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ENDOCOMIA, A NEW GENUS OF MYRISTICACEAE

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SUMMARY

The new genus *Endocomia*, ranging from South China to New Guinea, is described, keyed out and discussed among the other four Southeast Asiatic genera of Myristicaceae, viz. *Knema, Myristica, Gymnacranthera*, and *Horsfieldia. Endocomia* was formerly included in *Horsfieldia* under the name *H. macrocoma*, an 'aggregate' species. In *Endocomia* presently 4 species, one with 3 subspecies, are recognized; of these 2 species and 1 subspecies are newly described. The genus and the species are fully treated taxonomically.

After having revised all species of the Southeast Asiatic genus *Horsfieldia*, it became evident that some taxa, formerly going under the name *Horsfieldia macrocoma*, could not be maintained in this genus. These taxa are presently segregated into the herewith newly proposed genus *Endocomia.*

In Sinclair's posthumous account of the whole genus *Horsfieldia* (Gard. Bull. Sing. 27, 1974, 133–141; ibid. 28, 1975, 1–181) the taxonomic treatment of the *H. macrocoma* aggregate was left out for obscure reasons, only the enumeration of the specimens belonging to it was given. In an earlier treatment of the family Myristicaceae for Malaya (Gard. Bull. Sing. 16, 1958, 389) Sinclair discussed the existence of at least three varieties within *H. macrocoma*. With Sinclair as well as with earlier authors including Warburg (1897) and King (1891), *Horsfieldia macrocoma* was well known as being aberrant, probably most prominently so by its monoecism, which is, except for some anomalies in *Myristica*, unique in the Asiatic Myristicaceae.

Traditionally, apart from anatomical characters of the leaves and characters of the indumentum (see Koster & Baas, Blumea 27, 1981, 115–173), and the embryo, the main distinction between the four genera recognized in Asiatic Myristicaceae since Warburg's monograph (1897) is as follows: (1) *Knema* – inflorescences short woody tubercles of slow unlimited growth, bracteole present, attached usually at some distance below the perianth, androecium a stalked disc with the anthers free or largely free, stellately and more or less horizontally attached mainly by their bases, aril completely covering the seed, laciniate at the apex only; (2) *Myristica* – inflorescences either short woody tubercles or branched panicles, bracteole present, at the base of the perianth, androecium a stalked elongated column often with a sterile apical portion, anthers entirely adnate to the column by their backs, not free at apex, aril com-

pletely covering the seed, laciniate to or nearly to the base; (3) *Gymnacranthera* – inflorescences paniculate, bracteole absent, androecium a sessile or very shortly stalked elongated column without sterile apical portion, the anthers free at apex, aril completely covering the seed, laciniate to or nearly to the base; (4) *Horsfieldia* – inflorescences paniculate, bracteole absent, androecium various of shape, usually subsessile, anthers either completely adnate to the column by their backs or their apical parts free, sometimes (strongly) incurved, aril completely covering the seed, entire or only at apex shallowly lobed or convoluted. These characters summed up for the new genus (5) *Endocomia* are – inflorescences paniculate, bracteole absent, androecium distinctly stalked, the synandrium subglobose with the anthers attached to the central column by their backs, not free at apex, aril either completely or but partly covering the seed, generally conspicuously laciniate to c. 1/4 to halfway, rarely subentire or laciniate only at apex. Within the above comparison of characters the differences of *Endocomia* with the other genera, especially *Horsfieldia*, look rather scanty, but at closer examination there are a number of striking differences on other points, as listed and discussed below.

DIFFERENCES WITH HORSFIELDIA

In the following 14 features the newly proposed genus *Endocomia* differs from *Horsfieldia*; possible differences in pollen, anatomy, characteristics of indumentum and of the embryo have not been investigated, but according to Koster & Baas (Blumea 27, 1981, 115–173) *Horsfieldia macrocoma*, with 2 specimens studied, falls leaf anatomically within the ranges of *Horsfieldia* for all characters investigated. I examined the embryo of *Endocomia canarioides* in the fruiting collection in spirit (*de Wilde & de Wilde-Duyfjes 18877*) from North Sumatra and found the cotyledons rather spreading, c. 45°, scarcely connate at base, and possibly falling within the descriptions and figures presented by Warburg for *Horsfieldia*.

Endocomia	*Horsfieldia*
1. Monoecious.	1. Dioecious.
2. Twigs without lenticels.	2. Twigs usually with distinct lenticels.
3. Inflorescences axillary of leaves, sometimes pseudoterminal, at base with or without cataphylls.	3. Inflorescences always axillary of normal leaves (or leaf scars), at base always with cataphylls.
4. Flowers ultimately grouped into umbel-like clusters, the flowers either all in the same stage of development or in different stages.	4. Flowers on the ultimate branches of the tinflorescences either scattered or in clusters, usually all in the same stage of development (different stages in a cluster only seen in *H. amygdalina*).

5. Perianth 3–5-lobed to or nearly to the base.	5. Perianth either 2-, 3- (or 4-)lobed, to various depth.
6. Perianth lobes or tepals in anthesis horizontally spreading or reflexed.	6. Perianth lobes in anthesis erect or suberect, only slightly opening the bud.
7. Perianth inside papillary-hairy to various degree.	7. Perianth inside glabrous.
8. Colour of perianth inside greenish-creamy to bright red.	8. Perianth inside yellow.
9. Synandrium short-ellipsoid to depressed-globose, 0.5 mm long or less, anthers not free at apex, central column narrow, not broader than the androphore, at apex not excavated, sometimes shortly protruding, androphore cylindrical, longer or shorter than the synandrium but always distinct.	9. Androecium of various shape and size, usually more than 0.5 mm long, central column broader than the androphore, at apex usually excavated, androphore usually much shorter than the synandrium.
10. Anthers few, 2–6, completely sessile, at apex not incurved.	10. Anthers few to many, 2–c. 25, completely sessile or free at apex, the apical portion incurved or not.
11. Stigma narrowly 2-lobed, or 3–5-lobed, or 3–5-lobulate.	11. Stigma 2-lobed or 2-lipped; in *H. iryaghedhi* few-lobulate.
12. Seed usually shortly pointed at one side.	12. Seed at both ends rounded.
13. Aril either completely covering or shorter than the seed, usually deeply laciniated for c. 1/4 to halfway (aril almost entire in the Philippines).	13. Aril completely covering the seed, only at apex lobed or convoluted.
14. Testa variegated (not conspicuously so in New Guinea).	14. Testa not variegated.

DIFFERENCES AND SIMILARITIES WITH OTHER GENERA

The character states 1–14 as listed above will now be discussed in some more detail; they may or may not agree with the other Asiatic genera, as indicated below.

(1) Monoecism. Most likely in *Endocomia* the inflorescences are generally mixed male and female with male flowers predominant. However, also purely male inflorescences seem to occur, as well as inflorescences with predominantly female flowers, the latter sometimes resulting in richly fruiting infructescences. Also, the female flowers themselves are similar to the males in general appearance and

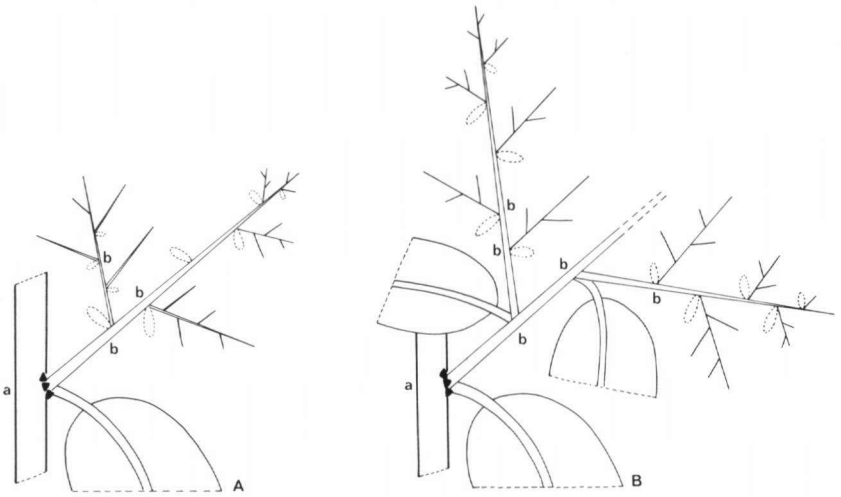


Fig. 1. Two different modes of inflorescence arrangement in *Endocomia*. – A. Paniculate inflorescence with caducous bracts (b), axillary to a foliage leaf, with at the base of the rachis (a) a few persistent scale-like cataphylls. This situation prevails in *E. macrocoma*, *E. canarioides*, and *E. virella*, and in all species of *Horsfieldia*. – B. Similar inflorescences axillary to foliage leaves along shoots developed from a bud leaving cataphylls at base of the shoot; at base of the inflorescences cataphylls are lacking. This situation is facultatively present in *E. rufirachis* and some other myristicaceous genera except *Horsfieldia*. The supposed homologies of inflorescences and bracts and foliage leaves between A and B are evident from the drawing.

may be difficult to trace in predominantly male inflorescences. The other Asiatic genera of Myristicaceae are dioecious; only in *Myristica fragrans* (cultivated) and *M. crassa* occasional female flowers may be mixed with male flowers. Outside Asia *Brochoneura* (Madagascar) and (sometimes) *Iryanthera* (America) have been reported as monoecious.

(2) In the genera *Knema*, *Myristica* and *Gymnacranthera* a part of the species have distinct lenticels, in other species they apparently are lacking specifically. In *Horsfieldia* possibly all hundred species have lenticels on the twigs, although in some species they may be inconspicuous. In *Endocomia* I never observed distinct lenticels.

(3) The flower-bearing woody tubercle-like short-shoots of *Knema* and *Myristica* p.p. are quite distinct. Panicle-like inflorescences axillary to normal leaves or leaf-scars occur in *Myristica* p.p., *Gymnacranthera*, *Horsfieldia* and *Endocomia*. At the base of the common peduncle there are a few minute scattered cataphylls, only c. 1 mm long or less, except in a part of the material of *Endocomia* where these are lacking conspicuously. This discrepancy can be explained by postulating basical compound paniculate inflorescences in which the (lateral) ramifications branch from the axils of caducous bracts and which as a whole emerge from the axils of normal foliage leaves always accompanied by some minute

cataphylls at base, as schematically drawn in fig. 1A. This situation is, *grosso modo*, prevalent in *Gymnacranthera* and *Horsfieldia*, and in *Endocomia* partly so. In the remaining part of *Endocomia*, and also in *Myristica* (at least in part) and e.g. in the American genus *Virola* (at least in part) the compound inflorescences are axillary to normal leaves but without cataphylls at base, as figured in fig. 1B. From fig. 1 it will be clear that the situation in A is homologous with the whole leafy twig as drawn in B; the situation in A being the rule in *Horsfieldia* and *Gymnacranthera*, in A or B facultatively in *Endocomia* and *Myristica*.

Pseudo-terminal inflorescences occur in *Endocomia* by the abortion of the terminal bud, a feature never seen in the other Asiatic genera.

(4) Umbel-like ultimate clusters of flowers in the inflorescences are common in all genera of Asiatic Myristicaceae, but there is a clear difference between two states, namely one in which the flowers in a cluster (and usually in the whole inflorescence) are all in the same stage of development, i.e. of more or less equal age and size, or one in which the flowers in a cluster are clearly in different stages of development, i.e. of different size. Both states may occur in *Knema* and *Myristica*, but in *Gymnacranthera* and *Horsfieldia* the state of all flowers being of about equal age and size is prevalent. In *Endocomia* two of the four species, viz. *E. virella* and *E. macrocoma*, have flower clusters with flowers in different stages of development (fig. 2f).

(5, 6) The deeply 3–5-cleft perianth, with the perianth-lobes reflexed, recalls the situation in most *Knema* species, although five lobes or tepals is exceptionally for that genus. More or less outward curved or reflexed perianth lobes are prevalent in *Myristica* and *Gymnacranthera*.

(7) Perianths in Asiatic Myristicaceae are generally glabrous inside. Only in the small genera *Gymnacranthera* and *Endocomia*, and in *Knema pubiflora* they are pubescent inside. In the latter the hairs are thin and densely set, in the two named genera the indument is of a different nature with the hairs placed in rather distinct longitudinal rows; in *Endocomia* the hairs are coarser and ± papillose (fig. 2c, d, g, h).

(8) Red colour of the inner perianth is common in other myristicaceous genera, e.g. *Knema* and *Myristica*; in *Horsfieldia* the perianth is never red inside.

(9) The synandrium in *Endocomia* is short-ellipsoid to depressed globose, and stalked; it links up morphologically with those of *Myristica*, or to a lesser extent with those of *Gymnacranthera* in which, however, the apical portions of the anthers are free. *Knema*, with a more or less peltate staminal disk, is quite different, whereas in *Horsfieldia* the staminal column is usually broadened (and often excavated), much broader than the basal part or androphore. In general it resembles much the condition in the American genus *Virola*.

(10) A lower number of anthers occurs occasionally in other myristicaceous genera; few anthers in *Horsfieldia* always go together with a peculiar shape of the androecium and with a reduction of the size of the anthers, and very different from the androecium in *Endocomia*.

(11) Minute few- to many-lobed stigmas occur in *Knema*, and in *Horsfieldia* only in the deviating *H. iryaghedhi* from Ceylon. In *Endocomia* both 2-lobed and many-lobed

stigmas occur (fig. 2h, i); *Myristica* and *Gymnacranthera* have bi-lobed stigmas.

(12) The often pointed seed seems unique in *Endocomia*, although this feature is not always distinct in all specimens. The pointed seed was regarded as an important character for distinguishing *Horsfieldia pandurifolia* in the Flora of China (1979) but that species is presently reduced to *Endocomia macrocoma*.

(13) The state of the aril in *Endocomia* is in many respects intermediate between the situation as in *Myristica* and *Gymnacranthera* on the one hand, with the arils deeply laciniated to or almost to the base, and, on the other hand, the state as in *Knema* and *Horsfieldia* with almost entire arils. In these four genera the aril is completely or almost completely covering the seed. In *Endocomia* the aril may be completely covering the seed, but often it reaches to much lower, sometimes only to about half-way; in most specimens the aril is conspicuously deeply laciniated to c. 1/4–1/2-way, but in specimens from the Philippines the laciniation is less apparent and sometimes almost absent, resembling the state as in *Horsfieldia* (fig. 3b, c, f).

(14) Variegated seeds (fig. 3g, h) seem unique at least in Asiatic Myristicaceae. The feature is quite conspicuous in West Malesian specimens of *Endocomia*, but rather faint in East Malesia, especially in New Guinea.

Although *Endocomia* is readily distinct from the other Asiatic genera of Myristicaceae by a number of characters, I have contrasted the new genus against the other four Asiatic genera in two abridged keys, substituting the first two keys offered by Sinclair (1958: 250, 251). For sterile material *Endocomia* falls in Sinclair's third key (1958: 251) next to *Horsfieldia*. Koster & Baas (Blumea 27, 1981, 158, 159) present a synoptical key for anatomical characters to the Asiatic genera, in which *Endocomia* would fall under *Horsfieldia*.

I. KEY TO THE GENERA FOR MALE FLOWERING SPECIMENS

1a. Inflorescences short woody tubercle-like protuberances with the scars of previous pedicels and bracts. Bracteoles present 2

b. Inflorescences a branched panicle, the upper parts occasionally woody with a fe few scars. Bracteoles present or absent 3

2a. Androecium a stalked disc with the anthers usually largely free, stellately attached by their bases. Bracteoles at the base of the flower or median on the pedicel **Knema**

b. Androecium a stalked column with the anthers completely fused to it by their backs, the apex of the column often sterile. Bracteoles embracing the base of the perianth on one side . . . . . **Myristica**

3a. Bracteoles present, at the base of the perianth . . . . . **Myristica**

b. Bracteoles absent 4

4a. Androecium various, with the central column solid or excavated, usually considerable broader than the basal part or androphore. Perianth inside glabrous, the lobes or tepals in anthesis more or less erect, not reflexed . . . . . **Horsfieldia**

b. Androecium elongated to depressed globose, the central column at apex not excavated, narrow, about as wide as or narrower than the androphore. Perianth inside (papillary) hairy, the lobes or tepals erect or reflexed in anthesis 5

5a. Anthers elongate, mutually free in the apical portions. Perianth lobes suberect **Gymnacranthera**

b. Anthers short, completely sessile, without apically free portions. Perianth lobes spreading or reflexed . . . . . **Endocomia**

II. KEY TO THE GENERA FOR FRUITING AND FEMALE FLOWERING SPECIMENS

1a. Aril completely covering the seed, laciniate to or nearly to the base into many usually narrow segments. Hairs of leaf bud when dry flat and with a glassy appearance, each cell with 2 arms 2

b. Aril completely or but partly covering the seed, entire or at apex convoluted or laciniate up to about half-way. Hairs not particularly flat, not glassy, usually stellate, or dendroid, or filiform, each cell with 1 arm 3

2a. Twigs in older parts striate. Leaves above often with venation rather laxly reticulate. Bracteole present. Arms of hair cells of equal lengths . . . . . **Myristica**

b. Twigs not striate. Reticulation of leaves indistinct above. Bracteole absent. Arms of hair cells of different lengths . . . . . **Gymnacranthera**

3a. Aril entire or shallowly laciniate or convoluted at apex. Seed not variegated, not pointed at one end 4

b. Aril usually coarsely laciniate in the upper 1/3 (entire in the Philippines). Seed usually variegated, often bluntly pointed at one end. Bracteole absent. Stigma narrowly 2–few-lobed. Leaves not whitish beneath (without alveolar tissue); reticulations lax . . . . . **Endocomia**

4a. Bracteole absent. Stigma usually minutely 2-lobed or 2-lipped (or few-lobed in *H. iryaghedhi* from Ceylon). Leaves usually not whitish beneath (papillose and whitish only in *H. iryaghedhi*); reticulations usually lax above . . . . . **Horsfieldia**

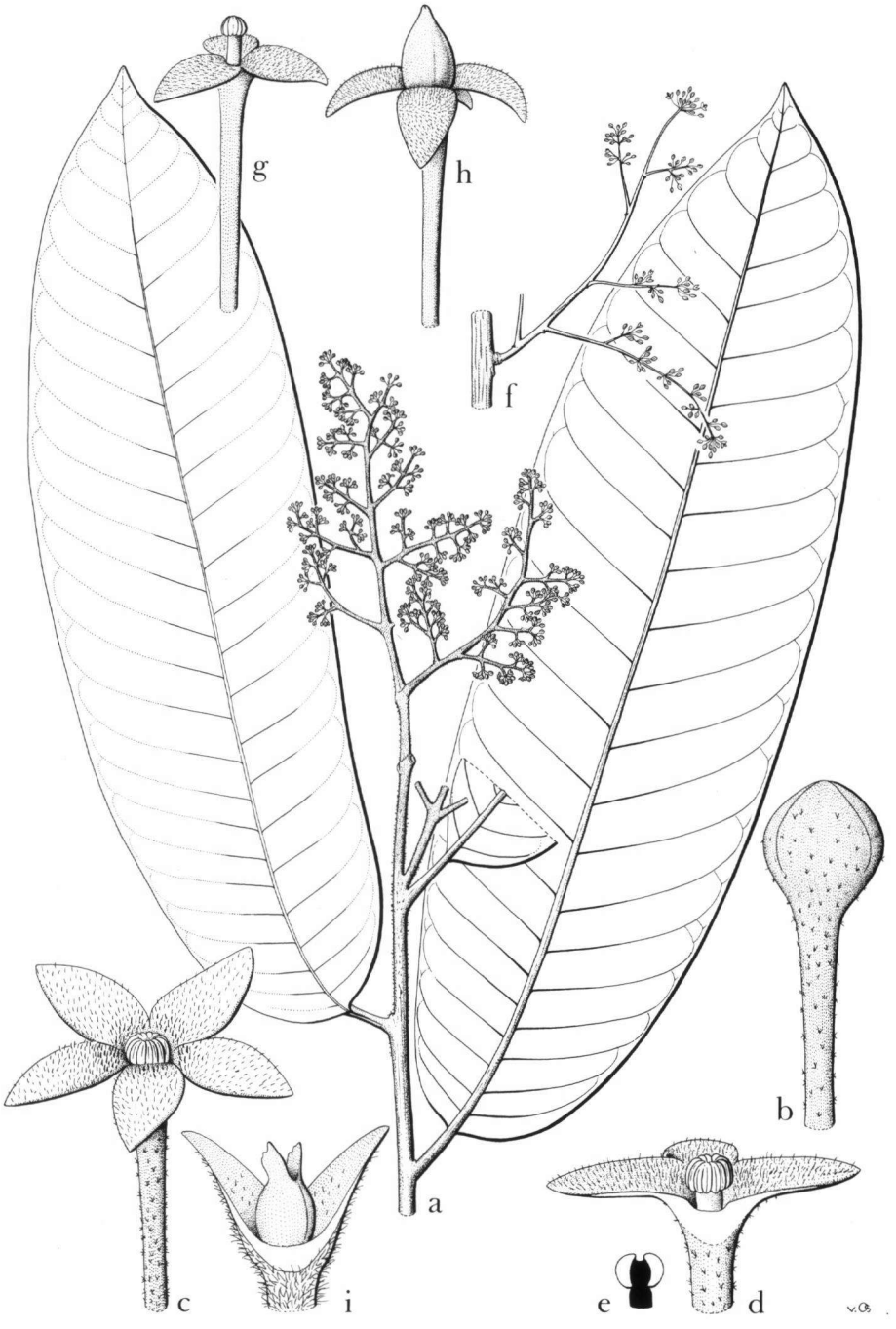
b. Bracteole present. Stigma few- to many-lobed. Leaves usually whitish beneath; reticulations usually forming a dense network above . . . . . **Knema**

ENDOCOMIA de Wilde, *gen. nov.* – Fig. 1–3

Horsfieldia sect. *Pyrrhosa* subsect. *Papillosae* Warb., Mon. Myrist. (1897) 265. – Based on *Horsfieldia papillosa* Warb., *H. prainii* (King) Warb., *H. canarioides* (King) Warb.

Arbores monoici. Inflorescentiae paniculatae. Perianthium masculum profunde 3–5-lobatum, intus indumento papilloso, lobis in anthesi patentibus vel reflexis. Bracteolae desunt. Antherae 2–6, connatae in synandrium breviter ellipsoideum vel globosum, androphoro distincto. Semen variegatum. Arillus plerumque omnino semen obtegens, integer vel usque ad dimidiam laciniatus.

Type species: *Endocomia macrocoma* (Miq.) de Wilde, based on *Myristica macrocoma* Miq.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Trees 5–50 m, monoecious. Twigs subglabrous or glabrescent, terete or subterete, never angular by lines or ridges from petiole to petiole, bark smooth, not striate, when older longitudinally cracking and sometimes flaking; without lenticels. *Leaves* distichous, with distinct petiole, blades to 40 cm long, membranous to chartaceous, not particularly brittle when dry, glabrescent, nerves above flat to raised, reticulations lax, above distinct or not, lower surface not glaucous, without alveolar tissue or papillae, without larger dots by non-traumatic cork warts. *Inflorescences* axillary in between or behind the leaves, not rarely also pseudo-terminal with the terminal bud abortive, paniculate, usually several times branched, small to large, up to 30 cm long, pubescent or glabrescent or early glabrescent, at base of common peduncle with or without a few minute cataphylls; inflorescences with either male or mixed male and female flowers, sometimes with female flowers dominant. *Flowers* pedicelled, pubescent or glabrescent, always in umbellate clusters or fascicles with the flowers typically either all in the same stage of development, or flowers in one terminal fascicle in different stages of development; pedicels at base not articulated; bracts caducous. *Perianths* membranous to thinly leathery, not succulent, 3–5-lobed to c. 3/4 or nearly to the base, greenish or yellowish, inside yellowish or (in New Guinea) bright red, always papillose-hairy to various degree, the lobes in anthesis horizontally spreading or more or less reflexed; bracteoles absent. Male perianth generally of about the same size as the pistillate perianth, broadly ellipsoid or ovoid, or subglobose, sometimes faintly angular, not laterally compressed. *Androecium:* synandrium either depressed globose or globose or short-ellipsoid, circular in transverse section, central column narrow, not wider than the androphore, at apex not excavated, rarely slightly protruding, androphore short to long, cylindrical, always distinct; anthers completely sessile, mutually connate and adnate with their backsides, few, 2–6, vertical, not inflexed, short, 0.5 mm long or less, opening more or less extrorsely. Female perianth resembling that of the staminate flower, inside variously papillary hairy; ovary broadly to narrowly ovoid, glabrous, stigma sessile, 2-lobed, 0.2–0.3 mm high, the lobes narrow and undivided or broad, in the latter case each lobe minutely 2–5-lobulate. *Fruits* few to many in small to large panicles up to 30 cm long; fruits ovoid or ellipsoid or narrowly ellipsoid, rarely obovoid, glabrous, the perianth not persisting; seed ellipsoid, usually pointed at apex, testa usually variegated; aril either completely covering or shorter than the seed, usually conspicuously deeply laciniated to 1/4–1/2-way; albumen ruminate, apparently without starch; embryo incompletely known.

Fig. 2. Inflorescences and flowers of *Endocomia*. – *E. rufirachis* (Sinclair) de Wilde. a. Flowering twig; note flowers all in about the same stage of development and rachis of inflorescences at base without cataphylls; × ½; b. male flower in mature bud stage; c. ditto, in anthesis, note papillose-hairy inner surface of perianth lobes; d. section of male perianth showing stalked androecium; e. longitudinal section of androecium, schematic, androphore and central column drawn solid black; b–e all × 12. – *E. macrocoma* (Miq.) de Wilde subsp. *longipes* de Wilde. f. Inflorescence containing female and male flowers, flowers in different stages of development, × ½; g. male flower in anthesis, note reflexed perianth-lobes and slender androphore, × 12; h. female flower in anthesis, × 12. – *E. macrocoma* subsp. *macrocoma*. i. Female flower in section, × 12. – a–e *B.N.B. For. Dept. 1716* (Sabah), f–h *SAN 66753* (Sabah), i *Atasrip 103* (Obi I.).

Distribution. South China through Southeast Asia and Malesia east to New Guinea; not in Central and East Java, nor in the Lesser Sunda Islands, Solomon Islands and Australia. This distribution range is slightly smaller than those of *Horsfieldia* and *Gymnacranthera*, and of about the same extension, but slightly smaller as that of *Knema*. *Myristica* ranges larger, from South India to far into the Pacific.

KEY TO THE SPECIES

1a. Flowers in one cluster or semi-cluster all in about the same stage of development. Synandrium* depressed-globose, slightly broader than long. Androphore short, about as long as or shorter than the synandrium, and hence the latter situated close to the bottom of the perianth. Anthers 4–6 (thecae 8–12). Dry fruits 4.5–7 cm long 2

b. Flowers in one cluster usually in different stages of development, i.e. perianth buds of different sizes. Synandrium globose or longitudinally short-ellipsoid, about as broad as long or longer than broad. Androphore about as long as or longer than the synandrium or in Java sometimes shorter than the synandrium; hence the synandrium usually situated well above the bottom of the perianth. Anthers 3 or 4. Fruits of various size 3

2a. All male perianths (3- or) 4-valved. Anthers 4–6. Tomentum of leaf bud, twig apex and inflorescences grey-brown, composed of hairs c. 0.1–0.2 mm, sometimes glabrescent. Nerves above flat or but little raised. Dry pericarp 2–10 mm thick. Southern Peninsular Thailand, Malaya, Sumatra . . . . . **2. E. canarioides**

b. Male perianths more or less evenly mixed 4- and 5-valved. Anthers 4. Leaf buds, twig apices and inflorescences pubescent by rusty hairs of c. 0.5 mm, sometimes late glabrescent. Nerves raised above. Dry pericarp 1.5–3(–4) mm thick. Borneo **3. E. rufirachis**

3a. Leaves 8–20 cm long, drying greenish; nerves 7–12 pairs. Inflorescences weak and slender, rather poorly flowered. Androphore much longer than the synandrium. Anthers 4. Tomentum inconspicuous, greyish, of hairs c. 0.1 mm long, plants sometimes almost glabrous. Fruits 4.5–7 cm long, pericarp 5–8 mm thick, drying brown. Eastern Sarawak, Sabah (Beaufort Hill) . . . . . **4. E. virella**

b. Leaves larger, 15–35 cm long, usually drying dark brown; nerves 11–24 pairs. Inflorescences, flowers and tomentum various. Fruits up to 4.5 cm long, pericarp less than 5 mm thick, drying blackish. Southeast Asia and Malesia . . **1. E. macrocoma**

1. Endocomia macrocoma (Miq.) de Wilde, *comb. nov.* – **Fig. 2g–i; 3b–d.**

Myristica macrocoma Miq., Ann. Mus. Bot. Lugd.-Bat. 1 (1864) 207; ibid. 2 (1865) 49, p.p. (excl. spec. celeb. = *Horsfieldia irya*). – *Horsfieldia macrocoma* (Miq.) Warb., Mon. Myrist. (1897) 299, tab. 21, fig. 1–6; Sinclair, Gard. Bull. Sing. 16 (1958) 392; ibid. 23 (1975) 75, p.p. – Type: *Teijsmann (5553)* (5 sheets U), *s.n.* (iso BM, L).
For further synonyms see under the subspecies.

* This is the androecium minus the androphore, hence the clump of anthers proper.

Trees 5–50 m. Twigs terete, not ridged, rather pale grey brown to dark brown, towards the apex 2–6(–10) mm diam., early to rather late glabrescent from tomentum of grey brown to rusty hairs c. 0.1–0.5 mm, bark at first smooth, soon finely to coarsely striate, lower down coarsely striate with a tendency of longitudinally cracking, sometimes flaking, lenticels absent (or very inconspicuous). *Leaves* in two rows (but see notes under subsp. *prainii*), membranous to chartaceous, elliptic or obovate to oblong-oblanceolate, broadest usually at or somewhat above the middle, or more or less parallel-sided, (12–)15–35(–40) × (4–)5–12 cm, base (narrowly) rounded to attenuate, top acute-acuminate; upper surface drying olivaceous brown to usually dark brown, glabrous, lower surface glabrous (very early glabrescent) or late-glabrescent; midrib above slender, flat (level) or but slightly raised; nerves 11–24 pairs, above level or but slightly raised, the submarginal arches generally indistinct; tertiary venation forming a lax to rather fine network, sometimes slightly trabeculate, distinct on both surfaces or not; petioles 10–25 × 1.5–3.5 mm, glabrous to late-glabrescent; leaf bud 8–25 × 1.5–3.5 mm, with dense grey brown to rusty tomentum of hairs 0.1–0.5 mm. *Inflorescences* slender to stout, much or little ramified, early glabrescent or with persistent tomentum of greyish or rusty hairs 0.1–0.5 mm long, in ♂, ⚲, and ♀ (see note 1): 6–30 × 2–25 cm, rather moderately to many-flowered, common peduncle 0–50 mm long; bracts ± elliptic, 1.5–3 mm, ± thinly pubescent, very early caducous. *Flowers* arranged in lax to dense umbel-like clusters of c. 4–10, these clusters generally rather widely spaced (3–)5–30 mm along the main branches of the inflorescence, the flowers in one cluster usually in different stages of development. *Perianths* 3- or 4- (or 5-)valved, outside glabrous (very early glabrescent) or pubescent by thin hairs c. 0.1–0.5 mm long, the perianth valves inside towards the top with few to many rather coarse pale or brownish hairs c. 0.2–0.4 mm long, usually ± arranged in rows corresponding with the spaces between the anthers, sometimes hairs present only near the valve-sutures; pedicels slender, glabrous or pubescent as the perianth. Male perianth in bud broadly ellipsoid or broadly ovoid, 1.5–2.3 × 1.3–2 mm, top ± rounded to subacute, base rounded to ± attenuate, transverse section rounded or ± 3- or 4-quetrous, pedicel slender, 1.5–7 mm long; perianth in anthesis cleft to 2/3–4/5, valves 0.2–0.3(–0.5) mm thick. Synandrium depressed-globose or globose to ellipsoid, 0.2–0.5 × 0.3–0.5 mm; anthers 3–6 (i.e. 6–12 thecae), androphore cylindrical, slender, longer to shorter than the androecium, 0.3–1 mm long. Female perianth in bud ovoid-ellipsoid, 2.2–2.6 × 1.7–2 mm, glabrous or thinly pubescent, cleft in anthesis to c. 2/3–5/6, valves 0.2–0.3 mm thick, inside towards the apex with pale to brown-red hairs 0.1–0.4 mm long; pedicel 2–6 mm, glabrous or pubescent; ovary ovoid or narrowly ovoid, 1.3–1.8 × 0.8–1.2 mm, glabrous, stigma 0.2–0.3 mm high, narrowly to broadly 2-lipped, in the latter case the lips minutely 2–5-lobulate. *Fruits* 3–12 in a pendent loose panicle (10–)15–30 cm long, fruits various of shape, ovoid, or (narrowly) ellipsoid, or obovoid, 1.5–4 cm long, glabrous, dry pericarp 1–3 mm thick, blackish, finely granulate, not or but sparingly warted; aril either almost completely closed at apex or laciniate to c. half-way; seed usually with pointed apex, testa variegated (not always apparent in New Guinea); see further under the subspecies.

Notes. 1. In this species the inflorescences are often mixed male and female, the female flowers apparently being most frequent towards the ends of the ramifications; in other cases there are separate male and female inflorescences on the same twigs.

2. Similarly as in *Endocoma virella* the flowers in one single subumbel or cluster are generally in different stages of development, hence open flowers are found together with closed ones and usually with much smaller, still growing flower buds. In the related genus *Horsfieldia* this condition was only seen in *H. amygdalina* from continental Southeast Asia and the Andaman Islands.

3. With Sinclair the *Horsfieldia macrocoma*-aggregate was apparently still under consideration because in the posthumously published account in Gard. Bull. Sing. 28 (1975) 75 the species *H. macrocoma* remained without synonyms and without description, but all the specimens belonging to the aggregate were enumerated.

KEY TO THE SUBSPECIES

1a. Anthers (3 or) 4–6 (i.e. synandrium with 8–12 thecae), synandrium c. 0.4–0.5 mm long, androphore about as long as the synandrium or but slightly longer, 0.3–0.6 mm long. Stigma broadly 2-lipped, minutely lobulate 2

b. Anthers 2 or 3 (i.e. 4 or 6 thecae), synandrium 0.2–0.3 mm long, the androphore much longer, 0.7–1 mm. Stigma narrowly 2-lipped. Perianth inside greenish to pale yellowish. Fruits 3–4.5 cm long. E. Sumatra, Borneo
b. subsp. longipes

2a. Plants either early glabrescent or leaf bud, inflorescences and flowers with tomentum of greyish or pale brown hairs c. 0.1–0.2 mm long or less. Perianth inside either greenish to yellowish in continental Southeast Asia, W. Malesia, Philippines, or red in New Guinea. Fruits c. 2.5–4 cm long. Variable
c. subsp. prainii

b. Leaf bud, inflorescences and flowers with ± conspicuous rusty tomentum of hairs c. 0.2–0.5 mm. Perianth greenish yellow. Fruits 1.7–3.5 cm long. Moluccas . . . . . **a. subsp. macrocoma**

a. subsp. macrocoma – Fig. 2i; 3d.

Horsfieldia macrocoma (Miq.) Warb. var. *macrocoma*; Sinclair, Gard. Bull. Sing. 16 (1958) 393.
Myristica nesophila Miq., Ann. Mus. Bot. Lugd.-Bat. 1 (1864) 206, p.p. – For the syntype *de Vriese s.n.* (L), Bacan I., not the lectotype = *Horsfieldia*.
Horsfieldia leptocarpa Warb., Mon. Myrist. (1897) 346, t. 21 (excl. spec. *Forster s.n.*, Celebes = *Horsfieldia irya*). – *Horsfieldia leptosperma*, nom. sub *Horsfieldia olivaeformis*, op. cit. – Type: *de Vriese s.n.* (B, lost, n.v.; iso L), fr., Celebes or Buru.
Gymnacranthera ibutii Holthuis, Blumea 5 (1942) 183, f. 4. – Type: *Lam 2976* (L), Talaud I.

Leaf bud and twigs at apex rusty pubescent by hairs 0.2–0.5 mm, twig apices sometimes early glabrescent. Inflorescences rather condensed, much branched, 6–15 cm long, with the flowers densely rusty pubescent by hairs 0.2–0.5 mm long. Pedicels of male and female flowers 3–4 mm long. Male perianth 3-valved, in anthesis

cleft to c. 4/5, *in vivo* inside greenish yellow. Synandrium subglobose to ellipsoid, 0.5 × 0.4–0.5 mm, anthers 4, androphore 0.4–0.6 mm long. Ovary ± narrowly ovoid, the stigma rather broadly 2-lipped and very finely lobulate. Infructescences 10–16 cm long. Fruits very variable of shape (see notes), either fusiform, or ellipsoid, or ± obovoid, or pear-shaped, 1.7–3.5 × 1.2–1.9 cm, top acute to broadly rounded, base rounded or narrowed, pericarp 1–3 mm thick; stalk 6–12 mm long. Aril at apex laciniate for c. 1/3–1/2-way. Seed ± ellipsoid, c. 1.5–2 cm long, with acutish top, testa blotted-variegated.

Distribution. Moluccas: Talaud I., Morotai, Halmaheira, Bacan I., Obi I., Buru, Ceram, Ambon I.; possibly Celebes (one sterile collection).

MOLUCCAS. Talaud I.: Lam 2976. – Morotai I.: Kostermans 862, 921. – Halmaheira: bb 23732; Teijsmann (5553); de Vogel 3454. – Bacan I.: de Vogel 3891, 3915; de Vriese s.n. – Obi I.: Atasrip 103; Saänan (Exp. van Hulstijn) 46. – Buru: bb 22841, 24468. – Ceram: de Vriese s.n. – Ambon I.: Robinson 1874.

? CELEBES. bb 17640 (sterile); de Vriese s.n. (possibly from Buru).

Cultivated in Bogor: Rastini (26); Sinclair SF 10036.

Ecology. Forest with little undergrowth and disturbed forest, on alluvial flats locally with stagnant water, hill slopes, on porous volcanic soil, loam soil with stones; 0–400 m altitude. Flowers and fruits throughout the year.

Vernacular name. Polótan'a (Talaud I., Korakelong).

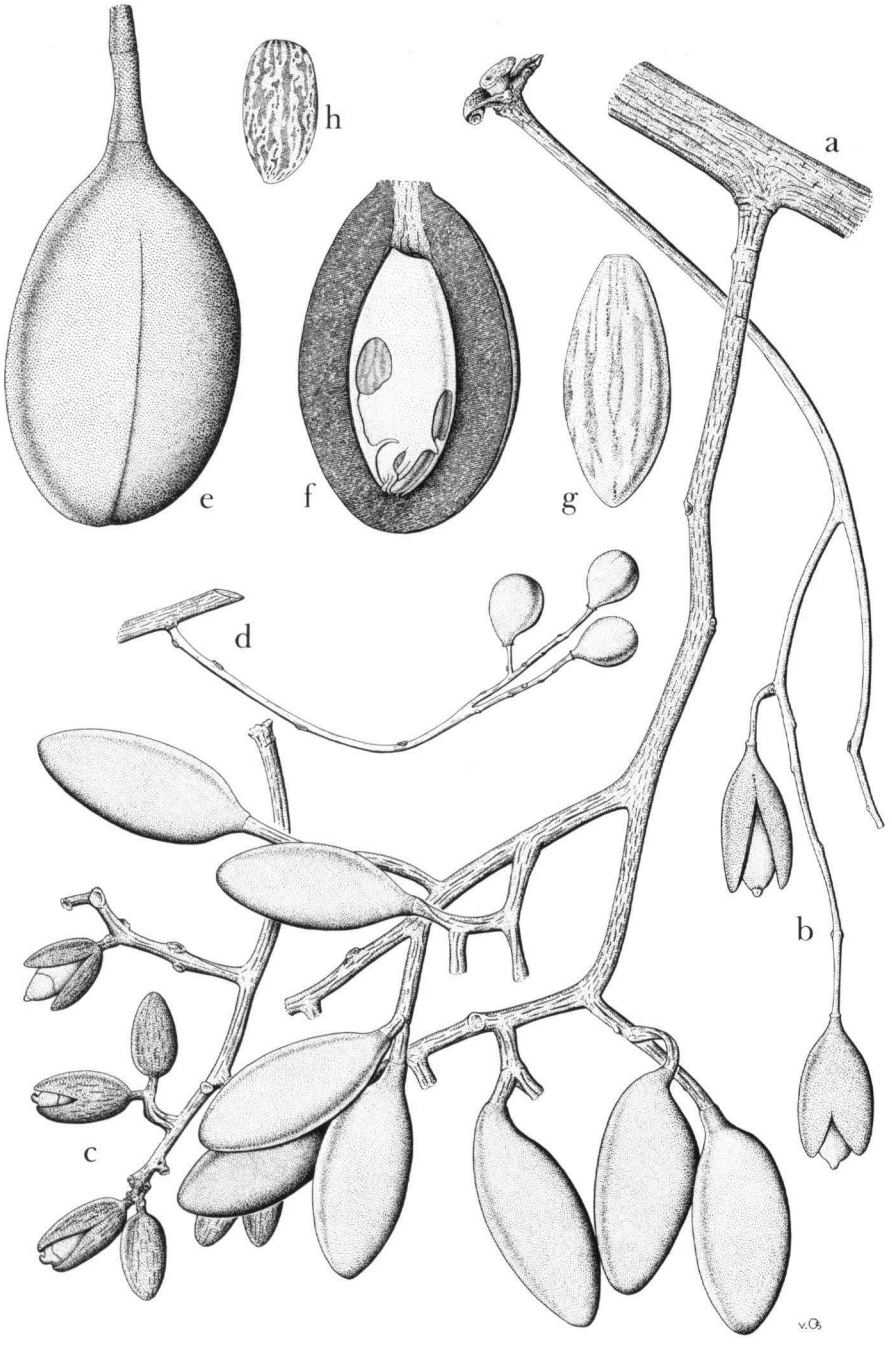
Notes. 1. Fieldnotes. No buttresses, outer bark 0.2–0.7 mm thick, slightly fissured or not, little peeling off; inner bark 9–18 mm, on section pale red to pink-ochre, with some pale reddish watery exudate; sapwood whitish to yellowish tinged red, gradually passing into the darker heartwood. Perianth (inside) greenish yellow; ripe fruit yellow or orange, aril bright red, at apex incised to 1/3–1/2; seed mottled brown.

2. The type subspecies is arbitrarily separated from subsp. *prainii*, the latter being very variable in many features, and mainly differing by a much less developed tomentum on leaf bud and inflorescences, and by generally larger fruits. Our present subspecies is accepted with a remarkable variation in fruit shape; this is generally ± ellipsoid, but fruits from Bacan I. (*de Vogel 3891*) and Obi (*Saänan, exp. van Hulstijn 46*, and *Atasrip 103*) are small, c. 17–22 mm long and either broad-ellipsoid or pear-shaped (obovoid); the type of *Horsfieldia leptocarpa* (annotated in L as from Celebes but likely from Buru; see Warburg, l.c.) has rather fusiform fruits c. 28 mm long.

b. subsp. **longipes** de Wilde, *subsp. nov.* – **Fig. 2f–h.**

Differt a subspecies macrocoma indumento gemmae atque inflorescentiarum c. 0.1 mm longis solum, antheris 3, androphoro synandrio multo longioro, foliis in sicco fusco-brunneo, fructibus c. 3.5–4 × 1.5–2 cm. – Typus: *de Vogel 888* (L; iso K), SE. Kalimantan.

Leaf bud pubescent by dull brown hairs c. 0.1 mm long or less, twig apex early glabrescent. Inflorescences lax, little to much branched, 6–30 cm long, with the flowers glabrous or sparingly pubescent by grey-brown hairs c. 0.1 mm long. Male


a
b
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g
h

and female flowers with slender pedicels (2–)4–7 mm long. Male perianth 3- (or 4-)valved, in anthesis cleft to 4/5–5/6, *in vivo* inside greenish to yellowish. Synandrium globose or depressed-globose, 0.2–0.3 × 0.2–0.4 mm, anthers 2 or 3, androphore slender, (0.6–)0.7–1 mm long. Ovary narrowly ovoid, with short and narrow 2-lipped stigma. Infructescences 15–30 cm long. Fruits narrowly ovoid-ellipsoid, 3.5–4(–4.5) × 1.4–2 cm, top blunt or subacute, base rounded or narrowed, pericarp 1–2 mm thick; stalk c. 15 mm long. Aril at apex laciniate to 1/5. Seed c. 3 cm long, the top acutish or to c. 2 mm beaked, testa variegated with longitudinal blotches.

Distribution. East Sumatra and Borneo (Sarawak, Sabah, E. and S. Kalimantan).

SUMATRA. E. Sumatra, Pakan Baru: (Esche) bb 35339.

BORNEO. Sarawak: Brooke 9305; (Richards) Oxford Univ. T. 2537; S 28892, 36241. – Sabah: Clemens 27394, 27528; (Aban Gibot) SAN 66753. – E. Kalimantan: Kostermans 6905. – SE. Kalimantan: bb 18157; de Vogel 728, 888.

Ecology. Primary forest, mixed dipterocarp forest, riverside forest, on stream banks, alluvial flats, on deep clay soil, low ridges with sandy soil, sedimentary soil; 0–1000 m altitude. Flowers and fruits throughout the year.

Vernacular name. Kumpang lumau (Iban, Borneo).

Notes. 1. Fieldnotes. Bark of trunk greyish or chocolate brown, somewhat fissured or not and little to profusely scaling off in small thin pieces; outer bark c. 2 mm thick, brown, living bark 7–17 mm, cream or light brown or light brown-red, or yellowish, with pale orange or reddish watery exudate, sapwood pale yellow or pale brown. Perianth greenish to yellowish, or creamy or pale green. Fruits hanging from the branches, green.

2. Characterized from other *Endocomia* species by the short tomentum of leaf buds and inflorescences, by the subglabrous flowers, by flowers in all different stages of development, by the long-stiped androecium, and the number of anthers: only 2 or 3.

3. Much related to *Endocomia virella* with ± similar flowers, but the latter differing by the leaves drying distinctly greenish, and by much larger fruits.

c. subsp. prainii (King) de Wilde, *comb. et stat. nov.* – **Fig. 3c, d.**

Myristica prainii King, Ann. Roy. Bot. Gard. Calc. (1891) 299, pl. 126. – *Horsfieldia prainii* (King) Warb., Mon. Myrist. (1897) 292, t. 21 f. 1–3. – Types: *King's Coll. 417* (CAL, n.v.; iso BM, K, L; lecto), Andaman I., *431* (CAL, n.v.); *Carter s.n.* (CAL, n.v.).

Fig. 3. Infructescences, fruits and seeds of *Endocomia*. All × ½. – *E. rufirachis* (Sinclair) de Wilde. a. Infructescence (*Kostermans 9579*, E. Kalimantan). – *E. macrocoma* (Miq.) de Wilde subsp. *prainii* (King) de Wilde. b. Infructescence; note complete aril and pointed seed (*Edaño PNH 7281*, Philippines); c. infructescences; note arils little laciniated, incompletely covering the seeds pointed at apex (*Kostermans & Soegeng 478*, Irian Jaya). – *E. macrocoma* subsp. *macrocoma*. d. Infructescence (*Atasrip 103*, Obi I., female flower drawn in fig. 2i). – *E. canarioides* (King) de Wilde. e. Fruit in spirit; f. ditto, opened, note deeply laciniated aril; g. seed of the same, note variegated testa (*de Wilde & de Wilde-Duyfjes 18877*, N. Sumatra); h. seed, note variegated testa (*King's Coll. 10064*, Malaya, type).

Myristica exaltata Wall., Cat. 6804 A & B; King, Ann. Roy. Bot. Gard. Calc. (1891) 327, pl. 174. – *Myristica amygdalina* var. *β hookeri* A.DC., Prod. 14, 1 (1856) 204. – Type: *Wallich 6804* (K-Wall.), Burma, Trogla Hills.

Horsfieldia papillosa Warb., Mon. Myrist. (1897) 291, t. 21 f. 1–3. – *Myristica papillosa* (Warb.) Boerl., Handl. Fl. Ned. Ind. 3, 1 (1900) 85. – Type: cultivated in the botanical garden, Bogor, a male specimen, B, lost, n.v., origin unknown.

Horsfieldia merrillii Warb. in Perkins, Fragm. Fl. Philip. (1904) 49; Merr., Philip. J. Sc. 2 (1907) Bot. 274; En. Philip. Flow. Pl. 2 (1923) 182. – Types: *Merrill 2233, 2370* (US, n.v.), Mindoro (see notes).

Horsfieldia oblongata Merr., Philip. J. Sc. 13 (1918) Bot. 286; En. Philip. Flow. Pl. 2 (1923) 182; Markgraf, Bot. Jahrb. 67 (1935) 148 (for the New Guinean specimens only). – Type: *Ramos Philip. Pl. 1393* (PNH, n.v.; iso BRI, G, NSW, NY, SING, n.v.; BM, L), Luzon.

Horsfieldia trifida A.C. Smith, J. Arn. Arbor. 22 (1941) 60. – Type: *Brass & Versteegh 14017* (A, n.v.; iso L), West New Guinea.

Horsfieldia pandurifolia H.H. Hu, Acta Phytotax. Sin. 8 (3) (1963) 197; Wu (ed.), Fl. Yunnan 1 (1977) 10, f. 3; Tsiang & Li (red.), Fl. China 30 (2) (1979) 196, f. 89. – Type: n.v., from Yunnan.

Horsfieldia longipedunculata H.H. Hu, Acta Phytotax. Sin. 8 (3) (1963) 198. – Type: n.v., from Yunnan.

Leaf bud pubescent by greyish to dull brown hairs c. 0.1–0.2 mm long or less, twig apex early glabrescent. Inflorescences rather condensed to lax, usually much-branched, 8–25 cm long, with the pedicels and perianths sparingly to densely short-pubescent by grey-brown or grey hairs c. 0.1–0.2 mm long. Pedicels of male and female flowers slender, 1.5–2.5 mm long. Male perianth 3- or 4- (or 5-)valved, in anthesis cleft to (2/3–)3/4–5/6, *in vivo* inside greenish to yellowish, or red (see notes). Synandrium depressed-globose or globose, or ellipsoid, (0.3–)0.4–0.5 × 0.3–0.5 mm, anthers (3 or) 4, or 5 or 6 (New Guinea, see notes), androphore slender, relatively short, (0.2–)0.3–0.6 mm long. Ovary ovoid, with broad 2-lipped stigma. Infructescences 10–30 cm long. Fruits narrowly to broadly ellipsoid to ovoid, top obtuse or often subacute, base rounded or with an up to c. 5 mm long narrowed portion, (2.2–)3–4.5 × (1–)1.2–2.5 cm, dry pericarp 1–2.5 mm thick; stalk 5–15 mm long. Aril at apex either almost entirely closed (Philippines, New Guinea) or laciniate to c. 1/5. Seed c. 2–3.2 cm long, top acute or shortly beaked, testa variegated by longitudinal markings or in New Guinea not or only indistinctly so (see notes).

Distribution (see also the enumeration of species by Sinclair, 1975: 75). China (Yunnan) through India (Assam), Bangladesh, Burma, Andaman I. and Indo-China to West Java, and in the Philippines and New Guinea; not in: Malaya, most of Sumatra, Central and East Java, Borneo, Celebes and the Moluccas.

CHINA. Yunnan: Henry 13532.

INDIA. (South) Andaman I.: King's Coll. s.n., 417; Proudlock in Herb. King s.n.; Jovag in Herb. Hooker s.n.; Nair 3191.

BURMA. Wallich 6804.

LAOS. Poilane 20289.

THAILAND. van Beusekom c.s. 4692; Nimanong & Phusomsaeng 257 (Fl. Thailand 41880); Pinnin c.s. 1589; Sangkhachand 1489.

SUMATRA. Simaloer (Simeuluë): Achmad 578, 1080, 1158.

JAVA. West Java: Koorders 30468; Kostermans & Kuswata 58; Docters van Leeuwen 14078.

PHILIPPINES. Luzon: Aquilar FB 14270; Bawan FB 24927; Ramos 1393. – Mindoro: Ramos BS 46444; Merritt FB 3617, 3696; McGregor 151; Merrill 4031; (Celestino & Castro) PNH 1997; (Britton) PNH 19479; Ramos 1354; Santos 5217-A; Whitford 1408. – Samar: (Ramos) BS 17457; (Sulit) PNH 6042, 14464, 60402, (Madulid) 117944, (Gutierrez) 117291, 117583, (Madulid c.s.) 118251; Ramos 1607; Sablaya 41. – Leyte: Rosenbluth FB 12731; Wenzel 813. – Bohol: (Ramos) BS 48273; Univ. San Carlos 909. – Negros: (Edaño) PNH 7281. – Panay: (Ramos & Edaño) BS 30838, 46017.

NEW GUINEA. Irian Jaya: Brass & Versteegh 14017; BW 2731, 2796, 5758, 7455, 9165, 9250, 10916, 11182, 25761, 30496, 31093; Kostermans & Soegeng 478; Pullen 916; von Römer 322; van Royen 3548; Soegeng 284; Versteegh 1784. – Papua New Guinea: Brass 6969, 29358; Carr 11950, 12743, 16520, 21950; Hartley TGH 10058, 11420; Hoogland (& McDonald) 3512, 4148, (& Craven) 10506; Jacobs 8997, 9155; LAE 52928, 73955; NGF 4651, 7297, 8169, 9666, 9682, 9834, 11960, 17304, 18860, 28641, 34341, 37129, 41120, 42548, 45846; Schlechter 17171; Schodde 2415, (& Craven) 4347, 4718.

Ecology. Lowland and hill side forest, riverine forest, swamp forest, hill evergreen forest (Thailand); by streams, on alluvial soil, clayey soil, limestone country, copper-rich soil. Flowers and fruits throughout the year, but flowers in West Malesia mainly July, August, in the Philippines mainly March–May, in New Guinea throughout the year.

Vernacular names. Sumatra: mandarahan pajo, m. sitoboelong (Simaloer I.). Java: kelapatjoeng (W. Java). New Guinea: apaap (Wanigela, N. Div.), batamu (Kutubu lang., S. Highl.), guma (Waskuk, Sepik), guwa (Wagu, Sepik), hiroroh (Orokaialay, Mumini, N. Div.), ibuumbottegli (Kemtoek, near Hollandia), kamopi (Roberbai, Japen I.), kamorree (Biak lang., Japen I.), kebowak (Tehid lang., Vogelkop), maforeb (Miniafia lang., N. Div.), paa (Skosy lang., near Hollandia), sebohonggwa (Manikiong lang.), tikzè (Nemo lang., near Hollandia).

Uses. The wood is used for house-building (Sepik area).

Notes. 1. Fieldnotes. Without or with short buttresses up to 2 m × 0.3 m × 4 cm. Branches often horizontally spreading, or drooping. Bark grey to blackish brown, smooth, without or with shallow fissures, shallowly irregularly peeling off or not; exudate watery, colourless or pale red to brownish, once recorded as slightly milky; blaze pale brown to salmon, wood white or straw or salmon-cream. Perianth inside greenish to yellow (W. Malesia), once purple (Thailand) or dark red to deep maroon (New Guinea). Anthers creamy to pale yellow, ovary green with brown or blackish stigma. Flowers with sweet odour (Philippines). Fruit glossy green, turning yellow, in the Philippines and New Guinea orange. Aril bright red, laciniate at apex only, in the Philippines and New Guinea usually almost entirely closed, not laciniate.

2. In *Endocomia* the seeds are almost always variegated, except in *E. macrocoma* subsp. *prainii* from New Guinea in which the seeds are dull greyish brown, not variegated or only faintly so.

3. A variable subspecies. Variation mainly concerns the tomentum, some features of the male flowers, the shape and size of the fruits, the colour of the seeds (see note 2), and this seems more or less correlated with the geographic area as is briefly indicated below.

Specimens from the Philippines deviate by the tomentum of the inflorescences, especially the flowers, composed of rather long hairs c. 0.1–0.2 mm, of a pale grey-

ish white colour. Here belong *Horsfieldia merrillii* and *H. oblongata*, both differing mainly in the shape of the fruits, and the first named characterized by an (almost) glabrous perianth within, the last one by an entire, not laciniate aril.

Specimens from New Guinea, including also *Horsfieldia trifida*, rather stand apart by the androecium of 5 or 6 anthers, the perianth inside dark red, orange fruits and partly by small fruits of only 22–25 mm long, whereas also the seed coat in New Guinea specimens is not variegated or only faintly so; specimens from other areas have mainly only 4 anthers (but see note 7), the perianth inside greenish or yellowish (once purple in Thailand; *FB 41880*), the fruit yellow (once orange in the Philippines) and always variegated seeds. Also, in New Guinea the inflorescences (infructescences) are generally slightly shorter. In other features the New Guinea specimens agree with those from continental Southeast Asia, West Malesia and the Philippines.

4. *Schram BW 2731*, New Guinea, is noteworthy by the whitish blotches on the leaves, reminiscent of those usually present on the leaves of *Horsfieldia irya*.

5. Some specimens from New Guinea (e.g. *Hartley 10058, NGF 17304*, and others) have remarkably small fruits, c. 22 × 10 mm only.

6. The fruits of *van Beusekom c.s. 4692*, from northern Thailand, measure c. 3–4.5 × 2–2.5 cm and are with those mentioned from Yunnan the largest of the present subspecies. These may be confused with those of *Endocomia canarioides* from Malaya and Sumatra, but the latter differs by often a thicker pericarp, deeply laciniate aril, and by the flowers in one inflorescence (and at least in one partial subumbel or cluster) opening at about the same time, whereas in *E. macrocoma* the flowers in one cluster or partial raceme are as a rule in different stages of development.

7. Hu (l.c.) mentions for *Horsfieldia pandurifolia* that the androecium consists of 10 anthers, these evidently being 10 thecae belonging to 5 anthers. In the flowers of *Ramos 1354* from the Philippines I saw either 4 or 5 anthers. In all other specimens, except from New Guinea (see note 3), I always counted (3 or) 4 anthers.

8. The drawing of *Horsfieldia pandurifolia*, in the Flora of China, fig. 89, p. 198 shows the leaves dispersed, not distichous. As I have not seen original vegetative material from China, I cannot confirm this, but dispersed leaves certainly are exceptional in *Endocomia*.

9. I have not seen the syntype specimens of *Horsfieldia merrillii*, in US, both originating from western Mindoro. Warburg described the perianths inside as without hairs, but I rather think that only few hairs are present towards the apex and the margins of the lobes, as was seen in some specimens from the Philippines. Sinclair examined the types and regarded them identical with other Philippine material.

2. Endocomia canarioides (King) de Wilde, *comb. nov.* – **Fig. 3e–h.**

Horsfieldia canarioides (King) Warb., Mon. Myrist. (1897) 294, t. 21 f. 1 & 2; Gamble, Mat. Fl. Mal. Pen. 5 (1913) 208; Ridley, Fl. Mal. Pen. 3 (1924) 55. – *Myristica canarioides* King, Ann.

Roy. Bot. Gard. Calc. 3 (1891) 304, pl. 134. – *Horsfieldia macrocoma* (Miq.) Warb. var. *canarioides* (King) Sinclair, Gard. Bull. Sing. 16 (1958) 389, f. 55. – Syntypes: *King's Coll. 10064* (CAL, G, n.v.; K, lecto; L), *10194, 10816* (BM, K), *10845* (K, L); *Maingay 1298* (K, L).

Myristica racemosa King, Ann. Roy. Bot. Gard. Calc. 3 (1891) 328, pl. 173. – *Horsfieldia racemosa* (King) Warb., Mon. Myrist. (1897) 347; Gamble, Mat. Fl. Mal. Pen. 5 (1912) 222; Ridley, Fl. Mal. Pen. 3 (1924) 60. – Type: *Curtis 934* (CAL, n.v.; iso K; SING, n.v.).

? Embelia ridleyi King & Gamble, Mat. Fl. Mal. Pen. 4 (1905) 112; Sinclair, Gard. Bull. Sing. 15 (1956) 31. – Type: *Ridley 6324* (SING, n.v.; iso K).

Tree 10–35 m. Twigs terete, brown or rather pale grey-brown, towards the apex 1.5–4(–10) mm diam., early glabrescent from minute grey to grey-brown tomentum of hairs c. 0.1 mm long or less, lower down the bark smooth or finely to coarsely striate, on older twigs coarsely striate and sometimes longitudinally cracking, lenticels absent or very inconspicuous. *Leaves* in 2 rows, membranous to chartaceous, elliptic to oblong, broadest at or slightly above or below the middle, 8–30 × 4–13.5 cm, base subcordate or rounded to short-cuneate, top acute-acuminate; upper surface drying dark brown, glabrous, lower surface early glabrescent; midrib on both surfaces early glabrescent, above flat or but slightly raised; nerves 11–19 pairs, above slender, flat or but little raised, the submarginal arches distinct or not; tertiary venation forming a lax network, distinct or not on both surfaces; petioles 8–30 × 1.5–4 mm, early glabrescent; leaf bud 6–25 × 1–3 mm, densely grey-brown or brown pubescent by hairs c. 0.1–0.2 mm long or less. *Inflorescences* generally situated behind the leaves, thinly pubescent or subglabrescent with greyish hairs c. 0.1 mm or less, or glabrescent, in ♂ (and ☿ and ♀, see notes) rather variable of shape, loose or condensed, many-flowered, c. 6–25 × 3–15 cm, common peduncle 5–60 mm long, bracts not seen, caducous. *Flowers* in loose to dense clusters of 3–8, all of about the same stage of development; perianth 3- or 4- (or 5-)valved, outside thinly greyish pubescent by hairs c. 0.1(–0.2) mm or glabrescent, or glabrous, the perianth-valves inside pubescent by pale hairs c. 0.2–0.3 mm, often arranged in a few longitudinal rows; pedicels slender, thinly pubescent or glabrescent. Male *perianth* in bud broadly ellipsoid-obovoid, c. 1.5–1.6 × 1.3–1.4 mm, top broadly rounded or somewhat depressed, base ± tapering, transverse section subcircular or faintly angular, pedicel c. 1.5–2.5 mm; perianth in anthesis cleft to c. 3/4–4/5, the valves widely spreading or ± recurved, c. 0.2(–0.3) mm thick, inside with rather pale hairs 0.2–0.3 mm long, arranged in a few longitudinal rows corresponding with the spaces between the anthers. Synandrium (androecium excl. androphore) depressed-globose, 0.3–0.5 × 0.5–0.6 mm, subcircular in transverse section; anthers 4–6 (i.e. 8–12 thecae), androphore cylindrical, rather broad, c. 0.3–0.4 × 0.3 mm. Female flowers not seen (see notes); ovary glabrous (as seen in very immature fruits). *Fruits* (solitary or) 2–6 together in long panicles 15–25 cm long, ellipsoid-oblong, glabrous, (4.5–)5–7 × 2.5–3.5 cm, top rounded or narrowly rounded, base rounded or as a narrowed portion c. 3–5 mm long, glabrous, drying dark brown or blackish, finely granulate, not warted, dry pericarp 2–10 mm thick; stalk 15–20 mm long; aril laciniate at apex for c. 1/3 to nearly half-way; seed ellipsoid-oblong, 4–5 cm long, top subacute or bluntly beaked up to 3 mm long, testa elongately purplish brownish variegated.

Distribution. Peninsular Thailand, Malaya, Singapore, Sumatra.

THAILAND. S. Peninsular: Phusomsaeng 165; Phusomsaeng c.s. 38 (BKF 51927).

MALAYA. Ahmad KEP 99019; Maingay 1298; Avé 210, 271. – Perak: FRI 19139; King's Coll. 10064, 10562, 10816, 10845; Scortechini 619b. – Pahang: FRI 021781. – Selangor: KEP 94463; Soepadmo 1200A. – Malacca: Ridley 3313. – Johore: Ahmad S 266; FRI 14037; SF 36924. – Penang I.: Curtis 934.

SINGAPORE. Ridley 6324, 6355, 11270; Smith 94.

SUMATRA. Palembang: bb T.3.P.107; Sibolangit: Galoengi 244; G. Leuser Res.: de Wilde & de Wilde-Duyfjes 18877.

Cultivated in Bogor: IV.H.103; IV.H.115.

Ecology. Evergreen forest, open bamboo-forest, lowland rainforest, on flat land or hillsides; at 0–300 m altitude. Flowers Jan.–June, fruits June–Sept.

Vernacular names. Tum-phra (Peninsular Thailand), pianggoe talang (Sumatra, Palembang).

Notes. 1. Fieldnotes. Bark smooth, grey-brown or dark brown, flaking in small thin pieces, or finely fissured or cracked. Slash inner bark recorded as brownish white, yellowish brown, or red, with watery reddish white exudate. Slash wood white or pale yellow. Leaves shiny on both surfaces. Flowers green or pale green. Fruits green turning yellow (Malaya), or purple brown (N. Sumatra), mature aril yellow. Fresh fruits are ellipsoid-oblong and may be very large, measuring up to 10–12 cm in length.

2. Characterized by the flowers in one inflorescence being all in about the same stage of development, by the short tomentum of leaf bud and inflorescences, and by the large fruits with thin or thick pericarp.

3. The fruits are very variable in the thickness of the pericarp, and possibly, when more material becomes available, two varieties can be recognized on this character. The specimens with thick pericarp (incl. e.g. *King's Coll. 10064*, the type, from Malaya, and *de Wilde & de Wilde-Duyfjes 18877*, from Sumatra) represent the type. A specimen with large fruits with thin pericarp, c. 2 mm thick only, is *Avé 210*, from Malaya. Fruiting specimens with thin pericarp may be difficult to distinguish from large-fruited specimens of *Endocomia macrocoma* subsp. *prainii*.

4. Female flowers have not been seen; possibly they can be found among the male flowers in predominantly male inflorescences, or are to be found in purely female inflorescences besides the male ones, as is the case in the related *Endocomia macrocoma*. On the type sheet, *King's Coll. 10064*, a twig is mounted with a male inflorescence, and fruits are added in an envelope, suggesting that both were found on one single tree. The female inflorescences are, as judged from the infructescences, as large as or larger than the male inflorescences, the panicles reaching a length of c. 25 cm.

3. Endocomia rufirachis (Sinclair) de Wilde, *comb. nov. et stat. nov.* – Fig. 2a–e; 3a.

Horsfieldia macrocoma (Miq.) Warb. var. *rufirachis* Sinclair, Gard. Bull. Sing. 16 (1958) 393. – Type: *Wood A 4770* (SING, n.v.; K, L).

Tree 10–40 m. Twigs terete, brown to dark brown, towards apex 3.5–5(–14) mm diam., rather early to late-glabrescent from rusty tomentum of hairs c. 0.5 mm,

bark lower down finely and soon coarsely striate, on older twigs with a tendency of flaking, lenticels absent or very inconspicuous. *Leaves* in 2 rows, membranous to thinly chartaceous, elliptic-oblong to oblong-lanceolate, ± parallel-sided or broadest at or slightly above (rarely below) the middle, 18–38 × 6–11 cm, base subcordate or broadly rounded to short-cuneate, top acute-acuminate; upper surface drying bright to dark brown, glabrous, lower surface early glabrescent; midrib on both surfaces often late-glabrescent, above slender, flattish to moderately raised; nerves 17–25(–30) pairs, above slender, raised or partly raised, sometimes late-glabrescent, the submarginal arches often distinct and regular; tertiary venation forming a lax network distinct or faint above; petioles 8–25 × 1.5–3 mm, ± late-glabrescent; leaf bud 8–18 × 2–3.5 mm, densely rusty pubescent by hairs c. 0.3–0.5 mm. *Inflorescences* situated in between or behind the leaves or sometimes terminal, densely pubescent by rusty hairs c. 0.5–0.7 mm, in ♀ and ♂: 3–5 times ramified, many-flowered, 8–30 × 5–25 cm, common peduncle 1.5–5 cm; bracts elliptic-oblong, 2–6 mm long, caducous. *Flowers* usually in rather dense clusters of c. 5–10, sometimes flowers more dispersed and only 2 or 3 together, all flowers ± in the same stage of development; perianth (3- or) 4- or 5-valved, outside pubescent by hairs 0.2–0.5 mm, often late-glabrescent, the perianth valves inside densely pubescent by similar hairs arranged in a few longitudinal rows, pedicels pubescent by hairs 0.2–0.5 mm long. Male *perianth* in bud obovoid to ± obconical, 1.5–1.8 × 1.2–1.5 mm, top rounded to subtruncate, base ± tapering, in transverse section faintly angular or not, pubescent or towards the top late-glabrescent; pedicel slender, 2–3.5 mm; perianth in anthesis cleft to 3/4–4/5, the valves spreading or ± recurved, c. 0.2 mm thick, inside densely pubescent by rusty hairs c. 0.2–0.3 mm. Synandrium (androecium excl. androphore) depressed-globose, (0.2–)0.3 × 0.5–0.6 mm, subcircular in transverse section; anthers 4 (thecae 8), sessile, central column narrow, apex not excavated, androphore rather broad but much narrower than the androecium, cylindrical, c. 0.3 × 0.2–0.3 mm. Female flowers not seen. *Fruits* 6–18 in large panicles up to 30 cm long, ellipsoid-oblong, glabrous, top narrowly rounded, base subacute or often tapering into a 4–10 mm long narrowed portion, 4.5–6.5 × 1.8–2.5 cm, glabrous, drying blackish, finely granulate, without lenticels, not warted, dry pericarp c. 1.5–3(–4) mm thick; stalk 8–16 mm long; aril laciniate at apex to c. 1/5–1/3; seed ellipsoid-oblong, 3.5–4.5 cm long, top beaked for 0.2–4 mm, testa elongately variegated purplish brownish.

Distribution. Borneo: Sarawak (1st and 3rd Div.), Sabah, E. Kalimantan.

BORNEO. Sarawak, 1st Div.: S 37530; Sinclair & Kadim 10359; 3rd Div.: Jacobs 5256. – Sabah: SAN A 1983, A 4770, 16059, 26345, 29530, 29776, 32689, 36663 (NT 624), 46138, 71385, 76380, 77428, 84445; B.N.B. For. Dept. 1716, 4644, 7746; Stevens c.s. 388. – E. Kalimantan: (Achmat) bb 34292; Kostermans 5469, 6783, 9579, 9903, 21668; Nedi 742.

Ecology. Primary and logged-over lowland rainforest on flat land and hill slopes; on leached clays, loam soils, black soil, also on sandstone and limestone or on periodically inundated ground; 0–400 m altitude. Flowers and fruits throughout the year.

Vernacular name. Sikut nabalu (Sabah).

Notes. 1. Fieldnotes. Buttresses sometimes present, but short and rounded. Bark usually blackish, brittle, smooth with superficially longitudinal cracks or paperthinly

flaking off; inner bark (living bark) c. 10–15 cm thick, pale yellow or brown to reddish brown or orange, cambium yellowish to red; sapwood pale, whitish to brown-yellow, soft; little pale red exudate from inner sapwood. Flowers recorded as yellow or reddish, or brown-red, the latter colours possibly referring to the brown-red tomentum. Fruits green to yellow, aril bright red.

2. Characterized by the inflorescences with all flowers in about the same stage of development, by the conspicuous rusty tomentum on leaf buds and inflorescences, and by the large fruits.

3. Resembles in general appearance *Horsfieldia motleyi*, with similarly pubescent flowers but which is different in all details. *Endocomia macrocoma* subsp. *macrocoma* from the Moluccas may resemble by similar, rather conspicuous yellowish red tomentum, but differs by the flowers in one cluster in various stages of development, by the shape of the androecium, and by smaller fruits.

4. In spite of a fairly large number of flowering specimens seen I only could find male flowers. Some of the collections contain male inflorescences and have fruits separately attached to the herbarium sheet, and are apparently collected from one single tree. In the related *Endocomia macrocoma*, usually the female flowers are scattered in between the more numerous male ones in one inflorescence, or can be found on separate female inflorescences on the same tree.

5. In some collections one of the inflorescences has a terminal position on the twig, a condition never seen in *Horsfieldia*; this is apparently caused by abortion of the terminal bud immediately above the highest leaf with an axillary inflorescence.

4. Endocomia virella de Wilde, *spec. nov.*

Endocomia macrocomae affinis, sed differt foliis in sicco virescentibus, fructibus maioribus, c. 4.5–7 cm longis, pericarpio sicco brunneo, 5–8 mm crasso, inflorescentiis subglabris, laxis, floribus eiusdem fasciculi aetate diversa, perianthio 3- vel 4-valvato, virescenti-luteo, antheris 3 vel 4, androphoro gracili, valde synandrio longior. – Typus: *F. Sadau SAN 49546* (L, iso K).

Tree 8–20 m. Twigs terete, not ridged, rather pale grey-brown, towards the apex 1.5–4 mm diam., very early glabrescent from grey tomentum of hairs c. 0.1 mm or less, bark finely irregularly striate, lower down faintly longitudinally cracking, not flaking, lenticels absent. *Leaves* in 2 rows, membranous to thinly chartaceous, elliptic to elliptic-oblong, broadest usually at the middle, 8–20 × 3.5–8 cm, base cuneate, top acute-acuminate; upper surface drying dark olivaceous to dull green, glabrous, lower surface olivaceous to dull pale green, glabrous; midrib above slender, flat; nerves 7–12 pairs, above flat or but little raised, the submarginal arches rather distinct or not; tertiary venation forming a lax network generally indistinct on both surfaces; petioles slender, glabrous, 10–18 × 1.5–2 mm; leaf bud small, slender, 6–10 × 0.6–1 mm, with rather sparse greyish tomentum of hairs c. 0.1 mm or less. *Inflorescences* slender and lax, glabrous or subglabrous (glabrescent) from sparse, very minute tomentum of greyish or pale brown hairs less than 0.1 mm, in ♂ or ♀ (see notes): 5–15 × 1.5–8(–10) cm, not many-flowered, common peduncle 5–25 mm; bracts not seen, early caducous. *Flowers* in lax umbel-like clusters of 2–6

flowers, these rather wide (c. 5–20 mm) apart along the main branches of the inflorescence, the flowers in one cluster usually in different stages of development; perianths 3- or 4-valved, outside glabrous (i.e. very early glabrescent from sparse tomentum of hairs less than 0.1 mm), the perianth valves inside towards the top with pale hairs 0.2–0.4 mm long arranged in a few rows corresponding with the spaces in between the anthers; pedicels slender, early glabrescent. Male *perianth* in bud broadly ellipsoid or broadly ovoid, c. 1.8–2 × 1.5–1.6 mm, top rounded to subacute, base (broadly) rounded, transverse section ± 3- (or 4-)quetrous, pedicel 4–6 mm long; perianth in anthesis cleft to c. 5/6, the valves widely spreading or ± recurved, c. 0.2 mm thick. Synandrium (i.e. androecium excl. androphore) globose to depressed-globose, 0.2–0.3 × 0.3–0.4 mm, subcircular in transverse section; anthers 3 or 4 (i.e. with 6 or 8 thecae), androphore cylindrical, slender, c. 0.8–1 × 0.2 mm. Female flowers not seen (see notes). *Fruits* 1–4 in little-branched panicles 12–25 cm long, ellipsoid-obovoid to ellipsoid-oblong, (4.5–)5–7 × 2.5–3.5 cm, top rounded, the base subattenuate or with an up to 7 mm long narrowed portion, glabrous, drying bright to dark brown, finely granulate, dry pericarp ± woody, 5–8 mm thick; stalk 25–30 mm; aril laciniate to c. 1/4–1/3; seed ellipsoid-oblong, c. 4 cm long, top subacute, testa elongately purple-brown variegated.

Distribution. Borneo: Sarawak (4th Div.), Sabah (Beaufort Hill).

BORNEO. Sarawak, 4th Div., Niah National Park: Rena S 39933. – Sabah, Beaufort Hill: SAN 34528, 39855, 44583, 49300, 49546, 55742 (NT 202).

Ecology. Primary forest on hill sides, ridges; brown soil or blackish soil; 0–400 m altitude. Flowers in January and May, fruits in January, August, and October.

Notes. 1. Fieldnotes. Once recorded as with buttresses. Bark greenish, brown-yellow, yellowish green, or black, smooth or scaly, inner bark either reddish, orange yellow, or brownish, with clear or red sap, smelling; sapwood white, soft or medium hard. Flowers (perianth) greenish to yellowish, anthers yellow. Fruits green.

2. Characterized by the minute tomentum, the smallish leaves drying green, the slender and lax inflorescences, the greenish flowers in each cluster in different stages of development, the long-stalked androecium (synandrium) of only 3 or 4 anthers, and the large fruits drying brown. Specimens may resemble the Bornean subspecies of *Endocomia macrocoma*, but this dries brown and has much smaller fruits.

3. Female flowers have not been seen, as is also the case in *Endocomia canarioides* and *E. rufirachis*. The fruits are borne on large infructescences, to c. 25 cm long, and the female flowers should be found either in between the male ones of predominantly male-flowered inflorescences, or in purely female-flowered inflorescences. In *S 39933* from Sarawak male inflorescences and fruits are together. The male flowers, with the stalked androecium and yellow sessile anthers, were erroneously annotated as female with a yellow stigma, and most likely the fruits and the male flowers have been collected from one single tree.

4. Specimens had been left unnamed by Sinclair, and were annotated as an undescribed new species of *Horsfieldia* by the late Mr. Hildebrand of the Rijksherbarium at Leiden.

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Numbers refer to the species number as accepted in this treatment. New names and combinations are in **bold type**. Synonyms have '=' before the number of the species to which they belong.