 18; S 29687: 4; S 29813: 4d; S 29844: 10a; S 30048: 13; S 31133: 19; S 31738: 21; S 32006: 13; S 32008: 10a; S 32066: 5; S 32117: 20; S 32284: 20; S 32399: 14; S 33533: 10a; S 34136: 10a; S 34170: 10a; S 36645: 4ei; S 36665: 4ei; S 36737: 10b; S 36914: 5; S 37873: 5; S 37949:

- 21; S 37985: 14; S 39145: 13; S 39475: 4c; S 41142: 14; S 41296: 10a; S 41452: 13. S 41500: 18?; S 41515: 18; S 41539: 10a; SAR 3638: 4 – Sauveur I 12: 21 – Schierbrand 12: 10a – Schiffner Tropische Cultur- und Heilpflanzen 54: 10a – Scortechini 30: 3; 143: 4c; 1294: 10a; 1767: 9; 1992: 6 – SF 2003: 13; 9432: 13; 12514: 10a; 14958: 4c; 15737: 4c; 16454: 18; 17571: 10a; 21909: 4c; 22043: 18; 22109: 18; 25980: 13; 26136: 11; 26150: 10a; 26694: 15?; 28572: 11; 28574: 11; 28625: 11; 30272: 13; 32118: 11; 32442: 13; 33491: 18; 34443: 18; 34445: 10a; 34446: 13; 34547: 18; 35140: 4eii; 35413: 13; 35683: 4; 35707: 20; 35713: 13; 36313: 11; 36838: 20; 36845: 4c; 37131: 13; 39997: 11 – Shah & Kadim 302: 13; 328: 13 – Shah & Noor MS 815: 13 – Shimizu, Iwatsuki, Fukuoka & Hutoh M 13943: 10a – Siebold 17: 10a – Sinclair & Kadim bin Tassim 10447: 18? – Smitinand 732: 10b – Soepadmo 58: 11; 109: 4c; 125: 10a; 615: 13 – Soepadmo & Mahmud 1199: 10b – van Steenis 3076: 10a – Stone & Sidek 12512: 10a.
- T. & P. 30: 18; 78: 10a – Teijsmann HB 3234: 4; HB 3488: 4c; HB 3951: 4c; HB 4425: 4c; HB 14319: 13; HB 14335: 13; HB 14459: 13 – Thorel 729: 8; 2769: 8 – Thorenaar 65 E 2 P 688: 20 : Treub 20: 9 – T.S. & C.P. 1052: 16 – Tsang W.T. 29853: 10b.
- Usteri 144: 10a.
- J. Vidal 691B: 8; 692B: 8 – S. Vidal 215: 18; 1048: 18 – Villamil 334: 10 – de Vogel 3905: 18; 3928: 18.
- G.W. Walker 210: 10a – Wallich 8048G: 11; 8048H: 8; 8053B: 10a – Wanaraks 52: 8 – C. Wang 35671: 10b – Wenzel 527: 18; 535: 18; 655: 18 – Wester 2: 10b – de Wilde & de Wilde-Duyfjes 13884: 10b; 13931: 10a; 16552: 10a – R.S. Williams 2948: 18 – Winit 1395: 8; 1576: 8 – Winkler 3158: 18 – Wiriadinata 1139: 18; 1150: 4c; 1212: 13; 1217: 21 – D.D. Wood 2128: 13 – Wray 190: 13; 1300: 4c; 5635: 13.
- Yates 1076: 10a; 2240: 18.

INDEX TO SCIENTIFIC NAMES

Numbers refer to the number of the accepted species; D 1–3 refers to the dubious names, E 1–62 to the excluded taxa. Accepted names are in plain type, new names in bold type, synonyms have '=' before the number of the species to which they belong.

- | | |
|---|--|
| <i>Alectryon connatus</i> Radlk. E 9 | <i>(Dimocarpus) gardneri</i> Leenh. E 26 |
| <i>coriaceus</i> Radlk. E 10, E 51 | <i>informis</i> Lour. E 28 |
| <i>ferrugineus</i> Radlk. E 20 | <i>leichhardtii</i> S.T. Reynolds E 30 |
| <i>forsythii</i> Radlk. E 22 | <i>longan</i> Lour. E 4, E 17, E 33, E 34, E 35, |
| <i>subcinereus</i> Radlk. E 31 | E 36, E 37, E 48, E 50, E 53 |
| <i>subdentatus</i> Radlk. E 56 | <i>pupilla</i> Moon E 48 |
| <i>tomentosus</i> Radlk. E 59 | <i>Eccremanthus eximius</i> Thwaites E 19 |
| <i>Allophylus cobbe</i> Raeusch. E 45, E 57 | <i>Euphoria crinita</i> Poirét = 10a |
| <i>Aporetica ternata</i> J.R. & G. Forster E 57 | <i>didyma</i> Blanco E 12 |
| <i>Arytera distylis</i> Radlk. E 14 | <i>echinulata</i> Radlk. E 17 |
| <i>divaricata</i> F. Muell. E 3, E 15 | <i>glabra</i> Blume = 10a |
| <i>foveolata</i> F. Muell. E 23 | <i>leichhardtii</i> Benth. E 30 |
| <i>lautereriana</i> Radlk. E 29 | <i>longana</i> Lam. E 34 |
| <i>microphylla</i> Radlk. E 38 | <i>nephelium</i> Poirét = 10a |
| <i>semiglaucula</i> F. Muell. E 52 | <i>nephelium</i> DC. = 10a |
| <i>Baccaurea capensis</i> Sprengel E 7 | <i>noronhiana</i> Blume E 41 |
| <i>Castanospora alphanthii</i> F. Muell. E 6 | <i>ramb-outan</i> Labill. = 10 |
| <i>Cnemidiscus</i> Pierre E 1 | <i>ramb-outan-aké</i> Labill. = 18 |
| <i>thorelii</i> Pierre E 58 | <i>setosa</i> Radlk. E 53 |
| <i>Dimocarpus crinita</i> Lour. = 10a | <i>verticillata</i> Lindl. E 60 |
| <i>fumatus</i> Leenh. E 24 | <i>xerocarpa</i> Blume E 62 |

- Glennia* Hook. f. E 1
 thorelii Leenh. E 58
 unijuga Radlk. E 25
Guioa acutifolia Radlk. E 61
 semiglaucula Radlk. E 52
Heterodendrum diversifolium F. Muell. E 16
 oleifolium Desf. E 42
Irina diplocardia Blume E 13
Lepisanthes erecta Leenh. E 18
 multijuga Leenh. E 39
 senegalensis Leenh. E 5, E 11, E 49, E 60
 simplicifolia Leenh. E 54
Litchi chinensis Sonnerat E 8, E 12, E 32
 ramboutan Labill. = 10a
 ramboutan-aké Labill. = 18
Mesonephelium cochinchinense Pierre = 8
Mischocarpus pentapetalus Radlk. E 27
Nephelium L.
 subsect. *Clathronephelium* Radlk. under
 genus
 sect. *Cnemidiscus* Lecomte E 1
 subsect. *Dictyonephelium* Radlk. under
 genus
 subsect. *Euclathronephelium* Radlk. under
 genus
 subsect. *Eudictyonephelium* Radlk. under
 genus
 sect. *Macronephelium* Radlk. under genus
 sect. *Mesonephelium* Pierre under genus
 sect. *Micronephelium* Radlk. under genus
 aculeatum Leenh. 1
 acuminatum Hook. f. E 2
 altissimum Teijsm. & Binnend. = 9
 bassacense Pierre = 4a
 beccarianum Radlk. = 4e i
 beckleri Benth. E 3
 bengalense G. Don E 4
 bifoliolatum Thwaites E 5
 callarrie F. M. Bailey E 6
 capense Baillon E 7
 caudifolium Ridley = 11
 chinense Druce E 8
 chryseum Blume = 10b
 var. *topengii* C. Y. Wu = 10b
 cochinchinense Pierre = 8
 compressum Radlk. 2
 connatum Benth. E 9
 coriaceum Benth. E 10
 costatum Hiern 3
 cuspidatum Blume 4
 var. *bassacense* Leenh. 4a
 subvar. *beccarianum* Leenh. 4e i
 var. *cuspidatum* 4b
 (*Nephelium cuspidatum*)
 subvar. *cuspidatum* 4bi
 subvar. *dasyneurum* Leenh. 4bii
 var. *eripetalum* Leenh. 4c
 var. *multinerve* Leenh. 4d
 var. *ophiodes* Leenh. 4e
 subvar. *ophiodes* Leenh. 4eii
 var. *robustum* Leenh. 4f
 daedaleum Radlk. 5
 danura Walp. E 11
 dasyneurum Radlk. = 4bii
 didymum Craib E 12
 diplocardia F. Muell. E 13
 distyle F. Muell. E 14
 divaricatum Benth. E 15
 diversifolium F. Muell. E 16
 echinatum Noronha = 10a
 echinulatum Ridley E 17
 erectum Thwaites E 18
 eripetalum Miq. = 4c
 eximium Thwaites E 19
 ferrugineum F. Muell. E 20
 forbesii E. G. Baker E 21
 forsythii Maiden E 22
 foveolatum Benth. E 23
 fumatum Blume E 24
 fuscatum Thwaites E 25
 gardneri Thwaites E 26
 glabrum Blume = 10a
 glabrum Cambess. = 10a
 glabrum Noronha = 10a
 var. *album* Hassk. = 18
 var. *nigrum* Hassk. = 18
 var. *rubrum* Hassk. = 18
 var. *sufferrugineum* Ridley = 10a
 griffithianum Kurz = 18
 hamulatum Radlk. 6
 havilandii Leenh. 7
 herveyi Ridley = 6
 hosei Ridley E 27
 bypoleucum Kurz 8
 informe Cambess. E 28
 intermedium Radlk. = 18
 juglandifolium Blume 9
 lappaceum L. 10
 var. *glabrum* Blume = 10a
 var. *lappaceum* 10a
 var. *maingayi* Valetton = 13
 var. *pallens* Leenh. 10b
 var. *topengii* How & Ho = 10b
 var. *xanthioides* Leenh. 10c
 laurinum Blume 11
 lauterianum F. M. Bailey E 29

- (*Nephelium*) *leichhardtii* F. Muell. E 30
leiocarpum F. Muell. E 31
lit-chi Cambess. E 32
longan Hook. E 33
longana Cambess. E 34
 var. *hypoleuca* King = 8
 var. *pallida* Trimen E 35
long-yan Blume E 36
macrophyllum Radlk. 12
maculatum Radlk. = 10a
maingayi Hiern 13
malaïense Griff. E 37
meduseum Leenh. 14
melanomiscum Radlk. 15
melliferum Gagnepain 16
microphyllum Benth. E 38
multijugum Hook. f. E 39
multinerve Radlk. = 4d
muricatum Griff. E 40
mutabile Blume = 18
 var. *pallens* Hiern = 10b
 var. *rigida* Blume = 18
 var. *trigyna* Blume = 18
noronhianum Cambess. E 41
obliquinerve Radlk. = 4bii
obovatum Ridley = 10a
oleifolium F. Muell. E 42
ophioides Radlk. = 4eii
oppositifolium Cordem. E 44
oppositifolium Walp. E 43
pallens Radlk. = 10b
papillatum Leenh. 17
parviflorum Gagnepain = 16
parviflorum Walp. E 45
philippense Monsalud & al. = 18
pinnatum Cambess. E 46
pubescens Ridley E 47
pupillum Wight E 48
ramboutan-ake Leenh. 18
rambutan Schnizl. = 10a
reticulatum Radlk. 19
rimosum G. Don D 1
robustum Radlk. = 4f
rubescens Hiern = 11
rubrum Wight E 49
schneideri Merr. E 50
- (*Nephelium*) *semicinereum* F. Muell. E 51
semiglaucum F. Muell. E 52
setosum Ridley E 53
simplicifolium Thwaites E 54
stipulaceum Beddome E 55
subdentatum Benth. E 56
subfalcatum Radlk. 20
sufferrugineum Radlk. = 10a
ternatum Cuzent E 57
thorelii Lecomte E 58
tomentosum F. Muell. E 59
toong Crevost & Lemariée D 2
topengii H.S. Lo = 10b
tuberculatum Radlk. = 9
uncinatum Leenh. 21
variabile Voigt D 3
verticillatum G. Don E 60
winterianum F.M. Bailey E 61
xanthioides Radlk. = 10c
xerocarpum Cambess. E 62
xerospermoides Radlk. = 15
Otonephelium stipulaceum Radlk. E 55
Pappea capensis Ecklon & Zeyher E 7
Paranephelium xestophyllum Miq. E 21
Pometia pinnata J.R. & G. Forster E 2, E 13,
 E 19, E 46
Ratonia distylis Benth. E 14
Sapindus edulis Aiton E 32
Scytalia chinensis Gaertn. E 8
 crinita Raeusch. = 10a
 danura Roxb. E 11
 oppositifolia Roxb. E 43
 parviflora Roxb. E 45
 ramboutan Roxb. = 10a
 rimosa Roxb. D 1
 rubra Roxb. E 49
Sisyrolepis muricata Leenh. E 47
Spanoghea connata F. Muell. E 9
 ferruginea Blume E 20
 nephelioides F. Muell. E 31
Stadmannia oppositifolia Poiret E 44
 sideroxyylon DC. E 44
Xerospermum cochinchinense Pierre = 8
 laoticum Gagnepain = 8
 noronhianum Blume E 40, E 41, E 62
 topengii Merr. = 10b