

## A revision of the genus *Trevesia* (Araliaceae)

MATTHEW H. P. JEBB

Botany School, Trinity College, Dublin 2, Ireland,  
now at the National Botanic Gardens, Glasnevin, Dublin 9.

**ABSTRACT:** The genus *Trevesia* Vis. is revised. Seven species are recognised, of which one, *Trevesia lateospina* Jebb from Thailand, is described as new. One new combination is made in *Brassaiaopsis* – *B. rufosetosa* (Ridl.) Jebb. A listing of excluded species and an index to all material examined are given.

### INTRODUCTION

*Trevesia* spp. are small, little branched, forest trees of south-east Asia. They are remarkable for the unusual pseudo-compound leaves that occur in several of the species. Leaves of all the species are palmately lobed, but in some the lobes are narrowed to form false petiolules, and the lamina is expanded again towards the base of the leaf. In one species (*T. burckii* Boerl.) these leaves are the normal adult state, while in another species (*T. palmata* (Roxb. ex Lindl.) Vis.) the leaf dissection is variable both between and within individual plants.

### SYSTEMATIC POSITION

The combination of palmately lobed leaves, pedicels without articulations, valvate (and usually calyptrate) petals which number more than 5 (6–16), and, similarly, the more than 5-loculed ovary (6–16) are diagnostic of the genus. *Trevesia* was described by Visiani in 1840 as a segregate from *Gastonia* for plants with a similar pleiomerous gynoeceum but without the pinnately compound leaves characteristic of that genus.

Seeman (1866) regarded the genus as related to *Reynoldsia* A. Gray, but this latter genus differs in having pinnate leaves and an inflorescence composed of a panicle of racemes, and is confined to the western Pacific.

Bentham (Bentham & Hooker, 1867) included both *Parapanax* Miq. and *Reynoldsia* in a broad concept of *Trevesia*; the former has digitate leaves and belongs in *Schefflera* J.R. Forst. & G. Forst. Under his rather broad generic concepts, Baillon (1879) regarded *Trevesia* as a section of *Gastonia*.

Harms (1894) considered the genus to be closely allied to *Schefflera* and more distantly to *Fatsia* Decne. & Planch. and *Osmoxylon* Miq. *Osmoxylon* has a unique compound umbel in which the primary rays each bear three umbels, and the petiole base also bears collar-like, transverse crests. Other workers, including Seeman (1866), continued to confuse species of the two genera however, even after Beccari's revision of *Osmoxylon* in 1878.

Viguié (1906) placed some of the genera with polymerous flowers into the tribe *Plerandrineae*, and Tseng & Hoo (1982) extended this concept to encompass a much larger number of genera, including *Trevesia*. Such a broad grouping also corresponds well with wood microstructure in the family (Oskolski, 1996).

Eyde and Tseng (1971) surveyed gynoeceal vasculature, and agreed with earlier authors (Harms, 1894; Li, 1942; Viguié, 1906) that the 5-merous flower was probably derived from a polymerous state in the Araliaceae. However, unlike all other genera with polymerous ovaries in the family, they found that *Trevesia* was exceptional in the positioning of the ventral, gynoeceal bundles (Eyde & Tseng, 1971; p. 225). Cronquist (1968) on the other hand, took the opposing view, and considered the 5-merous state to be ancestral.

Recent molecular investigations of the Araliaceae and Apiaceae suggest that neither Eyde & Tseng nor Cronquist are correct, but that the two carpelate state is most likely ancestral (Plunkett et al., 1996, 1997). Cladograms based on the *rbcL* gene sequence support a Hedera-

clade comprising *Hedera*, *Kalopanax*, *Trevesia*, *Dendropanax*, *Acanthopanax*, *Fatsia* and *Polyscias*, characterised by non-articulate pedicels, fused styles (except *Fatsia*), palmate leaves (except *Polyscias*) and a paniculate inflorescence (Plunkett et al., 1997). Phylogeographic patterns also support this alliance of genera, although another gene, *matK*, only partially supported this clade (Plunkett et al., 1997).

A survey of wood anatomy in the family (Oskolski, 1996) suggests a relationship between *Macropanax*, *Trevesia*, *Brassaiopsis*, *Oplopanax* and some *Schefflera* spp. *Brassaiopsis* and *Trevesia* share several morphological characters; both genera comprise small trees with thorny bark, large palmate leaves (which have a similar reddish-cast in many dry specimens), similar inflorescences, non-articulate pedicels, fused styles, and only differ sharply in ovule number, being two or rarely three in the former, but six to 16 in *Trevesia*. The recently published monotypic genus *Grushvitzkya stellata* Skvortsova & Aver. (1994) from Vietnam appears to represent the first potential link between the two genera, sharing all the above characters, but with a locule number of 5.

One species, *Trevesia rufosetosa* Ridl., is here removed to *Brassaiopsis* Decne. & Planch. (see Excluded Species). The species was originally mis-described, and subsequently not re-examined. However the original placement of the species further underlines the similarity of these two genera, which are only reliably distinguished by ovule and anther number. *Brassaiopsis* being characterised by its non-articulate pedicel, two stigmas fused into a slender, connate style, and two-loculed ovary (very rarely three) and five petals and stamens. Like *Trevesia*, *Brassaiopsis* has a surprising range of leaf forms; some species (*B. trevesioides* W. W. Smith and *B. palmipes* Forrest ex W. W. Smith) even exhibit the singular appearance of *T. burckii* and forms of *T. palmata*, where the lobes are constricted to their midribs.

The overall lack of congruence between morphological and molecular characters indicates how uninformative many of the morphological characters in Araliaceae may be in providing evidence for a phylogenetic scheme. For the present, however, there is no serious systematic problem in retaining the historical concept of *Trevesia*, although no new hypothesis on its relationships has come to hand during this revision.

### TAXONOMIC HISTORY

The first two species of *Trevesia* to be described were both given the same epithet, albeit under different generic names: *Gastonia palmata* Roxb. in 1814 (= *Trevesia palmata* (Roxb. ex Lindl.) Vis.), and *Sciadophyllum palmatum* Bl. in 1826 (= *Trevesia sundaica* Miq.). Palmate leaves are a common feature of araliaceous genera, and the epithet 'palmata' has been used on no less than 18 occasions for south-east Asian taxa, in combination with 13 generic names. In 1842 *Gastonia palmata* was transferred to *Trevesia* by Visiani, and in 1855, Miquel gave *Sciadophyllum palmatum* the new name *Trevesia sundaica*.

Clarke's account of *Trevesia* in the *Flora of British India* (1879) cites the sole species in India, *T. palmata*, and describes two varieties: *T. palmata* var. *insignis*, partly based on Miquel's Moluccan species (*T. insignis* which is in fact a species of *Osmoxylon*), and *T. palmata* var. *cheiranthia*, based on a mixture of *T. palmata* and *T. burckii*. This latter species was described by Boerlage in 1887, along with a Sumatran species, *T. beccarii* Boerl.

Kuntze (1891) created confusion by transferring all five of Beccari's new species of *Osmoxylon* (Beccari, 1878) to *Trevesia*, and at the same time he also raised Clarke's variety to species level, as *T. cheiranthia* (C. B. Clarke) Kuntze, a status change which Ridley was to accidentally repeat some years later (1922).

Harms (1894) created 2 sections in the genus: Sect. *Eutrevesia*, in which the inflorescence was a short, upright panicle, with deciduous lower peduncles, and the petals partially calyptrate, comprising *T. palmata* alone, and Sect. *Neotrevesia* with a longer inflorescence which is initially erect, later collapsing, and in which the petals are fully calyptrate. This latter

section was further divided into those with sessile flowers and an oval flower bud (*T. beccarii*), and species with long-pedicelled flowers and hemispherical flower buds (*T. burckii* and *T. sundaica*).

In 1922 Ridley described *T. rufosetosa* from Peninsular Malaysia. This latter was retained by Philipson (1979), but it is clear that Ridley made an error in counting the number of locules in the ovary (5 instead of the actual 2), even though he correctly indicated the stigma as bilobed. In addition he overlooked the large calyx lobes and the fact that the five petals and locules were in conflict with the generic description, these errors were repeated by Philipson. The true facies of the specimen indicate that it should be transferred to *Brassaiopsis*.

Craib (1930) described two new species from southern Thailand; *T. tomentella* Craib, and *T. valida* Craib. These species are characterised by the long, somewhat narrow, leaf lobes and their reddish indumentum, and in the present revision the two are regarded as synonymous. Merrill described the Sumatran species *Trevesia arborea* Merr. in 1934. Philipson (1979) reviewed the genus for the Flora Malesiana region without any changes to the accepted taxonomy.

Working on the Vietnamese flora, Grushvitzky & Skvortsova (in Grushvitzky et al., 1984) described a number of new species, each based on the degree of leaf dissection and the appearance of the developing fruit. They transferred *Fatsia cavaleriei* H. Lév. to the genus, while *T. longipedicellata* and its variety *palmatipartita*, and *T. sphaerocarpa* were described as new. None of these taxa are recognised in this revision, and all are reduced to *T. palmata*. The circumscription of *T. burckii* by these workers is also shown to be erroneous, and the specimens placed in this species (Grushvitzky et al., 1984) are transferred to *T. palmata* also.

## MORPHOLOGY

*Trevesia* are small trees with large leaves and thick axes. Whilst some species are well branched (*T. arborea*, *T. sundaica*) others appear to branch rarely except when injured (*T. lateospina*, *T. palmata*, *T. valida*). The stems bear sharp conical spines, and these are either numerous and borne in more or less precise semi-circular rings around the petiole base, or are sparser and somewhat randomly scattered.

The leaves are borne in compact terminal whorls, growth is rhythmic, and some scale leaves are produced between successive whorls. The leaves towards the middle of each whorl are largest, but usually these are neglected by collectors who gather leaves from near the base or apex of the whorl, which may be up to half their size. This form of growth is common to several genera of Araliaceae (*Brassaiopsis*, *Schefflera*).

The leaflets of two species (*T. palmata* and *T. sundaica*) show great variation, from entire, to sharply serrate, shallowly to deeply lacinate, or almost fully pinnatifid. Young *T. burckii* seedlings have ovate leaves. By the 4th or 5th leaf, however, the blade may become divided into 2 or 3 discernible lobes. Following the production of a number of such lobed leaves, the plant then produces leaves characteristic of the adult plant; each lobe is more or less lanceolate, and at its base the lamina is constricted such that the margins touch the costae, but almost immediately below this point the midribs of each leaflet are united by a sheet of laminal tissue not unlike the webbing of a duck's foot. This form of pseudo-compound leaf is normal to *T. burckii*, and only occasional in *T. palmata*, but is also found in at least two species of *Brassaiopsis*: *B. palmipes* Forrest ex W. W. Sm. and *B. trevesioides* W. W. Sm.

On a recent collecting trip to Thailand (1995) I was able to see *Trevesia palmata*, albeit in a sterile state. The variation in leaf dissection used by Grushvitzky and Skvortsova to distinguish species was found within individual populations of mixed age groups. Young, unbranched trees had palmately lobed leaves, whilst large specimens either had similar leaves, or the lobes were constricted to the costae, giving a pseudo-compound appearance. In some individuals these lobes were entire, while in others they were pinnately dissected. There was

some correlation between trees subject to the highest light levels having the most dissected laminas. Given the polymorphic nature of the species in Thailand, and in China (Feng & Li, 1979), it does not seem possible to maintain the species proposed by Grushvitzky & Skvortsova (Grushvitzky et al., 1984) even at a varietal level. Environmental or developmental factors appear important in controlling leaf morphology. Characters of fruit shape suffer too many vagaries in age and drying, and pollen morphology also appears to be of little help in establishing stable characters.

The base of the petiole forms a short sheath around ca. 1/2 the stem. The margins of this sheath may be papery or leathery, and form a pair of stipular ligules which may be partially or wholly fused. In the new species described in this paper, *T. lateospina*, the stipule is developed into a broad shield-like structure. The petiole of most species bears spines at its base, and in some species (*T. valida*) these may also be present near the leaf junction, or throughout the petiole (*T. palmata*, *T. beccarii*).

Inflorescence position is rarely mentioned on collecting notes. Whilst the initiation of the inflorescence is always terminal, its expression varies in timing from species to species. The inflorescence is terminal in *T. palmata* and *T. lateospina*, being overtaken by continuation of the stem shortly afterwards, so that the infructescence is borne sub-terminally. In *T. burckii* and *T. sundaica*, the development of the inflorescence is delayed, and therefore borne laterally, and some way below the leaves. In *T. valida* the inflorescence is borne amongst or slightly below the whorl of leaves. For two species (*T. arborea* and *T. beccarii*) there is no information on position. Bracts are present at all branch points of the inflorescence. In some species these are caducous, while in others they are more persistent.

The petal, calyx lobe, anther and locule numbers are somewhat variable in each species, ranging from 6–7 in *T. lateospina*, to 13–16 in *T. arborea*. In most species the petals are calyptrate, while in two; *T. palmata* and *T. lateospina*, the corolla opens, at least partially. In *T. palmata* the petals are often characteristically fused into a mixture of triplets, pairs and singletons.

On the young parts, including the outer surface of the petals, of all species, there is a more or less dense, reddish-brown indumentum of irregularly branched hairs. In a few species, stiff setose hairs are present on the stems and petioles and sometimes on the inflorescence also. In *T. valida* these are only sparsely developed, while in *T. lateospina* they are dense and persistent.

## POLLEN

Time and materials only permitted a very cursory examination of pollen. Comparisons with the literature revealed some marked inconsistencies. As with previous surveys (Shang & Callen, 1988; Grushvitzky et al., 1984), the grains were found to have equatorial dimensions of 21–39  $\mu\text{m}$  (27–50  $\mu\text{m}$  in literature) and to be oblate spheroidal (Polar/Equatorial ratio = 0.8–0.91). In all species, other than *T. burckii*, the 3 apertures have brevicolpate ectoapertures and endopores; in *T. burckii* the ectoapertures are porate. The ornamentation is reticulate, the muri being simplicolumellate. The brochi (Punt et al., 1994) ranged from 1.2–3  $\mu\text{m}$  (*T. arborea*) to 3.8–9  $\mu\text{m}$  across (*T. lateospina*). The muri were rounded, and ranged from 0.6–1.9(–2.9)  $\mu\text{m}$  across, in all species other than *T. burckii* they were smooth in appearance; acetolysed grains of *T. burckii* were found to be covered by numerous rounded granules. The area surrounding the ectoapertures varied from the rest of the mesocolpium in some species, forming a distinct margo of un-ornamented surface.

The pollen of *T. valida* was found to form regular ellipsoidal aggregations of ca. 60 grains, probably held together by pollenkit (Fig. 3: e). These pollinia or massula (Punt et al., 1994) may represent a dispersal unit in these species. Acetolysis broke these down into the individual grains (Fig. 3: c).

The difference in appearance between fresh, air dried pollen and acetolysed grains of *T. burckii*, was found to be striking (Fig. 1: a–d). A sample of pollen was collected in the Singapore Botanic Gardens in March 1995, some of this sample was air dried, while the remainder was acetolysed prior to examination by SEM. Acetolysed grains revealed an irregular covering of small spherical granules 0.02–0.04 µm in diameter (Fig. 1: c, d), which are obscured in fresh grains (Fig. 1: a, b). In other species these granules are less conspicuous (*T. valida*; Fig. 3: c, d) or absent (*T. lateospina*; Fig. 1: e, f). Exactly the same granules were present on pollen grains examined, and illustrated by Grushvitzky et al. (1984, plate 5: 3 & 3a). Pollen samples dissected from the anthers of herbarium material, and directly mounted for SEM examination without acetolysis, revealed amorphous surfaces with only slight depressions over the reticulations.

Whilst Grushvitzky et al. (1984) found that pollen characters confirmed some of their new Vietnamese taxa, some of the findings in the present survey differed from their published plates. In the case of *T. arborea*, only the type exists, and yet the published plate in Grushvitzky et al. (1984, f. 5: 5) reveals larger grains (36 vs. 30 µm), with brochi (5.7 µm) and muri (2.3 µm) of twice the dimensions that I observed (1.2–2.9 and 0.6–0.96 µm respectively). The two plates of *T. sundaica* also differ from one another; the *Zollinger 2325* specimen (Grushvitzky et al., 1984, Pl. 5: 4, SEM) has far broader muri than the *Koorders 779B* specimen (Grushvitzky et al., 1984, Pl. 4: 2, Light microscopy). Neither specimen matches the grains from *Kostermans 6209* (Fig. 3: a, b). In this revision I have reduced *T. longipedicellata* and *T. sphaerocarpa* to synonymy with *T. palmata*. In Grushvitzky et al. (1984) however, the type specimens each had pollen grains with a very broad reticulation (brochi = 5–11 µm) and thicker muri (1.8–3 µm) than *T. palmata*. Clearly a far broader survey is required to elucidate pollen diversity in the genus, and its taxonomic significance.

#### ECOLOGY AND BIOGEOGRAPHY

All the species are understorey trees of evergreen forest, and are found between sea level and 1,500 m. The young inflorescences of *T. palmata*, and probably other species, are eaten by people in Thailand, as are those of some other Araliaceae, including *Schefflera subintegra* (Craib) C. B. Shang (J. E. Maxwell and R. Pooma, pers. comm.). In consequence these plants are subject to a degree of human predation that probably leads to fertile collections being rare near footpaths or otherwise easily accessible sites.

*Trevesia palmata* is widespread throughout the Himalayan foothills, from Nepal and northern India, through Bhutan, Bangladesh, Burma, China, Thailand, Laos, Cambodia, and Vietnam. This distribution lies entirely within the seasonally more or less dry climatic core of south-east Asia, although the plant is only found in evergreen forests within this (Map 2). One other species is found in this area, *T. lateospina*, but is only known from a single mountain group in northern Thailand (Map 1).

*Trevesia burckii*, which has been confused with *T. palmata* in the past is well isolated geographically from the latter (Map 2). *Trevesia valida*, which is common in Peninsular Thailand, is seemingly never found sympatrically with either *T. palmata* to the north, or *T. burckii* to the south.

*Trevesia sundaica* is widespread in Java, but somewhat more scattered in Sumatra. Besides *T. burckii* and *T. sundaica*, two other species are found in Sumatra: *T. arborea* and *T. beccarii* (Map 1). The former known from the northern-most mountains of Sumatra, the latter somewhat more widespread in the northern and central Sumatran mountains. Whether any of these species show any marked ecological preferences is not apparent from the collection information, which is uniformly described as forest. Only *T. beccarii* and *T. burckii* appear to have been collected from the same locality (Beccari).

## MATERIALS AND METHODS

Examination of herbarium material (from A, AAU, ABD, BK, BKF, BM, BO, C, CMU, E, GH, K, KEP, L, P, SING, TCD, U, US, W and WU) was augmented with fieldtrips to Java, Peninsular Malaysia and Thailand, where three species were studied in the field. Pollen was examined by SEM, both from air dried material and preparation of the grains by acetolysis (Faegri & Iversen 1964). All specimens have been seen unless otherwise indicated, as n.v. Measurements and descriptions are of dried material, except for floral and fruit sizes, which are based on rehydrated (boiled in water) material. Unless otherwise indicated, all dimensions are given with length first followed by breadth. Abbreviations are standard, with the addition of the following: G. = Gunung (Mountain), Bt. = Bukit (Hill), F.R. = Forest Reserve, NP = National Park.

## TREVESIA Vis.

*Trevesia* Vis., Giorn. Tosc. Sci. Med. 1 (1840) 72; Vis., Mem. Reale Accad. Sci. Torino Ser. 2, 4 (1842) 262; Miq., Fl. Ind. Bat. 1(1) (1856) 747; K. Koch., Wochenschrift Gart. Pfl. 2 (1859) 67; Miq., Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 10; Benth. & Hook. f., Gen. Pl. 1 (1867) 943, in part; Boerl., Ann. Jard. Bot. Buitz. 6 (1887) 107; Boerl., Handl. fl. Ned. Ind. 1 (1890) 639; Harms in Engl. & Prantl, Nat. Pfl. Fam. 3 (8) (1894) 32; King, J. As. Soc. Beng. 67 (1898) 57; Koord., Atlas Baumart. Java 4 (1916) f.664–666; Hutch., Gen. Fl. Pl. 2 (1967) 71; Philipson, Fl. Mal. ser. 1, 9 (1979) 95; Grushv. & Skvortsova, Bot. Zhurn., 69(8) (1984) 1023. – Type species: *Trevesia palmata* (Roxb. ex Lindl.) Vis. *Petasula* Noronha, Verh. Bat. Gen. 5 (1790) ed. 1. art. 4: 3 partim; Steen. & Steen.-Krus., Regn. Veget. 71 (1970) 376–377.

Shrubs or large trees, unbranched to sparsely branching. Stems armed with few to many stout spines, in older stems these becoming worn. Leaves palmately lobed, more or less circular in outline, 30–70 cm across; lobes 5–13, variously dissected, broad based or constricted to the midvein, so as to give the impression of a compound leaf. Petiole terete, striate, base with a short sheath; stipules ligulate, triangular, partly or entirely fused. Inflorescence a raceme or panicle of umbels; arising terminally but in some species only developing laterally; rachis usually bearing several peduncles each of which may bear from 1 to 3 or more umbels; bracts small to large, persistent to caducous, at all branch points. Umbels 1 to 25, bearing 9–65 flowers; bracts small to large, 3–25 mm. Flowers not articulated below the receptacle; receptacle turbinate to campanulate; calyx very short, minutely lobed or more or less entire; petals 6–16, fused into a calyptra, or all free, or partially and irregularly fused; anthers 6 or more, usually equalling petal number or somewhat fewer, up to 16; pollen oblate spherical, 3-porate to brevicolporate, reticulate, colpi with or without a distinct margo; styles fused into a short or extended, blunt stylopodium; stigmas sessile or pulvinate; locules 6–16. Fruit globose, often with prominent stylopodium at apex. Indumentum of peltate scales, appressed arachnoid hairs or irregularly branched or stellate, very short to long reddish-brown hairs; dense on all young parts, persistent or becoming glabrescent; in some species setose bristles may be prominent at petiole bases, or throughout.

Ecology – All the species are small to middle-sized (1.5–15 m), little-branched trees of evergreen forest. They are found from sea level to 1,500 m.

Distribution – Nepal, India, Bhutan, Bangladesh, Burma, China, Thailand, Laos, Cambodia, Vietnam, Sumatra, Peninsular Malaysia, Sarawak, West Kalimantan, Java, Bali, Lombok.

Note – The name *Petasula* appears on 2 plates prepared by Francisco Noroña between 1786–87 in Java. Noroña died in Mauritius during his return to Europe and the collection of plates was finally deposited at Paris and the British Museum. Hasskarl (1844) interpreted the name *Petasula* as belonging to *Hedera*, while the treatment of van Steenis & van Steenis-Kruseman indicated that the 2 plates comprise disparate elements, one of *Trevesia sundaica* Miq. (#54 @

P, #50 @ BM), the other of an unidentified *Schefflera* (#31 @ P, #75 @ BM) (van Steenis & van Steenis-Kruseman, 1970).

### KEY TO THE SPECIES

- 1a. Leaves digitately pseudo-compound, individual lobes petiolulate, and base of leaf webbed ..... 2  
 b. Leaves digitately lobed, margin of lobes not touching midrib of lobes ..... 3
- 2a. Petals opening, but partly fused into pairs or triplets ..... **5. *T. palmata***  
 b. Petals calyprate, corolla falling as a whole ..... **3. *T. burckii***
- 3a. Mature flowers and fruits shortly pedicellate to sessile ..... **2. *T. beccarii***  
 b. Mature flowers and fruits distinctly (>1 cm) pedicellate ..... 4
- 4a. Stems, petioles and inflorescence densely covered by long (1–2 cm) setose hairs ..... **4. *T. lateospina***  
 b. Stems, petioles and inflorescence with short indumentum or few setose hairs ..... 5
- 5a. Leaf lobes more than 3 times as long as broad, lanceolate; locules 7–8 ..... **7. *T. valida***  
 b. Leaf lobes less than 2.5 times as long as broad, or pinnatifid; locules 8–16 ..... 6
- 6a. Petioles unarmed; umbels with <15 flowers; locules 13–16 ..... **1. *T. arborea***  
 b. Petioles armed with few to many prickles; umbels with >20 flowers; locules 8–12 ..... 7
- 7a. Leaves 5–9-lobed; petals opening, but partly fused ..... **5. *T. palmata***  
 b. Leaves 9–11-lobed; petals calyprate, corolla falling as a whole ..... **6. *T. sundaica***

#### **1. *Trevesia arborea* Merr.**

*Trevesia arborea* Merr., Contr. Arnold Arbor. 8 (1934) 116; Philipson, Fl. Mal. ser 1, 9 (1979) 99. –Type: W. & C. Bangham 725 (lectotype, designated here, A; isotypes A, K x 2), Indonesia, Sumatra, Aceh province, Takigeum, 3,600 feet, 7th January 1932.

Tree to 15 m, ‘large, prominent’, presumably branched, but stems unknown. Leaves palmately lobed, 21 to 40 cm across, base blunt to broadly cordate; lobes 8–9, elliptic, to 20 x 11 cm, apex acuminate; sinuses narrow; margin regularly serrate, teeth ca. 2 mm long, 3–8 mm apart; chartaceous-coriaceous, nearly glossy above; indumentum of dense, appressed arachnoid hairs 0.1–0.2 mm across, on lower lamina, more or less erect on and near veins, and especially dense on young leaves, reddish brown. Petiole to 40 x 0.7 cm, obscurely striate; base and stipule unknown. Inflorescence position unknown, cylindrical; rachis to 33 x 1.2 cm; bearing 8–10 evenly-spaced secondary peduncles and a cluster of ca. 5 at apex, 8–14 cm long, each with a terminal umbel; bracts to 1.5 cm long, broad, acuminate, persistent; indumentum of irregularly branched hairs 0.2–0.3 mm long, aggregated into evenly-spaced pulvini 0.7–1.3 mm across, these most numerous towards base and at base of bracts, dirty-brown in colour; bristle-like spines 1–2 mm in length scattered amongst hairs, and a few large recurved thorns to 1 cm long near base of inflorescence. Umbels 9–14-flowered; 5–6.5 cm across; pedicels 1 x 0.3 – 2 x 0.4 cm; bracts triangular to 0.5 cm long, densely pubescent, dark brown adaxially. Flower receptacle hemispherical, 7 x 15 mm; disk concave, stylopodium  $\pm$ level with disk margin, ca. 1 mm long. Calyx an undulate rim <0.1 mm long. Petals 13–16, fused into a calyptre, hemispherical, coriaceous, smooth; 6 x 15 mm overall; indumentum felt-like ca. 0.1 mm long, light brown, dense. Stamens 13–16, crowded in 2 irregular rows in bud; anthers oblong, curved, 4 x 1.8 mm; filaments curved, 3.5 mm long, flattened, 1.5 mm wide, margins

thin. Pollen grains, 27.2–30 µm on equatorial axis; brevicolpate, colpus to 9.6 µm long; brochi 1.2–2.9 µm, muri 0.6–2.9 µm; margo 2.1–3.1 µm across. Locules 13–16. Fruit unknown.

Ecology – Forest at 1,100 m; flowering January.

Distribution – Northern Sumatra. Known from the type alone. Map 1.

Notes – 1. Of the two sheets at A, the sheet with the inflorescence has been indicated as the type by Merrill in his own hand.

2. The large size of this species (40–50 foot on the collecting notes) and its robustly pedicelled flowers with from 13 to 16 floral parts and a rather leathery calyptra readily distinguishes it from all other members of the genus. Only known from the type collection, and whilst it was said to be a large and prominent tree, the region is poorly collected.

## 2. *Trevesia beccarii* Boerl.

*Trevesia beccarii* Boerl., Ann. Jard. Bot. Buitz. 6 (1887) 110, t.11; Boerl., Handl. fl. Ned. Ind. 1 (1890) 649; Philipson, Fl. Mal. ser 1, 9 (1979) 99. – Type: *Beccari 517* (lectotype, designated here, K; isotypes K, BM x 2), Indonesia, Sumatra, Padang, Ajer Mancior, 360 m, August 1878.

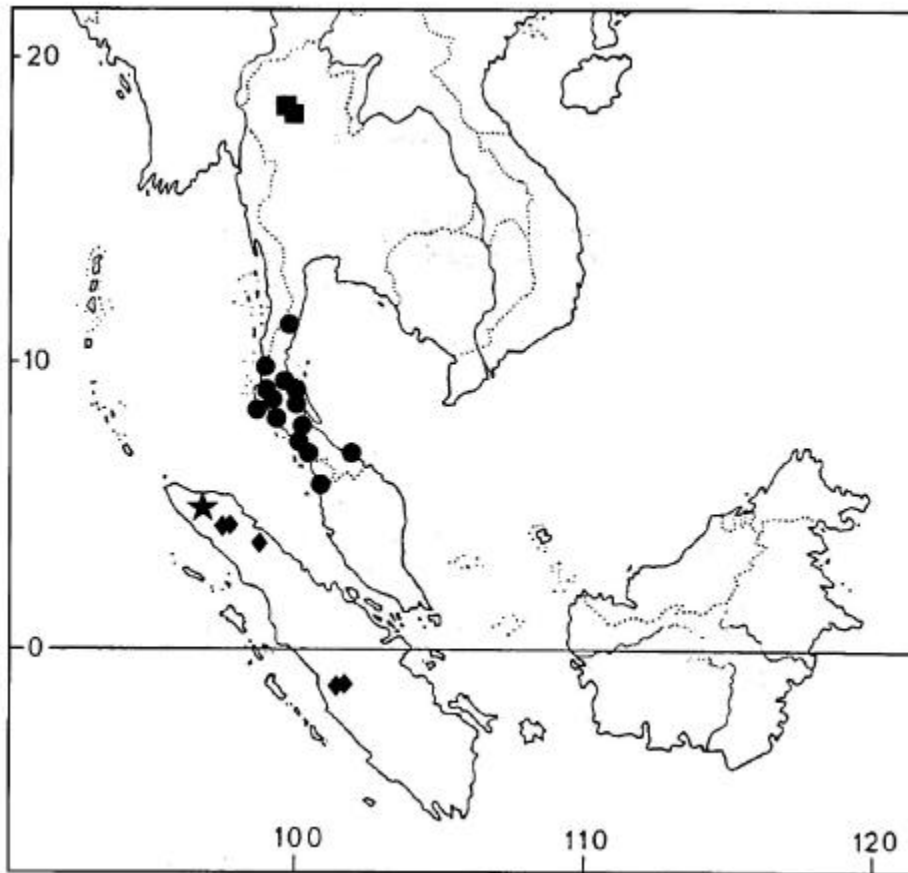
Shrub or small tree to 5 m; stems with stout curved spines 0.8 cm long, stem apex covered by dense reddish-brown, felt-like indumentum, or dense setose hairs to 0.5 cm long. Leaves palmately lobed, more or less circular in outline, 35–50 cm across, base blunt to broadly cordate; lobes (5–) 9–11, elliptic, to 22 x 16 cm, apex acute; sinuses rounded at base; margin irregularly and coarsely serrate, teeth 3–4 mm long; indumentum of tufted reddish hairs 0.05–0.1 mm long, on and near veins, scattered and appressed elsewhere on lower lamina, especially dense on young leaves. Petiole to 55 x 1 cm; with scattered stout spines 2–3 mm long; base sheathing, margin papery, to 3 mm broad, stipular ligules to 1.5 cm; indumentum of short reddish hairs throughout, becoming dense and intermixed with strigose pale hairs and longer bristles near apex and base. Inflorescence position unknown, conical; an irregular raceme; rachis to 23 x 1 cm; bearing 12–18 secondary peduncles 3–17 cm in length, each with a terminal umbel, basal branches bearing subsidiary lateral umbels; bracts triangular, to 2 cm long with a prominent central midrib, persistent; indumentum a mixture of hairs, bristles and spines, hairs irregularly branched, 3–4 mm long, more numerous towards base of inflorescence, and in axils, interspersed with bristle like spines 3–7 mm in length, these especially numerous at junctions of peduncles, spines scattered, at base of inflorescence, recurved, to 1 cm long. Umbels capitulate, with 10 to 20 sessile flowers; 1.5–2.5 cm across; bracts narrowly triangular, 0.8 x 0.25 cm, numerous. Flower receptacle obconic, 11 x 11 mm; disk concave, stylopodium truncate or somewhat spreading at top, 1.5 x 1.5 – 3.5 x 3 mm, above level of disk margin. Calyx a rim ca. 0.5 mm long with irregular acuminate teeth to 1 mm. Petals 10–13, fused into a calyptra, rounded-conical; to 8 x 11 mm overall; ribbed, apex blunt-acuminate, acute-conical in young buds; indumentum dense, 0.1 mm. Stamens 10–13; anthers oblong, to 3.8 x 1.7 mm; filaments flattened, recurved, 2–3 mm long, 1 mm wide. Pollen grains 32–39 µm on equatorial axis; brevicolpate, colpus 7 µm; brochi 2.5–4.9 µm, muri 0.65–2.9 µm; margo 0.8–2.8 µm across. Locules 10–13. Fruit unknown.

Ecology – Evergreen forest; 200 to 1,000 m; flowering May, August and October.

Distribution – Sumatra. Map 1.

Notes – 1. Jacob Boerlage was custodian of the Leiden Herbarium at the time he published this species. No specimen has been located at Leiden, and the Kew duplicate is therefore selected as the lectotype.





**Map 1.** Map showing distribution of *Trevesia arborea* Merr. ★, *T. beccarii* Boerl. ◆, *T. lateospina* Jebb ■, and *T. valida* Craib ●.

2. In some respects this species is similar to *T. arborea*, another Sumatran endemic; it differs in its broader-lobed leaves with wide sinuses, its capitulate umbels and flowers with somewhat fewer floral parts and a less leathery calyptra.

**Collections** – SUMATRA – ACEH: Lau Simerah to Lau Penanggajan, nr. Kutacane, *Alston 14511* (A, BM n.v., BO); Ketambe, Kutacane, *de Wilde & de Wilde-Duyffes 12283* (BO, L). – SUMATERA UTARA: Sibolangit, *Lorzing 5208* (BO), *11918* (BO), *Md. Museum 7676* (K). – SUMATERA BARAT: G. Merapi, *Bünnemeijer 5043* (BO); Padang, Ajer Mancior, *Beccari 517* (type), *531* (K); G. Sago, *Meijer 4033* (L).

### 3. *Trevesia burckii* Boerl.

*Trevesia burckii* Boerl., *Ann. Jard. Bot. Buitz.* 6 (1887) 110, t.12: 1-14; *Handl., fl. Ned. Ind.* 1 (1890) 649; Merr., *En. Born.* (1921) 456; Masam., *En. Phan. Born.* (1942) 566; B. C. Stone, *Tree Fl. Malaya* 3 (1978) 33; Philipson, *Fl. Mal. ser. 1*, 9 (1979) 97, f. 35. – Type: *Burck s.n.* (Type BO), Sumatra, Halaban, 1883.

*Trevesia cheirantha* (C. B. Clarke) Kuntze, *Rev. Gen.* (1891) 272; Corner, *Wayside trees of Malaya*, 2nd Ed., 1 (1952) 158. – *Trevesia cheirantha* (C. B. Clarke) Ridl., *Fl. Mal. Pen.* 1 (1922) 882. comb. superfl. – *Trevesia palmata* var. *cheirantha* C. B. Clarke in Hook. f., *Fl. Brit. India* 2 (1879) 732, partim; King, *J. As. Soc. Beng.* 67 (1898) 58. – *Hedera?* *cheirantha* Jack in Wall. *Cat.* 4925, nomen. – Type: *Wallich 4925* (lectotype, designated here, K-Wall), Peninsular Malaysia, Penang.

non *T. burckii* sensu Grushv. & Skvortsova, Bot. Zhurn. 69 (8) (1984) 1024, f. 2: 4; *ibid.*, Novitates Syst. Plant. Vasc. 22 (1985) 156.

Shrub or tree to 5 m; little branched, branches upright to somewhat reclining; stems with scattered stout spines 0.2–0.7 cm long; indumentum of closely appressed arachnoid hairs, reddish-brown, dense on young parts. Leaves of seedling trees simple, deltoid-ovate, in older plants palmate, and then appearing digitately compound, with lamina of lobes constricted to midribs, and then webbed at leaf base, outermost lobes not contracted on basal side; more or less circular in outline, to 60 cm across, base broadly cordate; lobes 7–9, lanceolate-oblong to obovate, up to 36 x 15 cm, apex acuminate, base cuneate to rounded, margin serrate in upper part; papery; indumentum brownish-red, throughout young leaves, persistent on midribs below, becoming glabrous elsewhere. Petiole 20 x 0.5 – 50 x 1 cm; smooth or with scattered upright spines 1–3 mm long; base with or without decumbent setose spines 1–2 mm long; basal sheath to 2 cm, stipular ligules 1–2.5 cm long; indumentum reddish-brown, scurfy, persistent near base and apex. Inflorescence terminal or amongst leaves; racemose; rachis to 60 cm, bearing 6–12 secondary branches, the majority at the apex, to 23 cm long and bearing a single terminal umbel, and 1–3 or more clasping bracts along their length; bracts triangular, to 2.5 x 1 cm, persistent or caducous, somewhat more persistent near apex; smooth or with scattered spines; indumentum of scurfy brown hairs 0.1–0.3 mm across. Umbels of 30–50 flowers; 3–8 cm across; pedicels 10 x 0.2 – 35 x 0.7 mm; bracts triangular, 3–5 mm, margin entire, indumentum dense on abaxial surface. Flower receptacle turbinate; 3.5 x 7 mm; disk flattened-conical; stylopodium to 2 x 2 mm, ±capitate; stigmas pulvinate or not. Calyx minutely dentate, teeth as many as petals, to 1 mm. Petals 7–10, fused into a calyptra, rounded, overall to 7 x 7 mm, apex mamillate; apically reddish furfuraceous. Stamens 7–10; anthers ellipsoid, 3 x 2 mm; filaments flattened, to 2.5 x 1.2 mm. Pollen grains 30–35 µm on equatorial axis; brevicolpate to porate 2.4–4 µm; brochi 1.2–3.3 µm, muri 0.8–1.2 µm; margo 2–2.6 µm across (Fig. 1: a–d). Locules 7–10. Fruits, globose, apically conical, to 2 cm across.

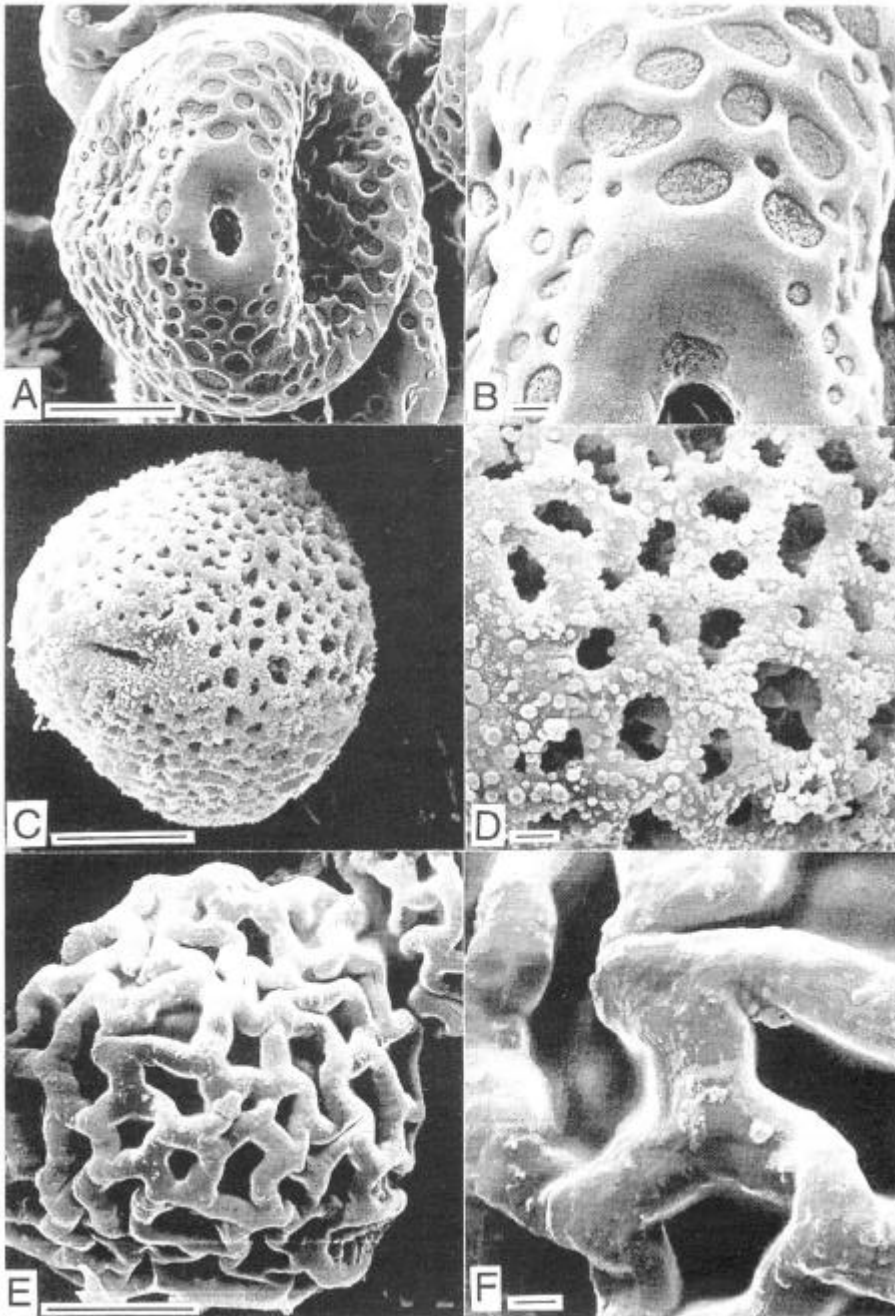
Ecology – Evergreen forest; sea level to 900 m.

Distribution – Sumatra, Peninsular Malaysia, Singapore, Thailand, Borneo. Map 2.

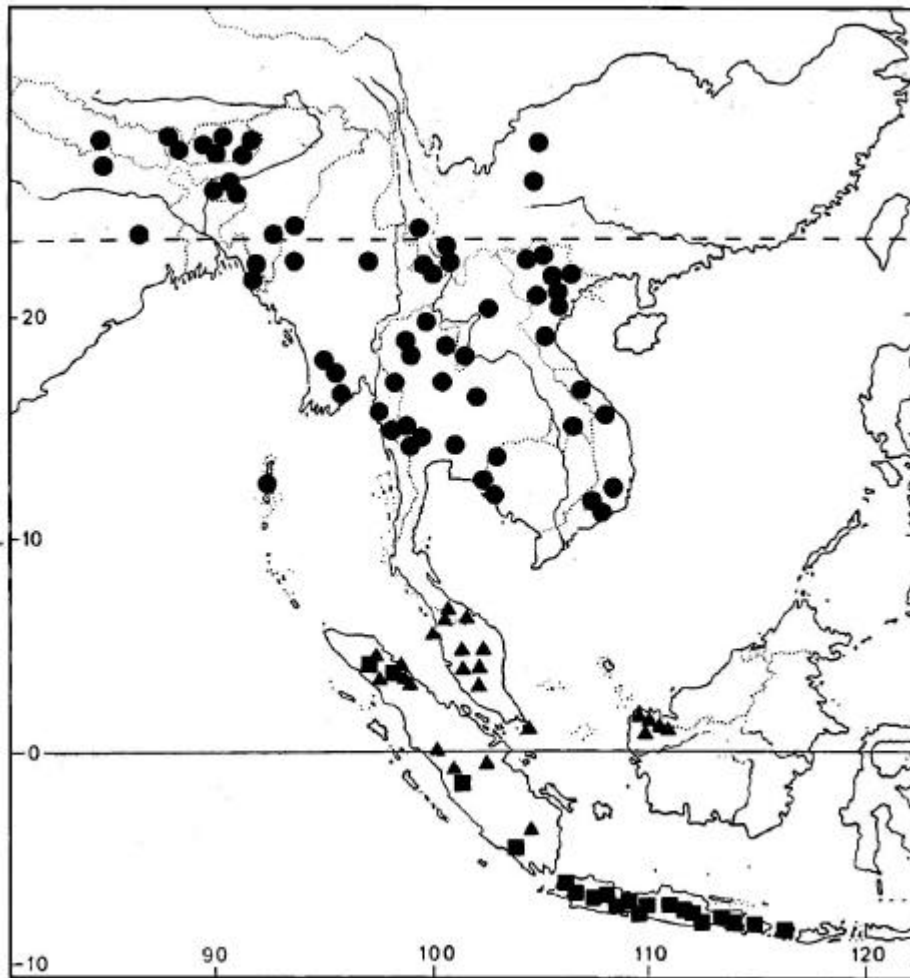
Notes – 1. Clarke's citation of specimens for his variety *T. palmata* var. *cheirantha* comprises 2 taxa: of these, only Wallich 4925 and that of Sir. W. Morris from Penang are conspecific with *T. burckii*, whilst the remainder belong to *T. palmata*. Since he has used the name *cheirantha* which has been written on the Wallich sheet, this is chosen as the lectotype. Boerlage (1887) does not cite the Wallich specimen, but includes the variety in the synonymy of his new species. Ridley (1922) apparently overlooked Kuntze's (1891) work on the species and repeated his combination. The only known Burck specimen is at Bogor, but as Boerlage published this species prior to visiting Bogor it is probable a specimen exists in Europe, though this has not been traced.

2. The remarkable leaf shape, with a basal webbing like a duck's foot and lanceolate lobes, is a constant feature of adult specimens of this species, but a variable feature of *T. palmata*. This has led to understandable confusion in the past (Clarke, 1879; Grushvitzky et al., 1984). Juvenile specimens of *T. burckii* have palmately lobed leaves in which the lobes are not narrowed to petiolules, but these do not occur in full-grown plants. The inflorescence is less branched compared to *T. palmata*, although again this character is somewhat variable. The petals of this species remain fused, except near the base, falling as a calyptra; in *T. palmata* the petals are only partly fused, and open as an irregular corolla, with some petals fused into pairs or triplets.

3. Corner (1952) states that the species (as *T. cheirantha*) is not recorded south of Malacca in Peninsular Malaysia. Whilst it is true that there are no collections from Johore, there is a collection from Singapore dating from 1899 (Ridley s.n.) although it is possible that this was introduced, as the specimen in the Singapore Botanic Gardens most probably is.



**Fig. 1.** Pollen grains: SEM of whole grains and surface details of same grains (Scale bars a, c, e = 10  $\mu$ m; b, d, f = 1  $\mu$ m). a & b. air dried grain of *T. burckii* Boerl.; c & d. acetolysed grains from the same sample (cultivated tree in Singapore Botanic Gardens, March 1995); e & f. acetolysed grain of *T. lateospina* Jebb (Garrett 779, K, Type).



**Map 2.** Map showing distribution of *Trevesia burckii* Boerl. ♦, *T. palmata* (Roxb. ex Lindl.) Vis. ●, *T. sundaica* Miq. ■.

**Collections – SUMATRA.** Province unknown, Poentian, *Jacobson* 2343 (BO); Tenang Baru, Rimbo Pari Mulyati, *Rahayu & Maskuri* 389 (BO, K). – ACEH: NE 03° 5' 97° 25', Kloët, *de Wilde & de Wilde-Duyffes* 19836 (L); 20 km NW Tapaktuan, *de Wilde & de Wilde-Duyffes* 20815 (L); 50 km S of Kutacane, G. Leuser range, *de Wilde & de Wilde-Duyffes* 18463 (BO, K). – SUMATERA UTARA: Sibolangit *Lorzing* 3997 (BO), 5658 (BO, U), 5858 (BO), 12073 (BO, K); Balimbangan, *Lorzing* 11352 (BO), 16791 (BO); Hoeta Bagasan, *Bartlett* 6780 (US); Asahan, Silo Maradja, *Bartlett* 7184 (US), *Bartlett & Rue* 32 (GH), 46 (US); Asahan, Bandar Pulu, *Yates* 1649 (A, BO, SING); Asahan, Hoeta Bagasan, *Rahmat si Boeea* 6477 (A, SING), 6780 (A); Tinggi Rajah, *Lorzing* 17030 (BO); Tapianoeli, Aek Roppak, nr. Hoeta Imbaroe, *Rahmat si Boeea* 4765 (A, US); Tapianoeli, Sopsopan, Aek Si Olip, *Rahmat Si Boeea* 5048 (A, US), 5083 (A), 5443 (A). RIAU: Badjalinggi, Tebingtinggi, *Lorzing* 7379 (BO); SE 00° 48' 102° 31' Tigapuluh Mts., 15 km SW Talanglakat, *Burley* 1718 (A, BO, KEP); SE 00° 46' 102° 32', Tigapuluh Mts., *Burley* 1753 (A, SING). – SUMATERA BARAT: Ajer Mantjoer, *Beccari* 520 (K); Mt. Ophir, *Binnemeijer* 550 (BO); Halabam, *Burck* 1883 (Type). – SUMATERA SELATAN: Palembang, *de Voort* 1525 (BO).

THAILAND – PENINSULAR: Narathiwat, Waeng, *ESS 265* (BKF); Songkhla, Boriphat waterfall, Ampoe Ratapoom, *Congdon & Hamilton 95* (A).

PENINSULAR MALAYSIA: Locality uncertain, *Norris s.n.* (GH). – PENANG, *Wallich 4925* (Type of *T. cheirantha*); Ulu Sungai, Jeram Perahu, *Shah & Noor 1968* (KEP, SING); Kemaman, Kajang, Sungai Ayam, 5/11/35, *Corner s.n.* (KEP), Penara Bukit, 12/1895, *Ridley s.n.* (SING). – KEDAH: Relau, Bukit ulu Jawe, *Baba 21492* (A, K), *Henderson 21492* (KEP). – PERAK: June 1888, *Wray 2322* (A, SING); Larut, *King's colls 4435* (SING), 6715 (K, U, US); Tandjong Rambutan, *Henderson 23776* (FHO, SING); Maxwell's hill, *Whitmore 12893* (K, KEP, SING); Kuala Kangsar, Piah F.R., *Ismail 104859* (K, KEP, SING), *Corner 31675* (SING); Lulok Merbok, *Hewitt 15959* (SING); Buta Tegoh, *Henderson 10064* (SING); Batang Padang, *Henderson 10865* (SING); K. Temengor, *Chelliah 98676* (KEP). – KELANTAN: Kwala Aring, *Yapp 99* (K); Channing, *Ridley 2/2/17* (K); Kampong Parit, *Haniff 10229* (SING). – TERENGGANU: G. Padang, *Whitmore 12613* (K, KEP); Ulu Telemong, Bt. Rambai, *Loh 13416* (K, KEP); Bukit Langut F.R., *Suppiah 11833* (KEP). – SELANGOR: NE 03° 12' 101° 35' Gombak, *Worthington 13239* (L); Kepong, FRIM, *Abdullah & Millard 402* (A, KEP, SINU), *Ogata 10402* (L), *Mabberley & Loh 1569* (FHO, KEP), *Othman 30109* (KEP), *Wyatt 60833* (KEP); Kepong, Sungeh Krah, Bt. Lagong F.R., *Sinclair 7934* (E), *Putz 23654* (KEP); 13th Mile Ginting-Simpah Rd. *Kochummen 16264* (K, KEP, L); Klang Gates, *Ridley 2/1/1921* (K); Kuala Lumpur Caves, *Ridley 316* (SING); Batu Caves, 12/1896, *Ridley s.n.* (SING); Kuala Lumpur, Weld Hill, *Hamid 1264* (KEP), 2870 (KEP); Ulu Gombak FR, *Ahmad 94294* (KEP); Ulu Langat power station, *Symington 51702* (KEP), *Whitmore 15125* (KEP). – PAHANG: Taman Negara, *van Balgooy 2590* (AAU, L), *Chan 23841* (A, KEP, L), *Shah 2648* (A, KEP); Ulu Sungai Sat, *Shah & Noor 1872* (A, KEP, SING); Ulu Sungai Sepia, Jeram Perahu, *Shah & Noor 1968* (A); Kuala Tembeling, 7/1891, *Ridley s.n.* (SING); Raub dist., Batu Talau, *Burkill & Haniff 16996* (SING), Gali, *Burkill & Haniff 16208* (SING); S.Telom, 2/9/1930, *Kiah 24029* (SING); Sungei Yeh, *Henderson 11124* (SING), *Henderson 11406* (SING); Fraser's Hill *Keng 26* (SINU), *Wee et al. 13* (SINU); Ialian river, 8/1891, *Ridley 2440* (BM n.v., SING). – NEGRI SEMBILAN: Poko Tapak Rinau, *Alvins 877* (SING); Ka Kaboo, *Goodenough s.n.* (SING). – MALACCA, Lubok Kadoudang, 6/1892, *Ridley s.n.* (SING).

SINGAPORE. Bedok, 1899, *Ridley s.n.* (SING); Botanic Gardens Jungle, *Keng 415* (SINU), *Kassim s.n.* (SINU).

BORNEO – SARAWAK. locality uncertain, *Sarawak Museum 2662* (A, US), *Sarawak Nat. Colls 86* (K). Kuching, Mt.Poi, *Hewitt 100* (BO, K); Pedawan rd., *Andersen 12538* (K); Tiang Bukap, on Padawan Rd. about 1/4 km S of village, *Frodin et al. 2108* (F, SAR); Tebakang, Bt. Alak, *Awa & Paie 45637* (K); Tebakang, Bt. Rawan, *Awa & Paie 45250* (K); Lundu, G. Gadin, *Clemens 22192* (A, K); G. Lundu, 8/1912, *Anderson 127* (SING). – KALIMANTAN BARAT, Pontianak, Madamang, Bentiang, *Shea 23805* (BO, K); NE 00° 52' 100° 26' G. Bentuang, 150 km NE of Pontianak *Burley et al. 2367* (A), 2964 (A).

#### 4. *Trevesia lateospina* Jebb, *spec. nov.* – Fig. 2.

Arbor circa 2.5 m altus, trunco aculeato, setosus crispus longus investus. Folia palmatifida lobis (6–) 9–13, incisus profunde, petiolo superne parce breviter setosa investe, stipulae clypeolae 2–5.5 cm longae, coriaceae. Inflorescentia ad 28 cm longa, setosus longus, umbellae pauce, bracteae ad 2.5 cm longa in alabastro flores superantes. Petala 6–7, liber non calyprata. Ovarii loculi 6. Fig. 2. Typus: *Garrett 779* (holotypus K; isotypus K, L), Thailand, Northern division, Doi Hua Mot, Hui Ton Nan drainage, 1,200–1,260 m, 24th May 1933.

Tree to 2.5 m, girth 8 cm; possibly not, or rarely, branched. Stem apex 2–3 cm thick; with scattered, stout spines, especially on lower part of internode, these conical, to 2 cm long; indumentum reddish-brown, of two types, a short scurfy pubescence of irregularly branched hairs, and setose hairs up to 2 cm long with thickened bases tapering rapidly to irregular sinuous, coiling and forking thread-like endings, both forms dense on stem innovations, petiole bases and stipules, but becoming worn, obscuring spines. Leaves palmately lobed, more or less rounded, 30–90 cm across, base truncate to narrowly cordate; lobes (6–)9–13, deeply dissected, sinus to within 2.5–9 cm of petiole, narrowly lanceolate, slightly ovate to obovate, 15 x 2.3 – 36 x 5 cm, apex acute-acuminate, base ca. 1/3 the width of the broadest point of lobe; midribs equally prominent above and below, distinct to very apex; veins ca. 9–12 pairs, arising obtusely (70°) and curving towards apex, ±longitudinal near margin; margin serrulate

in upper 4/5 of lobes; indumentum of irregularly branched hairs 0.1–0.2 mm across, near major veins, becoming dot-like markings to 0.1 mm across elsewhere on lower lamina. Petiole 4.5–36 x 0.5 cm, with coarse setose bristles near base and near junction with lamina; sheath short, 1–1.5 cm long, stipule developing into a broad, flattened, shield-like base, 2 x 1 – 5.5 x 3 cm, with 2 prominent ribs, and an irregularly serrate margin, coriaceous to woody near centre, papery and brittle at margin, apex bifid or trifid, with dense, coarse, setose hairs towards the centre. Inflorescence terminal; 15–30 cm long; bearing a single large terminal umbel and up to 2 lateral umbels; bracts triangular to 3 cm long; indumentum of hairs and setose bristles to 1.5 cm long, dense, persistent, on bracts, peduncle base and apices, scattered elsewhere. Umbels with ca. 50 flowers, in bud these sessile, densely packed, to 3 cm across overtopped by bracts, at anthesis to 9.5 cm across; pedicels 3 to 4.5 cm; bracts triangular 10 x 3 – 25 x 6 mm, leathery, densely pubescent and with setose bristles abaxially, margin dentate-ciliate. Flower receptacle obconical, 6.5 x 5.5 mm; disk flat, stylopodium 2.5 x 1 mm. Calyx lobes shortly triangular, 6–7, to 1.5 mm. Petals 6–7, free, 5 x 2.5 mm. Stamens 6–7; anthers reniform, 3.5 x 2.7 mm; filament to 2 mm. Pollen grains 32–34 µm across; apertures not discerned; brochi 3.3–9 µm, muri 1.9–2.5 µm; margo inconspicuous (Fig. 1: e, f). Locules 6. Fruits unknown.

Ecology – Evergreen forest; 1,100 - 1,260 m. Flowering: May to June.

Distribution – Thailand. Map 1.

Notes – 1. The deeply incised leaves are similar to those of *Trevesia valida*, from which it can be distinguished by the much reduced inflorescence, the large triangular bracts of the umbel, the abrupt stylopodium and the petals which open and are not calyptrate. The dense setose hairs which clothe the stem and inflorescence are also characteristic, but approached by a few collections of the latter species (i.e. the type of *T. tomentella*). The leaves of *T. lateospina* have up to 13 lobes, whilst *T. valida* usually has no more than 9. The epithet *lateospina* refers to the way in which the large stem spines are hidden by the hairs on the stem.

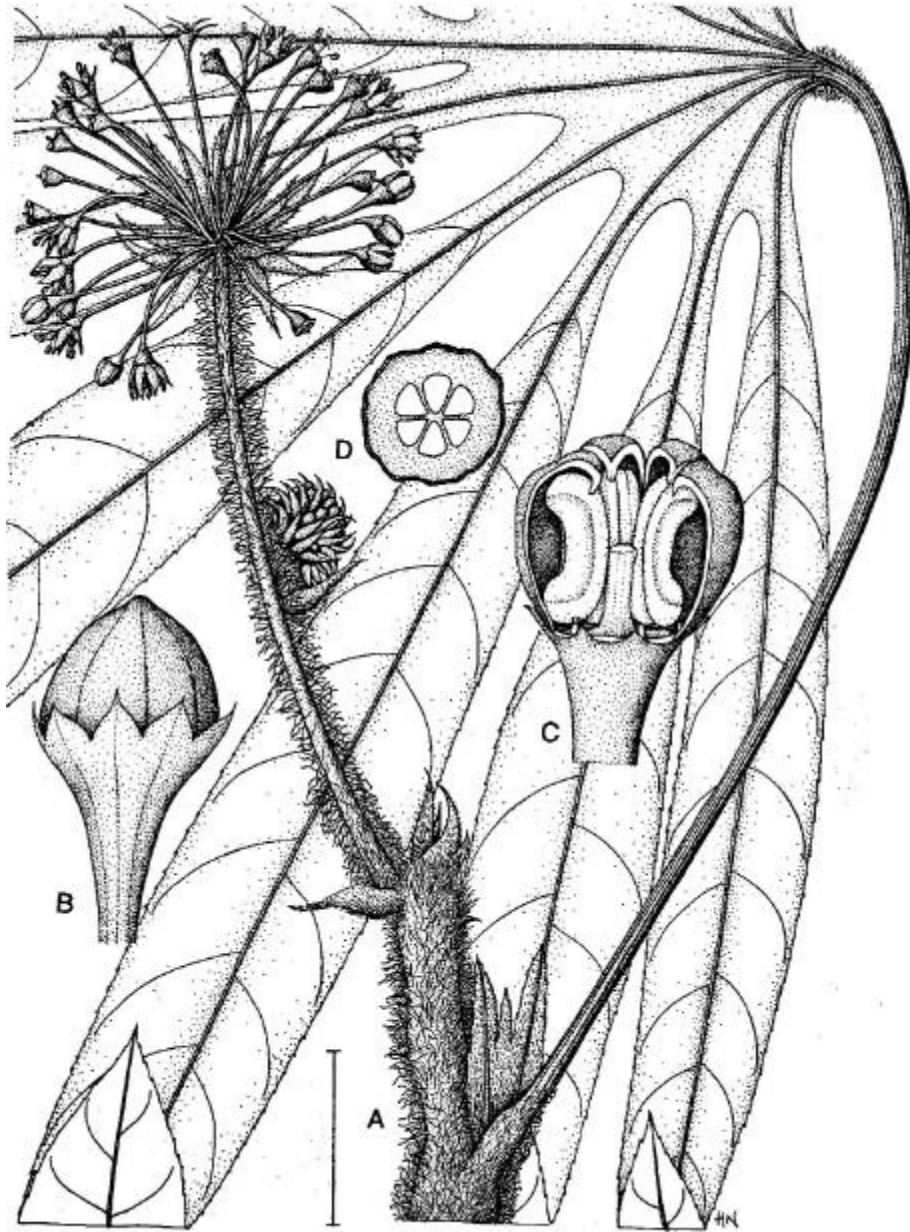
2. As with other species the inflorescence suggests sequential development, with the terminal umbel developing while the lateral umbels remain unexpanded. The implications for breeding ecology remain unknown, although it is possible that different levels of sexual expression occur. Ovules are present in the locules, but in none of the specimens seen is any fruit developed or developing.

Collections – THAILAND. NORTHERN: Doi Hua Mot, *Garrett 779* (Type); Chiang Mai, Doi Lang Gah, Ban Gampang Him, Tep Sedet S/D, Doi Saget, *Maxwell 93-511* (CMU); Lampoon, Doi Kuhn Dahn NP, east side of Doi Kuhn Dahn, Mae Tah, *Maxwell 94-617* (CMU), *Maxwell 94-685* (CMU, L).

##### 5. *Trevesia palmata* (Roxb. ex Lindl.) Vis.

*Trevesia palmata* (Roxb. ex Lindl.) Vis., Mem. Reale Accad. Sci. Torino Ser. 2, 4 (1842) 262; Decne. & Planch., Hort. Donat. (1858) 11; K. Koch., Wochenschrift Gart. Pfl. 2 (1859) 67; Seem., J. Bot. 4 (1866) 353; Kurz, For. Fl. Burma 1 (1877) 539; C. B. Clarke in Hook. f., Fl. Brit. India 2 (1879) 732; Boerl., Ann. Jard. Bot. Buitz. 6 (1887) 108, t. 12: 15; Dunn, J. Linn. Soc. Bot. 39 (1911) 502; R. Vig., in Lecomte, Fl. Gén. Indo-Chine 2 (1923) 1180, f. 140; Rehder, J. Arnold Arbor. 15 (1934) 113; Chun, Sunyatsenia 4 (1940) 247; H. L. Li, Sargentia 2 (1942) 13; G. Hoo & Y. Q. Tseng, Fl. Reip. pop. Sinicae 54 (1978) 10; K. M. Feng & Y. R. Li, Fl. Yunn. 2 (1979) 417, t. 125: 5 - 9; S. S. Chang, Flora Guizhouensis 4 (1989) 295, t. 107. – *Gastonia palmata* Roxb., Hort. Beng. (1814) 33 nomen; Roxb. ex Lindl., Bot. Reg. (1825) t. 894; Roxb., Fl. Ind. 2 (1832) 407. – *Gilibertia palmata* (Roxb. ex Lindl.) A. DC., Prodr. 4 (1830) 256. – *Hedera palmata* Wall. Cat. (1831) no. 4910 A. – Type: *Roxburgh 273* (lectotype, designated here, BM), Bangladesh, Chittagong, cult. at Calcutta Botanic Gardens.

*Hedera ferruginea* auct. non A. DC.: Wall. Cat. (1831) no. 4909.



**Fig. 2.** *Trevesia lateospina* Jebb. b. flower bud; c. 1/2 flower; d. transverse section of ovary. Scale bar; a = 4 cm; b-d = 4 mm. (a. stem & leaf = Garrett 779, inflorescence = Maxwell 94-617 and 94-685; b-d. = Garrett 779). Drawn by Holly Nixon.

- Brassaiopsis confluens* Seem., J. Bot. 2 (1864) 292. – Type: *Wallich 4910 B* p.p. (lectotype, designated here, K-Wall) Nepal.
- Trevesia palmata* var. *cheiranthia* C. B. Clarke, in Hook. f., Fl. Brit. India 2 (1879) 732. partim excl. *T. burckii* Boerl.
- Trevesia palmata* var. *insignis* C. B. Clarke in Hook. f., Fl. Brit. India 2 (1879) 732. – Type: *Griffith 2664* (lectotype, designated here, K), India, Khasia Mts.
- Plerandra jatrophiifolia* Hance, J. Bot. 19 (1881) 275. – Type: *Hance 21682* (BM), Cult. Hong Kong.
- Trevesia palmata* var. *incisa* Boerl., Ann. Jard. Bot. Buitz. 6 (1887) 109. – Syntypes: *Coll. Hort. Bot. Calcutta* (n.v.), *Anderson* (n.v.), India, Sikkim; *Jenkins* (n.v.), India, Assam.
- Plerandropsis bonii* R. Vig., Ann. Sci. Nat. Bot. 9(4) (1906) 134. – Type: *Bon 2160* (P), Vietnam, Tonkin, Dong Han.
- Trevesia cavaleriei* (H. Lév.) Grushv. & Skvortsova, Bot. Zhurn. 69 (8) (1984) 1023; *ibid.*, Novit. Syst. Plant. Vasc. 22 (1985) 156. – *Fatsia cavaleriei* H. Lév., Bull. Acad. Geogr. Bot. 24 (1914) 144. – Type: *Cavalerie 2144* (holotype P; isotype E, merotype A), China, Guizhou, Houa-kiang.
- Trevesia sanderi* hort. Gard. Chron. 3, 53 (1913) 295, f. 126. – Annam.
- Brassaiopsis papayoides* Hand.-Mazz., Akad. Wiss. Wien, Sit math-nat. Kl. 61 (1925) 120; *Sinensia* 7 (1933) 693; H. L. Li, *Sargentia* 2 (1942) 60; G. Hoo & Y. Q. Tseng, Fl. Reip. pop. Sinicae 54 (1978) 24. – Type: *Handel-Mazzetti 5793* (lectotype, designated here, W; isotype WU), China, Yunnan, Manhao nr. border with Tonkin.
- Trevesia palmata* var. *costata* H. L. Li, *Sargentia* 2 (1942) 14; G. Hoo & Y. Q. Tseng, Fl. Reip. pop. Sinicae 54 (1978) 11; K. M. Feng & Y. R. Li, Fl. Yunn. 2 (1979) 418. – Type: *Wang 76004A* (holotype A), China, Yunnan, Fo-Hai.
- Trevesia longipedicellata* Grushv. & Skvortsova, Bot. Zhurn. 69 (8) (1984) 1026, f. 2: 5, 5a, f. 3: 5; *ibid.*, Novit. Syst. Plant. Vasc. 22 (1985) 157. – Type: *Skvortsova, Arnautov & Nguyen tien Ban 310* (holotype LE n.v.; isotype HN n.v.), Vietnam, Vinh phu Province, Tam dao, 500 m, 3 Aug 1976.
- Trevesia longipedicellata* var. *palmatipartita* Grushv. & Skvortsova, Bot. Zhurn. 69 (8) (1984) 1027; *ibid.*, Novit. Syst. Plant. Vasc. 22 (1985) 157. – Type: *Grushvitzky, Arnautov & Pham van Nguyen 162* (holotype LE n.v.; isotype HN n.v.), Vietnam, Ha son binh Province, Tu li, near summit of Mt. Cai, 21 Dec 1969.
- Trevesia sphaerocarpa* Grushv. & Skvortsova, Bot. Zhurn. 69 (8) (1984) 1025; *ibid.*, Novit. Syst. Plant. Vasc. 22 (1985) 156. – Type: *Skvortsova, Arnautov & Pham van Nguyen 015* (holotype LE n.v.; isotype HN n.v.), Vietnam, Son la Province, Moc chau, 1100 m, 3 July 1976.
- Trevesia burckii* auct. non Boerl.: Grushv. & Skvortsova, Bot. Zhurn. 69 (8) (1984) 1024.

Tree to 8 m, DBH 10–12 cm; little branched, and then branching from near base. Stems with few scattered stout spines 2–3 mm long; bark grey; indumentum sparse to dense, of irregularly branched reddish-brown hairs. Leaves polymorphic; more or less circular in outline; 30 to 90 cm across; base broadly cordate; lobes (1–) 5–10, entire and simple in juvenile plants, palmate in older plants, either simple, lanceolate to elliptic with sinuses extending ca. 1/2 way to leaf base, or variously dissected, from incised to lacerate to lacinate or squarrose-lacinate, occasionally constricted to midribs, forming petiolules with base of lamina webbed between midrib bases and ‘leaflets’ either simple ovate, or variously dissected; apices acuminate; margin serrate; papery to coriaceous; indumentum of peltate or irregularly branched hairs 0.1–0.3 mm across, dense on midribs and major veins. Petiole 20 x 0.3 – 90 x 1 cm; smooth or thorned throughout or only near base and at apex; stipular ligules to 2 cm. Inflorescence a panicle; terminal or axillary; to 60 cm overall; secondary branches usually bearing a terminal umbel and a pair of sub-opposite umbels at their mid-point; bracts triangular, acuminate to 3 cm long, shortly persistent, densely pubescent, occasionally with strigose bristle-like spines 1–2 mm long; indumentum of irregularly stellate hairs to 0.1 mm across, dense. Umbels 25–65-flowered; 6–10 cm across; pedicels 2–4 cm; bracts 0.2–1 cm, narrow triangular, serrate, pale brown or whitish. Flower receptacle campanulate to turbinate, 6 x 6 – 9 x 9 mm; disk flat to domed, stylopodium 2 x 1 – 4 x 1 mm, capitate. Calyx dentate, the teeth as many as petals, acuminate, to 1 mm long. Petals 8–10 (–12), 5 x 1.6 – 8 x 2.5 mm; partly fused, at least some petals, sometimes all, as pairs or triplets, never wholly calyptrate. Stamens 8–10; anthers 2 x 1.5 – 3 x 2.5 mm; filaments 4–6 mm. Pollen grains 25.7–32.4 µm; colpus 13.6 µm long;



brochi 1.5–2.7  $\mu\text{m}$ , muri 0.6–0.9  $\mu\text{m}$ ; margo to 1.5  $\mu\text{m}$  across. Locules 8–12. Fruits spherical to 2.3 cm across, stylopodium persistent and prominent.

Ecology – Evergreen forest; 250 - 1,500 m.

Distribution – India (incl. Andaman Is.), Nepal, Bhutan, Bangladesh, Burma, China, Thailand, Laos, Cambodia, Vietnam. Map 2.

Notes – 1. *Hortus bengalensis* (Roxburgh, 1814) cites ‘Mr. J. R.’ as the collector of *Gastonia palmata* in Chittagong in 1810. The plant was then grown in the Calcutta Botanic Gardens, and finally described in *Flora Indica* from these cultivated specimens. However in the meantime Lindley’s *Botanical Register* had printed a plate of the species. At the British Museum there are 3 collections of Roxburgh material. Only one sheet bears the number 273, and this has been selected as the lectotype.

2. In the Wallich collection at Kew (K-Wall), *T. palmata* occurs under the numbers 4909 and 4910. Sheet number 4909 comprises a specimen of *T. palmata* and bears the unpublished name *Hedera ferruginea*. Wallich’s 4910 collection comprises 5 sheets with elements of *T. palmata* and 2 species of *Brassaiaopsis*:

4910<sup>A</sup> comprises a leaf and inflorescence fragments of *T. palmata* collected from Jalpaiguri in N. Bengal, and from Nepal; the specimen is annotated “*Hedera palmata* Wall. *Gastonia palmata* Hb. Ham.”.

4910<sup>B</sup> consists of 2 sheets, one of which is labelled “*Hedera confluens* Wall.” and comprises: a flowering stem apex of *Brassaiaopsis ficifolia* Dunn; a small detached leaf of *T. palmata*; and a larger inflorescence, probably of *B. floribunda* Seem. The second sheet of 4910<sup>B</sup> has been annotated by C. B. Clarke, and comprises a single large leaf and a detached umbel of *T. palmata*; and a stem with a single umbel of *Brassaiaopsis*, probably *B. floribunda* again, although C. B. Clarke has determined this as *B. hainla* (Buch.-Ham. ex D. Don) Seem. In his description of *B. confluens*, Seeman pointed out that the collection comprised 3 elements, including *Trevesia* and another species of *Brassaiaopsis*; this undoubtedly refers to the smaller leaf on the first sheet, and the flowering twig of *B. ficifolia* respectively. He based his *B. confluens* on the remaining parts, citing the palmate and bipinnatifid leaves. Since the leaf is the main diagnostic character for his species, the single large leaf on the second sheet, is selected as the lectotype of *B. confluens* Seem., which thereby becomes a synonym of *T. palmata*, the detached inflorescence and stem of *B. floribunda* are the remaining elements of this sheet.

4910<sup>C</sup> consists of a leaf and 3 fragments of inflorescence of *T. palmata*. The leaf is simple palmatifid, the lobes elliptic with serrated margins, although some are distorted and unformed.

4910<sup>D</sup> comprises a large leaf of *T. palmata* with jagged, lacinate lobes, and 2 fragments of inflorescence.

3. The types of *Plerandra jatrophiifolia*, *Plerandropsis bonii* and *Fatsia cavaleriei* are all specimens of *Trevesia palmata*. Handel-Mazzetti’s types are deposited in both W and WU, the specimen at his home institution (W) is selected as the lectotype of *T. papayoides*. None of the three specimens mentioned by Boerlage (1887) as representing his new variety *incisa* have been seen. The horticultural varieties ‘sanderi’ and ‘micholitzii’ have been discussed by Frodin (1992), although the latter has not been formerly published.

4. Clarke in the *Flora of British India* (1879) erroneously reduced *Trevesia insignis* Miq. to a variety of this species (var. *insignis*); this is in fact a species of *Osmoxylon*. In addition Clarke described a variety (var. *cheirantha*), which was based on specimens of *T. palmata* and *T. burckii*. This was raised to specific status by a succession of authors: *T. burckii* Boerl., and *T. cheirantha* of both Kuntze (1891) and Ridley (1922). Subsequent authors (Grushvitzky et al., 1984) have extended the use of the name *T. burckii* to cover specimens of *T. palmata* which exhibit the remarkable webbed leaf-base. It is apparent from field observations that the

diversity exhibited by *T. palmata* is rather great, and somewhat plastic within individuals, these are well illustrated in Feng & Li (1979, p. 416, f. 125). *T. burckii* on the other hand never exhibits further dissection of the leaflets, which are only finely serrated at most. The inflorescence of *T. burckii* is more reduced compared to *T. palmata*, the present species tends to have subsidiary umbels on secondary branches of the inflorescence. The petals of *T. palmata* are not fused into a calyptra, but instead are only partially fused, opening as single petals, pairs or triplets, whilst in *T. burckii* the entire corolla falls as a calyptra. The two species do not overlap in their geographic ranges (Map 1 & 2).

5. The types of *T. sphaerocarpa*, *T. longipedicellata* and its variety *palmatipartita* could not be borrowed, and have therefore not been seen. However specimens cited by the authors in the original publication (*Pételot 7838* = *T. sphaerocarpa*) or annotated by them (*Henry 11575* (A) & *Wang 76744* (A) both = *T. sphaerocarpa*; *Dickason 7676* = *T. longipedicellata* var. *palmatipartita*) have been seen. The Henry and Wang specimens have pinnatifid dissections of the lobes, while the fruits are somewhat intermediate between the illustrations of the fruits of *T. cavaleriei* and *T. longipedicellata* (Grushvitzky et al. 1984). *T. longipedicellata* var. *palmatipartita* combines the palmate leaf (*T. palmata* sensu Grushv. & Skvorsova) with the long stylopodium and flat-topped ovary of *T. longipedicellata*. Examination of *T. palmata* in northern Thailand shows that the leaf forms used by Grushvitzky et al. (1984) to distinguish species can be found in single populations. The marked differences in the pollen grains of *T. lateospina* and *T. sphaerocarpa*, when compared to *T. palmata*, however, is of note (Grushvitzky et al. 1984; Pl. 5).

6. At Kew, there is a Hooker specimen (*Hooker 537*) which has been annotated "Type of *T. palmata* var. *echinata*", but no literature reference has been traced.

Collections – Country/Locality uncertain: Herb. J. S. Mill s.n. (GH).

NEPAL: Yolngori, *Hamilton 994* (E); Mechi zone, Jhapa district, Katmandu, *Nicolson 3309* (US); Buri Bandaki, *Stainton 8783* (E); Churia Hills, Chitawan, *Troth 906* (US); N. of Betiyah, *Hutter 382* (K); *Wallich 4910B* (K-Wall).

INDIA: Ramnagar hills, *Haines 4810* (K); Sikkim, 1-3000', *Hooker s.n.* (GH, K, TCD, U), *Treuther s.n.* (K), *King 1893* (US), *King's colls 1887* (P, U), *Gamble 3055* (K); Rishap, Sikkim, *Clarke 13975* (K); Darjeeling, *Clarke 12073* (US), *Cowan s.n.* (E); Darjeeling, Chibla Khola, *Gamble 687* (A, K); N. Bengal, Jalpaiguri, *Wallich 4910A* (K-Wall); Assam: Khasia, s.n. 3/1850 (L); Khasia, 2-3000', *Hooker & Thompson 531* (K), *Griffith 2664* (Type of *T. palmata* var. *insignis*); Assam, Charduar/Bhorelli, *Yandall 77* (K); Assam, Garo Hills, Tura Mt., *Koelz 24382* (L); Garo Hills, *Rongrengiri 43041* (crayon rubbing ex B @ A); Nagni Mora, Deko valley, s.n. 11116 (A); Manipur, *Watt 7261* (E); Lushai hills, Kawhtebel, *Parry 595* (K); South Lushai hills, nr. Demagiri, *Gage 222* (A); Calcutta Botanic Gardens, *Gaudichaud 552* (P); Silhet, *Wallich 4910D* (K-Wall).

BHUTAN: Sontongkung, *Cave 10/2/1912* (E); Chamokdangi Tarai, *Cave 16/4/1912* (E); Mirichana, *Cooper 3774* (BM, E); Sarbhang dist., Jhogi Dhanra, *Grierson & Long 3563* (E); *Grierson & Long 2342* (E); Zimgang, *Grierson & Long 1975* (E, K); Banjormani, Mangde Chu, Tongsa, *Grierson & Long 4325* (E); Gaylegphug, Aie Bridge, *Grierson & Long 3919* (E)

BANGLADESH: Chittagong, *Clarke 20252* (BO), *Hooker 537* (K), *Heinig 5* (E), *Roxburgh 273* (Type of *T. palmata*); Karnaphulei, *Tixier 101* (P); Sax-bz, *Tixier 162* (P).

ANDAMANS: *Helper 2662* (K).

BURMA: Zokhua (Haka), *Dickason 7676* (A, L); Taping valley, N 24° 25', *Forrest 13693* (E, K); Mohikabaw Chg. to Kattawlaw, Thaungyin valley, *Lace 4657* (E); Maymyo Plateau, *Lace 6156* (ABD, E); Irawadi R., *Cubitt 345* (E); Pegu Yomah, *Kurz 3/1868* (BO); Pegu, *Forester s.n.* (US); Chanyza, Tenasserim, *Gallatly 595* (US); Rangoon, *McClelland s.n.* (K).

CHINA: – YUNNAN: localities uncertain; *Gamble 725* (K), *Henry 11904* (US), *Bonns d'Anty 302* (P); Longki, *Delavay s.n.* (P); Poneshee, *Anderson 3/1868* (K); Manhao nr. border with Tonkin, *Handel-Mazzetti 5793* (Type of *Brassaiopsis papayoides*); Szemai, *Henry 11757* (A, E, K); Yentai, Turking, *Henry 13805* (K); between Muang Hun and Muong Hai, *Rock 2395* (A), *Rock 2398* (A), *Rock 2402* (A); between Hsinfu and Kuan ni, Papienho river, *Rock 2949* (A); Dah-meng-lung, Che-li Hsien, *Wang 77895* (A); Fo-Hai, *Wang 74910* (A), *Wang 76004* (Type of *Trevesia palmata* var. *costata*); Lan-Tsang Hsien,

Wang 76520 (A), Wang 76594 (A), Wang 76744 (A); Shunning, Lomawe, Yu 15899 (A, E). – GUIZHOU: Houa-kiang, *Cavalerie* 2144 (Type of *Fatsia cavalerie*), *Cavalerie* s.n. (P); Wong-moo, Chenfeng, *Teng* 90994 (A);

HONG KONG: Cult. Bot. Gard., *Merrill* s.n. (A), *Hance* 21682 (BM).

FORMOSA: Ile Formosa, Hanoi cult., *Alleizette* (P).

THAILAND: – NORTHERN: Chiang Mai, Huoy Om Paa, *Winit* 202 (K); Khao Awn, *Kerr* 4723 (ABD, BM, K); Doi Sutep, *Maxwell* 89-75 (AAU, K). Chiang Dao, Doi Chiang Dao, *Bjornland* 567 (C), *Bjornland* 726 (BKF, C), *Santisuk* 6950 (BKF). Chiang Rai, Li Pa, *Anderson* 5330 (A). Tak, Doi Pae Poe, 90 km NW of Tak, *Hansen & Smitinand* 12914 (AAU, BKF, C, E, K, L, P). Sukhothai, *Maxwell* 72-96 (AAU). Phitsanulok, Thoung Saleng Louang, *Vidal* 4574 (P). – EASTERN: Chaiyapum, Pu Kio, *Kerr* 20270 (ABD, BM, K, TCD). – SOUTH-WESTERN: Utai Thani, Ban Rai, *van Beusekom* 2899 (AAU, BKF, L). Kanchanaburi, Saung Ka Lia, Kwae Noi river, *Kostermans* 434 (A, BO, K, L), *Kostermans* 517 (P); Muang Fang, nr. Burma border 800 m, *Kostermans* 162 (BO); Sai Yok, *Larsen & Smitinand* 9220 (BKF, C, P). – SOUTH-EASTERN: Chanthaburi, Doi Soi Dao, *Geesink* 6710 (BKF, K, L); Kao Sabap, *Kerr* 17998 (BM, E, K, TCD); Pong Nam Ron, *Smitinand* 5467 (K). Meiolek, *Marcan* 832 (A).

LAOS: Luang Phrabang, *Pételot* 30/12/48 (A); Luang Phrabang, Ph10, *Pedrono* 68 (P); Mekong, *Thorel* 3309 (P), *Thorel* s.n. (US); Paklai, *Thorel* s.n. (US); Attopeu, *Pierre* 1716 (P), *Harrard* (P); Phou Phing, *Poilane* 20252 (P), 20286 (P); Khim Muok, Luang Prabang, *Vidal* 751 (P); Nan Phoun, Pak Lai, Syabouri, *Vidal* 2145 (P).

CAMBODIA: Samrong prov., Sal, *Pierre* 953 (P), *Pierre* s.n. (P), *Pierre* 994 (BO); Phnom Chom Prov., *Poilane* 28724, 31450 (P).

VIETNAM: Blau, Phung 2000 (P); Hoi Xay, Lai Chau, *Poilane* 25795 (P); Tonkin, *Balansa* 1364, 3451, 3452, 3465 (P), *Chevalier* 32451 (P), *Fleury* 37793 (P), *Pierre* 3/1877 (E); Tonkin, Dong Ham, *Bon* 2160 (Type of *Plerandropsis bonii*); Tonkin, Moc Chau, Sonla, *Pételot* 7838 (A, P); Gây du Loang, *Poilane* 1268 (K, P); Annam, *Fleury* 32451 (P), *Poilane* 24528 (P); Ninh Binh, Cuc Phuang, *Pocs & Tiep* 69 (P); Annam, Braiaiu, *Poilane* 24067 (P); Annam, Dang Che, *Poilane* 11289 (P); Annam, Quang Tri Prov., *Poilane* 1368 (K); Annam, Col d'Ailao de Quantri, *Poilane* 24865 (P); Annam, Lang Bian, *Chevalier* 31260 (P), *Chevalier* 40550 (P); Annam, Ka Rom prov., *Poilane* 9973 (P), 9982 (P); Saigon Bot. Gdns., *Chevalier* 676 (P).

## 6. *Trevesia sundaica* Miq.

*Trevesia sundaica* Miq., Pl. Jungh. 4 (1855) 420; Miq., Fl. Ind. Bat. 1 (1856) 747; de Vriese, Pl. Ind. bat. orient. (1857) 81; Miq., Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 11; Boerl., Ann. Jard. Bot. Buitz. 6 (1887) 111, t. 12: 16; Boerl., Handl. fl. Ned. Ind. 1 (1890) 649; Koord., Exk. Fl. Java 2 (1912) 710; Fl. Tjib. 2 (1923) 222; Backer & Bakh. f., Fl. Java 2 (1965) 163; Philipson, Fl. Mal. ser. 1, 9 (1979) 99, f. 36. – *Gastonia sundaica* (Miq.) Baill., Hist. Pl. 7 (1879) 161, f. 202. – *Actinophyllum palmatum* Bl. ex Boerl. in Ann. Jard. Bot. Buitz. 6 (1887) 111 in synonym. – *Brassaia palmata* Nob. ex Decne. & Planch. in Rev. Hort. Ser. 4, 3 (1854) 106 in synonym. – *Aralia reinwardtiana* Steud. Nomencl. bot., 1 (1840) 118 nomen. – *Sciadaphyllum palmatum* Bl., Bijdr. (1826) 875; A. DC., Prodr. 4 (1830) 259 (sphalm. *Sciadaphyllum*). – *Aralia palmata* Reinw. ex Bl. (non Lam. Encycl. 1 (1783) 224, nec Lour. Fl. Cochinch. (1790) 187) Cat. Btzg. (1823) 43, nomen; Reinw. ex de Vriese, Pl. Ind. bat. orient. (1857) 82, nomen in synonym. – Type: Reinwardt s.n. H.L.B. 898,126-295 (lectotype, designated here, L).

Shrubby tree to 10 m, often developing multiple trunks; well-branched; trunks at first erect, later reclining to drooping and then sometimes rooting near apex. Bark with short, thickset spines, to 0.6 cm, these becoming worn and scattered on older trunk; innovations with indumentum of dense reddish-brown hairs occasionally with stiff, setose hairs; grey. Leaves palmately lobed, rounded in outline, to 60 cm across; base deeply cordate, in some cases the most basal lobes overlapping above petiole; lobes 8–11 (–13), elliptic to obovate, pinnate, incised or lacinate, or very constricted at base, 10 x 6 – 22 x 11 cm; apex acuminate or rounded, occasionally emarginate; sinuses 1/2 to 2/3 depth of lamina; margin sub-entire to serrate; indumentum of irregular branched hairs 0.1–0.2 mm near to veins, elsewhere closely appressed, dot-like, < 0.1 mm across. Petiole to 70 cm long, sparsely prickled or smooth; basal sheath to 2 cm long; stipular ligules to 1 cm long, papery. Inflorescence lateral, arising among or somewhat below leaves; rachis 3 to 12 cm long, bearing 3–12 secondary axes, each

3–27 cm long, and bearing a single, terminal umbel. Umbels 20–35-flowered; 3.5–10 cm across; pedicels 1.5–5.5 cm long, slender to very thickset, 1–5 mm in diameter; bracts triangular, to 4 mm long. Flower receptacle broadly turbinate to campanulate, 4 x 8 – 10 x 12 mm; disk domed; stylopodium conical, 2.5 x 1.5 – 4 x 2.5 mm. Calyx an irregular ring with acuminate teeth to 0.5 mm. Petals 8–12, fused into a calyptra, hemispherical, to 6.5 x 6.5 mm. Stamens 8–12; anthers ovate, 3.5 x 2 mm; filaments 2 mm long. Pollen grains 27–31.4 µm; colpi 14.1 x 3.9 µm; brochi 1.5–5.9 µm, muri 0.6–1.6 µm; margo 1.6–3 µm across (Fig. 3: a, b). Locules 8–10. Fruit globose, to 1.5 cm across.

Ecology – Evergreen forest 200 - 1,500 m; flowering June to December.

Distribution – Sumatra, Java, Bali, Lombok. Map 2.

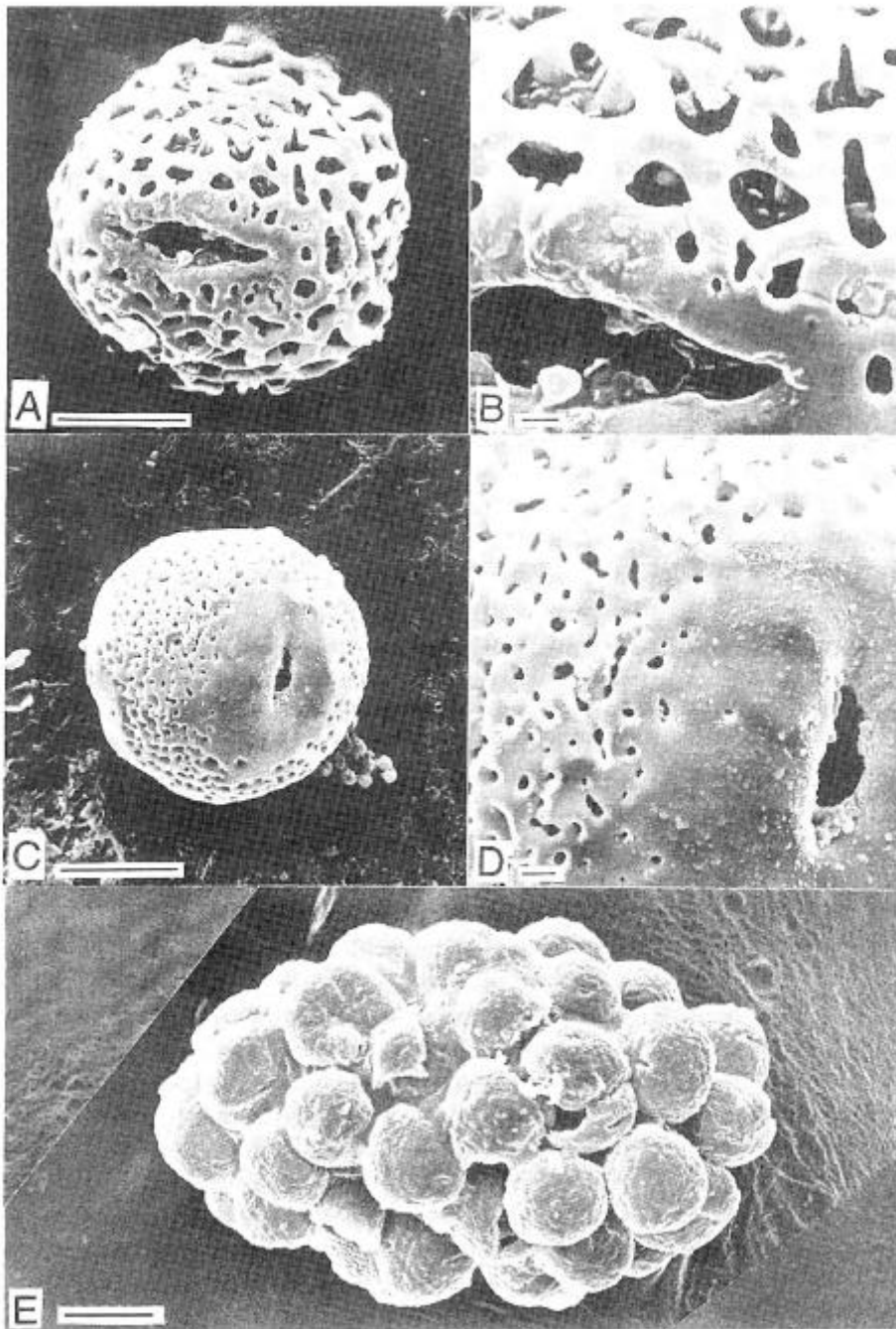
Notes – 1. The first reference to this species is in Blume's *Catalogus* (1823), where he cites *Aralia palmata*, crediting it to Reinwardt. This was, historically, the third usage of the binomial, the previous names applying to a species of *Osmoxylon* and *Brassaiopsis* respectively. Blume legitimised the name, in *Sciodaphyllum*, in his *Bijdragen* (1826). In transferring the name to *Trevesia*, the epithet becomes a homonym, and Miquel therefore renamed it *T. sundaica*.

2. At Leiden there are two sheets from Reinwardt's herbarium, one of which (H.L.B. 898.126-294) is annotated as 'Aralia palmata', although this sheet comprises a leaf alone. A second Reinwardt sheet (898.126-295) comprises a smaller leaf and a fragment of an inflorescence. Since Blume originally based the name on Reinwardt's material, these sheets comprise the type, and the sheet with fertile material (H.L.B. 898.126-295) is selected as the lectotype.

3. Like *T. palmata*, this species has very variable leaves, from obovate to deeply incised lobes, in some specimens the lobe bases may be narrowly constricted. It differs from *T. palmata* in that the leaves usually have a greater number of lobes, the inflorescence does not have as many branches, and the secondary peduncles usually only bear a single umbel, and the corolla is always calyptrate. In Sumatra it can be distinguished from *T. burckii* by the thick pedicels, which in the latter are more slender.

Collections – SUMATRA. locality uncertain, *Bünnemeijer 21* (BO). – SUMATERA UTARA: Sibolangit, *Nur 7385* (BO). – SUMATERA BARAT: G. Korinchi, *Bünnemeijer 9512* (BO). – SUMATERA SELATAN: Banding Agoeng, Palembang, *van Steenis 3274* (BO).

JAVA. G. Paniis, *Backer 10118* (BO), Wanajasa, *Backhuizen van den Brink 4748* (BO), Blume P, Soemanding, *Dagiman 63* (BO); Plankat, *den Berger 674* (BO); Panggang, *Hallier 14/2/18* (BO); Telaga Warna, *Hallier 14/2/1895* (BO); Tilajabodas, *Koenz 307* (BO); *Koorders 37793* (K); Res Praeger, *Koorders 11908* (P), *Koorders 37336* (BO, K), *Koorders 42193* (BO); G. Muria, Tjollo, N. of Kudus, *Kostermans 6209* (BO, L), *Kostermans 6477* (L); G. Sembaeng, Rangga, *Lorzing 1253* (BO); Java Reliq. Hillebrandiana (BO); Ramu Lamagari, Pasaosoeas, *Rustner 385* (BO); *Sutrismo 46* (K); *Sutrismo 68* (US); *s.n. 1872* (P); *Zollinger 2325* (A, BM); *Zollinger s.n.* (P). – JAWA BARAT: G. Karang, Bandam, *Koorders 772* (BO); Tjidadap, Preangar, *Backer 22954* (BO), *Winckel 439* (BO); Wanajala, Batavia, *Backer 14473* (BO); Buitenzorg, *Backhuizen van den Brink 7392* (BO); G. Sodong, Buitenzorg, *Backhuizen van den Brink 7225* (BO); Bogor, *Schiffner s.n.* (BO); Tjibodas, *Bruggeman 472* (BO), *Hallier 34* (BO), *Hallier 583* (BO), *Koorders 32232* (BO), *van Steenis 1835* (BO); G. Gede, Bandung, *Smith 579* (BO); G. Malabar, *Anderson 30* (K), *Anderson 32* (P); G. Tjeramai, *Backer 4815* (BO); G. Galoenggoeng, Singaparna, *Backer 8595* (BO); Preanger, Tasikmalaja, *Koorders 2245* (BO); Preangar, Meange Reg., Papandajan, *Backer 5650* (BO); Preanger, Tjadas-Malang, *Backhuizen van den Brink 2853* (BO); Preanger, Pangentjongar, *Koorders 10130* (BO), *Koorders 13906* (BO), *Koorders 26808* (BO); Preanger, Takoka, *Koorders 11904* (BO). – JAWA TENGAH: G. Slamet, Tegal, *Koorders 774* (BO), *Koorders 775* (BO); Banjoemas, Pringombo dist., *Koorders 778* (BO), *Koorders 33825* (BO), *Koorders 33984* (BO); Pekalongan, G. Prabata, *Backer 16012* (BO); Semarang, G. Telomojo, *Koorders 27655* (BO), *Koorders 35972* (BO); Pringgodani, G.Lawu, *Afriastini 556* (BO, K), *de Groot 175* (BO), *Dorgelo 142* (BO). JAWA TIMUR: Madioan, G. Willis, *Koorders 779* (A, BO, P), *Backer 11448* (BO); Madioan Ngebel, *Koorders 29166* (BO); Kediri, Gadoengan Pare, *Koorders 22674* (BO); Pasuruan, G. Ardjoeni, *Koorders*



**Fig. 3.** Pollen grains: SEM of whole grains and surface details of same grains (Scale bars a & c = 10  $\mu\text{m}$ ; b & d = 1  $\mu\text{m}$ ; e = 20  $\mu\text{m}$ ). a & b. air dried grain of *T. sundaica* Miq. (*Kostermans 6209*, L); c & d. acetolysed grain of *T. valida* Craib (*Geesink 5461*, AAU); e. air dried aggregation of ca. 60 pollen grains of *T. valida* (*Larsen et al. 1470*, AAU).

38159 (BO); Pasuruan, G. Imeroe, *Backer 3600* (BO); Pasuruan, Banloes, *Backer 30469* (BO); Pasuruan, Tangkil, Toeven & Kepadjan, *Koorders 23683* (BO); Pasuruan, Tawangredip, *Verhoef 3* (BO); Tengger, Nyepoeh, *Harrevelt 107* (BO), *Housset 668* (BO), *Kobus 158* (BO), *Koorders 37335* (BO, K); Besoki, *Koorders 14511* (P); Besoeki, G. Idjen, *Backer 25421* (BO), *Koorders 14343* (BO); Besoeki, Tjoeramais, *Koorders 28721* (BO); Siteobond, *Clason-Laarman 31* (BO).

BALI. Lake Brutan, nr. Bedugul, *Meijer 10547* (BO).

LOMBOK. locality uncertain, *Elbert 1862* (K); Batukau, Bt. Lesung, *Afriastini 6* (BO); Mt. Rindjami, *Elbert 1755* (BO, K).

### 7. *Trevesia valida* Craib – Fig. 4.

*Trevesia valida* Craib, Kew Bull. 1930 (1930) 425. – Type: *Kerr 7335* (lectotype, designated here, K; isotypes ABD x 2, BM, E, TCD), Thailand, Pattani, Banang Sta, 100 m, 26th July 1923.

*Trevesia tomentella* Craib, Kew Bull. 1930 (1930) 424. – Type: *Kerr 17470* (lectotype, designated here, K; isotypes BM, K, ABD), Thailand, Phuket, Taku, 50 m. syn. nov.

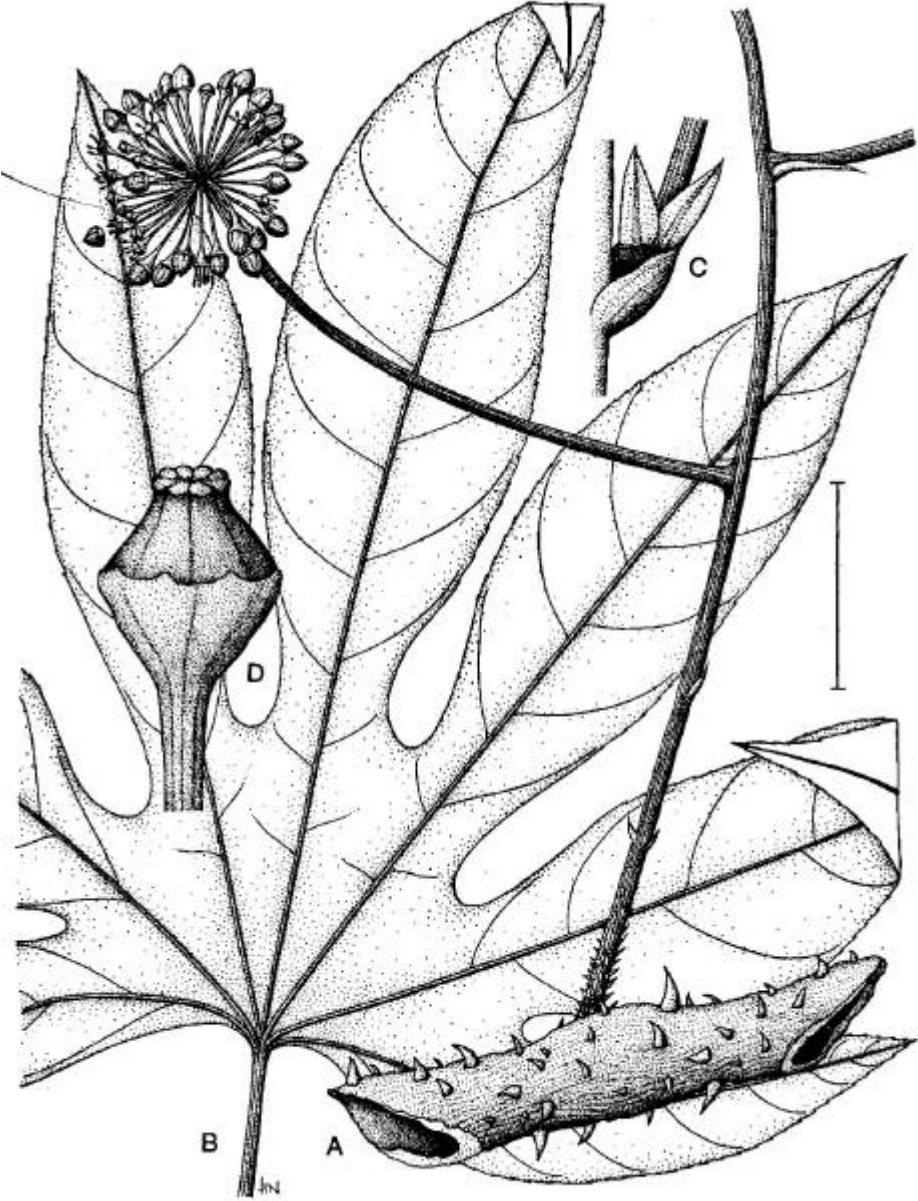
Tree 1.5–5 m tall, 4–5 cm DBH; presumably branching. Stem apex 1–2 cm thick, with few to many stout spines 3 x 1 – 7 x 3 mm. Leaves palmately lobed, deeply dissected, to 45 cm across, base truncate to shallowly cordate; lobes 7–9 (–10), lanceolate, 19 x 5–8 to 35 x 6 cm, apex acuminate to rounded, base narrowing to ca. 1/2 width, sinuses rounded, those nearest base occasionally reaching to petiole, and lamina then dissected; midribs equally prominent above and below, distinct to very apex; margin serrulate except in base of sinus, thickened when dry, this especially noticeable in sinuses; indumentum of scattered peltate hairs 0.05 mm across. Petiole rounded, striate, to 40 x 0.3–0.5 cm, drying a light reddish-brown, with scattered spines 0.1–0.2 (–0.4) cm long becoming markedly denser and larger towards base, base itself often with setose hairs and spines to 0.6 cm; sheath with a narrow papery margin, stipular ligules fused or free, 1–2 cm long; indumentum of closely appressed branched hairs 0.05–0.2 mm across. Inflorescence sub-terminal, usually borne immediately below or amongst leaves; rachis to 40 x 0.7 cm, base sometimes with scattered spines; bearing 5–9 secondary branches, mostly terminal, each 15–25 cm long, with a single terminal umbel, and with 1 or 2 short bracts; bracts triangular, narrow 0.5–1.5 cm long, caducous to persistent; indumentum sparse to dense, of short tufted hairs 0.02–0.05 mm in axils, or with scattered setose hairs throughout, reddish-brown. Umbels 25–45-flowered; 4–7.5 cm across; pedicels 1–1.5 cm with a short reddish indumentum, lengthening in fruit to 1–3.5 cm, becoming glabrous; bracts narrow, 2–4 mm long. Flower receptacle turbinate, 6.5 x 5.5 mm; disk conical; stylopodium 1–1.5 mm in length, with 7–8 prominent, pulvinate stigmas. Calyx with short, blunt to acuminate lobes 0.5–1 mm long, equalling petal number. Petals 7–8, fused into a calyptra, rounded-conical, apically acute to acuminate; 5 x 5 – 6.5 x 6.5 mm overall; indumentum dense at apex, light brown. Stamens 7–8; anthers oblong-ovoid, 3.5 x 1.8 mm; filament to 2.5 mm. Pollen grains 21–30 µm on equatorial axis; brevicolporate, colpus 5.7 x 2.1 µm; brochi 0.7–3.8 µm, muri 0.5–1.9 µm; margo broad and conspicuous, to 5.3 µm across (Fig. 3: c–e). Locules 7–8. Fruits spherical to 1.2 cm across when dry.

Ecology – Evergreen forest, stream banks, 50 - 600 m. Flowering May to August, fruiting July to November.

Distribution – Thailand (Peninsular), Peninsular Malaysia (Kedah). Map 1.

Notes – 1. *Trevesia tomentella* was distinguished by Craib. It is probably no more than a rather hairy individual.

2. The reddish cast that dried specimens of this species have is characteristic. The inflorescence differs from *T. palmata* in that the secondary branches bear only a single umbel,



**Fig. 4.** *Trevesia valida* Craib. a. stem and inflorescence; b. leaf; c. ligule detail; d. young fruit. Scale bar; a = 4 cm; b = 5.25 cm; c = 3 cm; d = 7.5 mm. (a. from *Santisuk 1188*, b-d. from *Kerr 7335*). Drawn by Holly Nixon.

much like *T. burckii*. The species is distinguished from *T. lateospina*, with which it shares similar leaves, by its larger inflorescence, short umbel bracts, calyprate corolla and less hirsute nature.

Collections – THAILAND: *Anon* in *BKF 2164* (BKF). – PENINSULAR: Chumphon: Surat, 52 km N of Chumphon, *Larsen et al. 1470* (AAU). Ranong, NE 09° 15' 98° 20', Khlong Kam Puan, *Geesink 5107* (BKF, L), *5213* (L). Surat Thani, 08° 59' 98° 48', Surat Thani to Takuapa, *Larsen et al. 31035* (AAU, BKF, K). Phangna, E of Phangnga, *Shimizu 7865* (BKF, L); Kuasuri, *Santisuk 1188* (BKF). Phuket, Taku, *Kerr 17470* (Type of *T. tomentella*), 08° 00' 98° 20', Khao Phra Thaew W.S., *Soejarto 6156* (L), *5935* (BKF, L). Krabi, 08° 15' 98° 52', Panom Bencha, *Kerr 18761* (ABD, BM, E, K, TCD); 08° 13' 98° 56', Khao Panom Bencha, *Larsen et al. 43314* (AAU). Nakhon Si Thammarat, Khao Luang, *Smitinand 908* (BKF), *Iwatsuki et al. 8460* (BKF); 08° 30' 99° 45', Khao Luang foothills, *Geesink 5461* (BKF, C, K, L, AAU, P, E). Phthalung, 07° 32' 99° 45', Khao Chong NP, *Chaeroephol 3710* (AAU, K, P). Trang, Chong, *Collins 2371* (BM, K, US); Kao Chong, *Geesink 7184* (BKF, L), *Pinuin et al. 328* (BKF), *Maxwell 75-877* (AAU, L); Khao Chong NP, Muang, *Sirirugsa 906* (A); Kuan Pra, Ampo Kao Kao, *Rabil 249* (AAU, ABD, BM, K). Satun, Thalae Ban, 20 km NE of Satun, *Larsen et al. 41095* (AAU), *41516* (AAU). Pattani, 06° 16' 101° 19', Banang Station, *Kerr 7335* (Type of *T. valida*); 06° 45' 101° 06' Khao Kalakiri, *Kerr 15032* (ABD, BM, E, K, TCD).

PENINSULAR MALAYSIA: – KEDAH, Kg. Carok Puyoh, *Ferry & Teo in KL 4069* (KEP).

### EXCLUDED SPECIES

*Trevesia rufosetosa* Ridl., Fl. Mal. Pen. 1 (1922) 883; Ridl., J. As. Soc. Straits 86 (1922) 294; B. C. Stone, Tree Fl. Malaya 3 (1978) 33; Philipson, Fl. Mal. ser. 1, 9 (1979) 97. – Type: Ridley s.n. (lectotype, designated here, SING; iso K), Peninsular Malaysia, Selangor, Semangkok Pass, January 1921. = *Brassaiopsis rufosetosa* (Ridl.) Jebb comb. nov.

Note – Examination of the type, and other collections, reveals that the fruit is consistently 2-loculed, and not 5-loculed as stated by Ridley (1922). He correctly identified the stigma as 2-lobed, implying he was examining flowers from the correct specimen. Possibly Ridley sectioned a flower in place of a fruit, and mistook the anthers as locules - the shape and appearance of dried fruits and buds is not dissimilar, and the mistake is a relatively easy one to make. Another error in the original publication is the description of the calyx limb as 'very short and obscure', whilst in reality the calyx possesses five sturdy, inrolled, much branched limbs to 2 cm in length, and is densely clothed with setose hairs. Philipson (1979) repeated these errors, even though the species fell outside the generic description (Ovary 7 - 12 loculed) which he gave. The species is transferred here to *Brassaiopsis*.

Whilst excluding the species it is also of note how similar the genus *Brassaiopsis* can be to *Trevesia*. The bristle-like hairs on the inflorescence of *B. rufosetosa* are remarkably similar to those of *T. lateospina*.

Other names have been previously excluded from the genus. These are mostly misplaced species of *Osmoxylon*. This latter genus has a distinct inflorescence, comprising a compound umbel in which each primary ray has three terminal branches, of which the central branch bears an umbel of 'pseudofruits'. The geographical range of this genus scarcely overlaps with the range of *Trevesia* except in the extreme west of Kalimantan and Sarawak.

*Trevesia barbata* (Becc.) Kuntze, Rev. Gen. (1891) 272. = *Osmoxylon barbatum* Becc., Malesia 1 (1878) 197.

*Trevesia carpophagarum* (Becc.) Kuntze, Rev. Gen. (1891) 272. = *Osmoxylon insidiator* Becc., Malesia 1 (1878) 195.

*Trevesia eminens* W. Bull, Cat. New Plants (1884) 17. = *Osmoxylon eminens* (W. Bull) Philipson, Blumea 23 (1976) 114.

*Trevesia geelvinkiana* (Becc.) Kuntze, Rev. Gen. (1891) 272. = *Osmoxylon geelvinkianum*



- Becc., Malesia 1 (1878) 196.
- Trevesia helleborina* (Becc.) Kuntze, Rev. Gen. (1891) 272. = *Osmoxylon borneense* Seem., J. Bot. 6 (1868) 141.
- Trevesia insidiator* Kuntze, Rev. Gen. (1891) 272. = *Osmoxylon insidiator* Becc., Malesia 1 (1878) 195.
- Trevesia insignis* Miq., Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 220; Seem., J. Bot. 4 (1866) 353. = *Osmoxylon insigne* (Miq.) Becc., Malesia 1 (1878) 195.
- Trevesia littoralis* Benth. & Hook. f., Gen. Pl. 1 (1867) 943. = *Schefflera littoralis* (Miq.) Harms in Engl. & Prantl., Naturl. Pflanzenfam. III 8 (1894) 38.  
Note – Bentham's inclusion of a number of species within *Trevesia* (Bentham & Hooker 1867) are not combinations (D. Frodin pers. comm.), and the authority is therefore solely Benth. & Hook. f. (see also *T. pleiosperma* and *T. sandwicensis*).
- Trevesia moluccana* Miq., Fl. Ind. Bat. 1 (1856) 748. = *Osmoxylon palmatum* (Lam.) Philipson, Fl. Mal. ser. 1, 9 (1979) 42.
- Trevesia novoguineensis* Scheff., Ann. Jard. Bot. Buitz. 1 (1876) 26. = *Osmoxylon novoguineense* (Scheff.) Becc., Malesia 1 (1878) 197.
- Trevesia pleiosperma* Benth. & Hook. f., Gen. Pl. 1 (1867) 943. = *Reynoldsia pleiosperma* A. Gray, Bot. U. St. Expl. Exped. 1 (1854) 725.
- Trevesia pulcherrima* (Vidal) Kuntze, Rev. Gen. (1891) 272. = *Osmoxylon pulcherrimum* Vidal ex Fern.-Vill., Nov. App. (1880) 102.
- Trevesia sandwicensis* Benth. & Hook. f., Gen. Pl. 1 (1867) 943. = *Reynoldsia sandwicensis* A. Gray, Bot. U. St. Expl. Exped. 1 (1854) 724.
- Trevesia tahitensis* (Nadeaud) Drake, Fl. Polyn. Franc. (1892) 81. = *Reynoldsia tahitensis* Nadeaud, Enum. Pl. Tahiti (1873) 63.
- Trevesia teysmannii* (Boerl.) Kuntze, Rev. Gen. (1891) 272. – *Eschweilera teysmannii* Boerl. = *Osmoxylon teysmannii* (Boerl.) Philipson, Blumea 23 (1976) 111.
- Trevesia zippeliana* Miq., Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 11 = *Osmoxylon palmatum* (Lam.) Philipson, Fl. Mal. ser. 1, 9 (1979) 42.

## REFERENCES

- Baillon, H. 1879.** *Histoire des Plantes*. 7: 66–256. Paris: Hachette & Co.
- Beccari, O. 1878.** *Malesia 1*: 193–198. Genova.
- Bentham, G. 1867.** Araliaceae in Bentham, G. & Hooker, J. D., *Genera Plantarum*. Vol. 1: 931–947. London: Reeve & Co.
- Blume, C. L. 1823.** *Catalogus Buitzenzorg* p. 43. Batavia.
- Blume, C. L. 1826.** *Bijdragen tot de flora van Nederlandsch Indië*, p. 875. Batavia.
- Boerlage, J. 1887.** *Trevesia* Vis., *Eschweilera* Zipp. et *Osmoxylon* Miq. *Ann. Jard. Bot. Buitz.* 6: 106–112.
- Clarke, C. B. 1879.** Araliaceae, in Hooker, J. D., *Flora of British India*. Vol. 2: 720–740. London: Reeve & Co.
- Corner, E. H. 1952.** *Wayside Trees of Malaya*. 2nd Ed. Singapore: Govt. Printing Office.
- Craib, W. G. 1930.** Contributions to the Flora of Siam. *Kew Bull.* 9: 424–425.
- Cronquist, A. 1968.** *The Evolution and Classification of Flowering Plants*. Boston: Houghton Mifflin.
- Eyde, R. H. & Tseng, C.C. 1971.** What is the primitive floral structure of Araliaceae? *J. Arnold Arbor.* 52 (2): 205–239.

- Faegri, K. & Iversen, J. 1964.** *Textbook of Pollen Analysis*. 2nd Edition. Oxford: Blackwell Scientific Publications.
- Feng, K. M. & Li, Y. R. 1979.** Araliaceae in *Flora Yunnanica* **2**: 417–418.
- Frodin, D. G. 1992.** Trevesia, in *The New Royal Horticultural Society Dictionary of Gardening*, ed. A. Huxley, Vol. **4**: 496–497. London: Macmillan Press.
- Grushvitzky, I. V., Skvortsova, N. T., Arkhangelsky, D. B. & Chistyakova, L. D. 1984.** The species of the genus *Trevesia* (Araliaceae) in the flora of Vietnam. *Bot. Zhurn.* **69** (8): 1019–1029. (in Russian).
- Harms, H. 1894.** Araliaceae. in Engl. & Prantl, *Die natürlichen Pflanzenfamilien*, **III**, **8**: 1–48.
- Hasskarl, J. K. 1844.** De planten, door den heer Noroña. *Tijdschr. nat. Gesch. Physiol.* **11**: 49–112.
- Kuntze, C. E. 1891.** *Revisio generum plantarum* **1**: 272. Leipzig: Arthur Felix.
- Li, H.-L. 1942.** The Araliaceae of China. *Sargentia* **2**: 1–134.
- Merrill, E. D. 1934.** An enumeration of plants collected in Sumatra by W. N. & C. M. Bangham. *Contr. Arnold Arbor.* **8**: 116.
- Miquel F. A. W. 1855.** *Plantae Junghuhnianae*, **4**: 420. Leiden.
- Noroña, F. 1790.** Relatio Plantarum Javanensium. *Verh. Batav. Genootsch. Kunst. Wet.* **5** (4): 1–28.
- Oskolski, A. A. 1996.** A survey of the wood anatomy of the Araliaceae, pp. 99–119 in Donaldson, L. A., Singh, A. P. eds. *Recent advances on Wood Anatomy*. Rotorua, New Zealand: NZ For. Res. Inst.
- Philipson, W. R. 1979.** Araliaceae. *Flora Malesiana*, ser. 1, Vol. **9**: 1–105.
- Plunkett, G. M., Soltis, D. E. & Soltis, P. S. 1996.** Higher level relationships of Apiales (Apiaceae & Araliaceae) based on phylogenetic analysis of *rbcL* sequences. *Am. J. Bot.* **83** (4): 499–515.
- Plunkett, G. M., Soltis, D. E. & Soltis, P. S. 1997.** Clarification of the relationship between Apiaceae and Araliaceae based on *matK* and *rbcL* sequence data. *Am. J. Bot.* **84** (4): 565–580.
- Punt, W., Blackmore, S., Nilsson, S. & LeThomas, A. 1994.** Glossary of pollen and spore terminology. *LPP Contrib. Series* **1**.
- Ridley, H. N. 1922.** Araliaceae. *Flora of the Malay Peninsular* **1**: 872–889.
- Roxburgh, W. 1814.** *Hortus Bengalensis*. Serampore: Mission Press.
- Seeman, B. 1866.** Revision of the natural order Hederaceae: XIV. On the genus *Trevesia*. *J. Bot.* **4**: 352–353.
- Shang, C. B. & Callen, D. 1988.** Pollen morphology of the family Araliaceae in China. *Bull. Bot. Res. N. E. Forest. Inst.* **8** (1): 13–48.
- Skvortsova, N. T. & Averyanov, L. V. 1994.** New genus and species – *Grushvitzkyia stellata* (Araliaceae) from the north Vietnam. *Bot. Zhurn.* **79** (7): 108–112.
- Steenis, C. G. G. J. van, & van Steenis-Kruseman, M. J. 1970.** Javanese plants of Francisco Noroña. *Regn. veg.* **71**: 353–380.
- Tseng, C.-J. & Hoo, G. 1982.** A new classification scheme for the family Araliaceae. *Acta Phytotaxonomica Sinica* **20**: 125–130.
- Viguiet, R. 1906.** Recherches anatomique sur la classification des Araliacées. *Ann. Sci. Nat. Bot. (sér. IX)* **9**: 305–405.
- Visiani, R. de 1842.** *Mem. Reale Accad. Sci. Torino* ser. 2, **4**, p. 262.

**ACKNOWLEDGEMENTS**

This revision was undertaken as part of a HCM Institutional Grant (ERBCHBGCT 930297) from the Commission of the European Communities to Dr. John Parnell at Trinity College, Dublin. I am grateful to Gerry Doyle, Dr. Hajo Esser, Pamela Hennesey, Prof. Mike Jones, Jill Macklin, Conor Meade, Dr. David Middleton, Pam Opie, Dr. John Parnell and Dr. Colin Pendry, for their support at the Botany Department of Trinity College Dublin. I would like to thank the Directors and Keepers of the many herbaria (A, ABD, AAU, BK, BKF, BM, BO, C, CMU, E, GH, K, KEP, L, P, SING, TCD, U, US, W and WU) for the loan of specimens and access to their collections. Kai Larsen and J. F. Maxwell provided useful information and advice on *Trevesia* in Thailand. In Thailand, Ratchan Pooma and Thirawat Boonthavikoon provided unstinting support and assistance in the field. Kongkanda Chayamarit and the staff of the Royal Forest Herbarium provided logistic and curation support in Bangkok. I am grateful to Drs. David Frodin and Hajo Esser for many helpful discussions, and especially to Marcella Campbell and Cathy Hayes for their help with the curation of material. I am most grateful to Holly Nixon for preparing the drawings.

This paper was originally accepted by the journal *Blumea*, and I am most grateful to the editors, Drs. Raymond van der Ham and Frits Adema, for both their work in having the paper reviewed, and for giving me permission to withdraw the paper, so that it could be published here in *Glasra*.

