

NOTES ON SOME GENERA OF THE SAPINDACEAE-CUPANIEAE

P. W. LEENHOUTS

Rijksherbarium, Leiden, The Netherlands

SUMMARY

1. For the first time four collections of *Diploglottis*, representing two species, are cited from New Guinea.

2. The genus *Euphorianthus*, formerly reduced to *Diploglottis*, is resurrected; the three species accepted by Radlkofer are united under a new combination.

3. A revision of *Sarcotoechia* for New Guinea is given. Up till now, *Sarcotoechia* was known with certainty from Australia only. The New Guinea material represents a new subgenus with five new species, one of which remains unnamed.

4. The three species of *Toechima* described from Malesia are combined and reduced to a new sub-species of the Australian *T. erythrocarpum*.

5. A revision is given of *Trigonachras*. This encompasses eight species; five are new, three of these remain unnamed. The genus was known from West Malesia up to and including the Philippines; this area can now be enlarged by Celebes and New Guinea.

1. DIPLOGLOTTIS IN MALESIA

Up till now the occurrence of *Diploglottis* in Malesia was known only from a casual remark by Ms. S.T. Reynolds (*Austrobaileya* 2, 1987: 330). A mention of the known collections which represent two species seems desirable, as follows:

1. *Diploglottis australis* (G. Don) Radlk.

NEW GUINEA. Southeast: *Carr 15581* (BM, L), *16052* (CANB, L, SING), both from Northern Prov., Isuarava. – Northeast: *Clemens 41671*, Morobe Prov., Boana (L).

2. *Diploglottis diphylostegia* (F. Muell.) F.M. Bailey

NEW GUINEA. Northeast: *P. Katik NGF 46737*, Morobe Prov., Lae Subdist., 3 miles from Sunium Village near Busu R., 6°35' S 146°55' E (L).

2. EUPHORIANTHUS

In a former paper (Blumea 24, 1978: 173-179) I reduced *Euphorianthus* to *Diploglottis*. Radlkofer, in his key to the genera of the Sapindaceae (in Engl., Pflanz

zenr. 98, 1931: 14), distinguished the two genera exclusively on the disk, whether complete or interrupted resp. I found that in *Euphorianthus* the disk is always uninterrupted, hence the flower regular, whereas in *Diploglottis* the disk may vary from regular to interrupted, accordingly the flower from actinomorphic to zygomorphic. At that time, and contrary to Radlkofer, I still was of the opinion that flower characters were of prime importance for the distinction of genera in the Sapindaceae and in this case there was apparently no clear difference in the flowers. Radlkofer derived his genus characters primarily from the fruits, but these appeared to be also not principally different in the present case. At that time I had not enough seeds available for comparison, but from Radlkofer's descriptions I did not get the impression that these were very different either. Therefore I came to the conclusion that the two genera were not really different and had to be united.

However, my recent study of the two genera showed me that there is a clear difference in the seeds. *Diploglottis* has lenticular seeds, when ripe completely enveloped by a 2-lobed ariloid; *Euphorianthus* has obovoid seeds with only a fairly small 2- or sometimes 3-lobed sarcotesta around the hilum. This difference led me to the conclusion that the two genera have to be kept separate.

Radlkofer (op. cit. 1933: 1227–1229) recognised 3 species in *Euphorianthus*, exclusively on leaf characters and based upon 14 collections. I could study 34 collections and these showed a rather wide but uninterrupted range of variability in all characters used. Therefore, I concluded that the genus is monotypic. The nomenclature of the only species is as follows:

***Euphorianthus euneurus* (Miq.) Leenh., nov. comb.**

Dysoxylum euneuron Miq., Ann. Mus. Bot. Lugduno-Batavi 4 (1868) 22. – T y p e : *de Vriese & Teysmann s.n.*, Ceram (L sh. nr. 903.295-135; iso in L).

Sapindus longifolius auct. non Vahl: Roxb., Hort. Bengal. (1814) 88; Fl. Ind. ed. 2, 2 (1832) 282. – *Euphoriopsis longifolia* Radlk., Sapind. Holl.-Ind. (1879) 19, 58, 98, nom. illeg. – *Euphorianthus longifolius* Radlk. in Engl. & Prantl, Nat. Pflanzenfam. 3, 5 (1895) 348. – T y p e : *C. Smith* in herb. Roxb., not seen.

Euphorianthus obtusatus Radlk. in Engl. & Prantl, Nat. Pflanzenfam., Nachtr. 3 (1907) 206. – L e c t o t y p e (present author): *Koorders 18839*, N. Celebes, Minahassa (M).

Euphorianthus pallidus Radlk., Bot. Jahrb. Syst. 56 (1920) 294. – S y n t y p e s : *Ledermann 8129* (K), *10769* (M), *10837* (not seen), NE. New Guinea.

3. SARCOTOECHIA IN MALESIA

In her revision of the genus *Sarcotoechia* for Australia (Austrobaileya 2, 1985: 181) S.T. Reynolds mentioned for the distribution: 'Australia and probably New Guinea'. This was the first time that the occurrence of this genus in Malesia was suggested. The evidence on which this supposition rested was not given, however.

For the present revision I could dispose of eight collections from the eastern half of New Guinea; a ninth collection is left out of consideration as it bears only very young flower buds. The eight collections which have been used for the present revision are: *L.J. Brass 31051* (1), *31795* (2), *31845* (3), *T.G. Hartley 12505* (4), *LAE*

51061 (5), NGF 21569 (6), 28678 (7), and R. Pullen 8401 (8). The ninth collection which is mentioned but not included is R. Pullen 5452.

On the basis of the main differences found these eight collections could be arranged as follows:

- petals 5; stamens 7; ovary 3-merous; leaflets small, convex: 5.
- petals 5; stamens 7; ovary 2-merous; leaflets larger, flat: 6.
- petals 0; stamens unknown; ovary 3-merous; leaflets small, convex: 3.
- petals 0; stamens 7 or 8; ovary 3-merous; leaflets larger, flat: 7, 8.
- petals 0; stamens 5; ovary 3-merous; leaflets small, convex: 1, 2, 4.

With such a small number of collections and relatively many differences it is difficult to establish characters, and accordingly to delimit taxa. The characters used in separating the Australian species seem to be useless in New Guinea.

Number 3 comes from the same locality as number 2 and is so much alike that I consider them conspecific. The numbers 7 and 8 not only show a unique set of characters, but, moreover, they are the only collections from the lowland; all others are montane. This seems a sufficiently good reason to keep them separate. The collections 5 and 6 are mutually distinctly different; 6 resembles 7 and 8 but differs in presence of petals, in ovary, and in ecology; 5 resembles 1-4 but differs in the presence of petals. This is the reasoning which led me to the recognition of 4 species.

The eight New Guinea collections differ constantly from the Australian species of *Sarcotoechia* in the presence of a hairy disk; in Australia the disk is always glabrous. As this character is constant in most genera of the Cupanieae I suggest a subdivision of the genus into two subgenera, one comprising the Australian species, the other one the New Guinea ones. As to the Australian species I further agree with Ms. Reynolds that a division between on the one hand *S. heterophylla* S.T. Reynolds and *S. serrata* S.T. Reynolds, on the other hand the other four species seems possible, in my opinion preferably as sections.

As far as Malesia is concerned the above considerations lead to the description of a new subgenus and of four new species, as follows:

Sarcotoechia subgenus **Pilosodiscus** Leenh., *nov. subgen.*

Discus floris pilosus. — T y p u s: *S. apetala* Leenh.

KEY TO THE SPECIES

- 1a. Petals present (scars visible under the fruit) 2
- b. Petals absent 3
- 2a. Ovary 3-merous. Twigs fairly long remaining angular. Leaflets bullate, the apex emarginate, rounded, or blunt 1. *S. angulata*
- b. Ovary 2-merous. Twigs terete. Leaflets flat, the apex acutely acuminate 2. *S. bilocularis*
- 3a. Leaflets 7-20 by 3-6 cm, flat, the apex tapering into a broad rounded acumen. *Lowland* 3. *S. planitiei*
- b. Leaflets 4.5-8 by 1.5-3.5 cm, ± bullate, the apex emarginate, rounded, or blunt. *Montane* 4. *S. apetala*

1. *Sarcotoechia angulata* Leenh., *nov. spec.*

Arbor. *Ramuli* in sicco conspicue angulati, denique teretes, 5 mm crassi, pustulato-lenticellati. *Folia* 1-jugata; petiolus semiteres, 1,5 cm longus, 1,5 mm latus; axes foliorum sparse pilosi vel subglabri. *Folia* subsessilia, 5,5–7 cm longa, 3–3,5 cm lata, elliptica, convexa, rigide pergamentacea, glabra; basis acute attenuata; margo revolutus; apex aut emarginatus aut rotundatus aut obtusus; nervi secundarii inter sese ca. 1 cm distantes, subcurvati, ad marginem liberi; venae venulaeque laxae reticulatae. *Inflorescentiae* ad 7 cm longae, dense pilosae, glabrescentes; pedicelli ca. 2 mm longi. *Sepala* ovata, 1,5 mm longa, 1,1 mm lata. *Petala* elliptica, breve unguiculata, 1,2 mm longa, 1 mm lata. *Stamina* 7. *Pistillum* trilocolatum. — T y p u s: P.F. Stevens LAE 51061, NE. New Guinea, Eastern Highlands Prov., Goroka Subdist., Marafunga near R. Fatima, 6°5' S 145°15' E (L).

Tree. *Young twigs* characteristically angular when dried, gradually becoming terete, 5 mm diam., pustular lenticellate, light greyish brown. *Leaves* 1-jugate; petiole semiterete, above to the apex slightly hollowed, 1.5 cm long, 1.5 mm thick; leaf axes sparsely hairy to subglabrous. *Leaflets* 5.5–7 by 3–3.5 cm, c. 2 times as long as wide, widest about the middle, stiff-pergamentaceous, glabrous; base attenuate; margin strongly recurved, leaflets ± bullate; apex emarginate, rounded, or blunt; nerves c. 1 cm distant along the midrib, slightly curved, ending free, about equally prominulous on both sides; veins and veinlets very laxly reticulate, prominulous on both sides. *Inflorescences* up to 7 cm long, densely hairy, glabrescent; pedicels c. 2 mm long. *Sepals* ovate, 1.5 by 1.1 mm. *Petals* 5, elliptic, short-clawed, 1.2 by 1 mm. *Stamens* 7; anther 0.8 mm long. *Pistillode* 3-locular. *Fruits* and *seeds* unknown.

Field notes. Tree 24 m high, d.b.h. 35–40 cm; bark grey brown, smooth, inner bark red, wood straw; leaves above dark green, shining, below slightly paler; calyx green, petals yellow, anther yellow.

Distribution. NE. New Guinea; only known from the type.

Ecology. In mixed forest at 2550 m altitude. *Fl.* Nov.

2. *Sarcotoechia bilocularis* Leenh., *nov. spec.*

Arbuscula. *Ramuli* teretes, 2,5–3,5 mm diam. *Folia* unijugata; petiolus semiteres, 1–2 cm longus, 1,5 mm latus; petioluli 3–5 mm longi; axes foliorum glabri. *Foliola* 9,5–12 cm longa, 3,25–4,5 cm lata, lanceolata, plana, rigide pergamentacea, glabra; basis attenuata; margo subrevolutus; apex gradatim breve acute acuminatus; nervi secundarii inter sese 1–1,75 cm distantes, curvati, in superiore parte foliorum arcuati; venae venulaeque laxae reticulatae. *Infructescentiae* ad 12 cm longae, sparse puberulae; pedicelli ad 4 mm longi. *Cicatrices petalorum* praesentes. *Cicatrices staminum* 7 vel 8. *Pistillum* bilocolatum. *Fructus* transverse ellipsoidales vel subglobosi, ca. 8 mm alti, 10 mm lati, basem breve angustati. *Semina* circum hilum annulo carnosio ornata. — T y p u s: C.D. Sayers NGF 21569, NE. New Guinea, Morobe Prov., Wagau, 6°50' S 146°50' E (L).

Treelet. *Twigs* nearly from the beginning terete, 2,5–3,5 mm diam., rather smooth, light greyish brown. *Leaves* 1-jugate; petiole semiterete, 1–2 cm long, 1,5 mm broad; petiolules 3–5 mm long; leaf axes glabrous. *Leaflets* 9,5–12 by 3,25–4,5 cm, c. 3 times as long as wide, widest in the middle, flat, stiff pergamentaceous, glabrous; base attenuate; margin slightly recurved; apex mostly tapering into a short acute acumen; nerves 1–1,75 cm distant along the midrib, strongly curved, the upper

ones looped and joined at some distance from the margin, above prominulous, beneath prominent; veins laxly reticulate, equally prominulous on both sides. *Infructescences* up to c. 12 cm long, thinly puberulous; pedicels slender, up to c. 4 mm long. *Flowers* described from remains under the fruits. *Petals*: scars present. *Stamens*: 7 or 8 scars present. *Pistil* 2-merous. *Fruits* transversely ellipsoid to subglobular, c. 8 by 10 mm, at base narrowed into a short stipe. *Seeds* with a small sarcotesta around the hilum.

Field notes. Slender erect tree 4.5 m high, d.b.h. 7.5 cm; leaves dark green and shiny above, pale below; fruit fleshy, orange red.

Distribution. NE. New Guinea; only known from the type.

Ecology. Edge of forest on ridge or steep slope at 1500 m altitude. *Fr.* Jan.

3. *Sarcotoechia planitieii* Leenh., *nov. spec.*

Descriptio typi: Arbor. *Ramuli* teretes, striati, 3–4 mm diam., dense pustulato-lenticellati. *Folia* unifoliolata vel 1–2-jugata; petiolus teres, 1.5–3 cm longus, 1–2 mm crassus; petioli 2–3 mm longi; axes foliorum dense puberuli, glabrescenti. *Foliola* 10–16 cm longa, 4–7 cm lata, elliptica vel obovata, plana, tenue pergamentacea, glabra; basis acute attenuata; margo non revolutus; apex gradatim late rotundata acuminatus; nervi secundarii inter sese 1–2 cm distantes, curvati, in superiore parte foliorum arcuati; venae venulaeque laxe reticulatae. *Infructescentiae* ad 12 cm longae, puberulae; pedicelli 4–5 mm longi. *Corolla* absens. *Cicatrices staminum* 7 vel 8. *Pistillum* trilocolatum. *Fructus* immaturi subglobosi, trilocolati. *Semina* in parte basali sarcotestam obiecta. – **T y p u s:** *R. Pullen 8401*, SE. New Guinea, Milne Bay Prov., Maiyu R., c. 16 km WNW of Biniguni airstrip, 9°40' S 149°10' E (L).

Tree. *Twigs* terete, finely grooved, 3–4 mm diam., densely pustular lenticellate, yellowish to greyish brown. *Leaves* unifoliolate or 1- or 2-jugate; petiole terete or above flattened with a narrow groove, 1.5–3 cm long, 1–2 mm thick; petiolules 2–3 mm long; leaf axes densely puberulous, glabrescent. *Leaflets* 7–20 by 3–7 cm, 2.5–3.5 times as long as wide, widest in to distinctly above the middle, thin-pergamentaceous, glabrous; base sometimes slightly attenuate; margin flat; apex ± tapering into a broad rounded acumen; nerves 1–2 cm distant along the midrib, strongly curved to nearly straight, only the few uppermost ones looped and joined, above prominulous, beneath prominent; veins and veinlets laxly reticulate, prominulous on both sides. *Infructescences* up to 15 cm long, puberulous. *Flowers* described from remains under young fruits. *Corolla* absens. *Stamens* 7 or 8. *Pistil* 3-merous. *Fruits* immature, 3-celled, ± globular. *Seeds*: at least the lower third part covered by a cupular sarcotesta with a narrow, lobed, free margin.

Field notes. Tree up to 25 m high, d.b.h. 40 cm, bole spurred, straight, without or with up to 1.20 m high buttresses; bark crumbly brown, scrape red-brown, blaze orange brown; sapwood cream; leaves above dull dark green, below green; fruits bright orange red; seeds purple brown with an orange sarcotesta.

Distribution. SE. New Guinea (Milne Bay Prov.).

Ecology. Rain forest on flat at 150–350 m altitude; soil well drained gravel. *Fr.* July.

Note. The name refers to the fact that this is the only lowland species of *Sarcotoechia* in New Guinea.

Paratype. *H. Streiman* & *P. Katik* NGF 28678, Milne Bay Prov., Raba Raba Subdist., junction Ugat and Mayu R. (L).

4. *Sarcotoechia apetala* Leenh., *nov. spec.*

cf. *Mischocarpus* Hartley & al., *Lloydia* 36 (1973) 270.

Descriptio typi: Arbor. *Ramuli* primo angulati, mox teretes, 2.5–5 mm diam., striati, pustulato-lenticellati. *Folia* 1-jugata; petiolus semiteres, 1–1.5 cm longus, 1 mm latus; axes foliorum glabri. *Foliola* subsessilia, 5–7 cm longa, 2–3 cm lata, obovata, convexa, rigide pergamentacea, glabra; basis acute attenuata; margo revolutus; apex aut emarginatus aut rotundatus aut obtusus; nervi secundarii inter sese ca. 5 mm distantes, subcurvati, ad marginem arcuati; venae venulaeque laxae reticulatae. *Inflorescentiae* 3–5 cm longae, puberulae, glabrescentes; pedicelli ca. 2 mm longi. *Sepala* ovata, 1–1.3 mm longa, 1–1.6 mm lata. *Corolla* absens. *Stamina* 5. *Pistillum* triloculatum. — **T y p u s:** *T.G. Hartley* 12505, NE. New Guinea, Morobe Prov., Mt Shongul c. 5 miles SW of Wagau (L).

Tree. *Twigs* at first angular, becoming terete, 2.5–5 mm diam., canaliculate, pustular lenticellate, light grey to light greyish brown. *Leaves* 1-jugate; petiole semiterete to sometimes narrowly deeply grooved above, 0.5–1.5 cm long, 1–2.5 mm broad; leaflets ± subsessile; leaf axes glabrous. *Leaflets* 4.5–8 by 1.5–3.5 cm, 2–3 times as long as wide, widest in to above the middle, stiff-pergamentaceous, glabrous; base attenuate; margin strongly recurved (leaflet often bullate); apex emarginate, rounded, or blunt; nerves c. 0.5–1 cm distant along the midrib, slightly curved, either, if nervation dense, distinctly looped and joined near the margin, or, if nerves more distant, ending free; veins laxly reticulate, inconspicuous or, if nerves distant and not joined, above distinct. *Inflorescences* c. 1–7 cm long, densely hairy, glabrescent; pedicels c. 2 mm long. *Sepals* ovate, 1–1.3 by 1–1.6 mm. *Corolla* absent. *Stamens* 5 or 7; anther 0.6–0.8 mm long. *Pistil* 3-merous. *Fruits* transversely triangular ellipsoid, c. 8 by 8 mm, at base narrowed into a short stipe. *Seeds* partly covered by a sarcotesta with a narrow free margin.

Field notes. Bushy tree 10–20 m high, d.b.h. 30 cm; bark dark grey-brown, warty and longitudinally fissured, inner bark reddish brown; leaves above dark green, shiny, below slightly paler; calyx green to greenish yellow; fruits fleshy, orange to red.

Distribution. NE. New Guinea (Morobe and Eastern Highlands Prov.).

Ecology. Subcanopy of rain forest on slopes at 1800–2200 m altitude. *Fl.* Aug., *fr.* Sept.–Oct.

Paratypes. NE. New Guinea, Eastern Highlands Prov., *Brass* 31051, Mt Otto (L); 31795, 31845, Purosa, Okapa area (L, LAE, NY, US, resp. L, LAE).

5. *Sarcotoechia* sp.

The ninth collection mentioned above seems to represent a fifth species. However, the flower buds are too small even to establish whether the disk is hairy or glabrous. Therefore, I do not like to name it, but for the sake of completeness it may be worthwhile to give a description, as follows:

Tree. *Twigs* terete, finely grooved, 3 mm diam., greyish brown, densely pustular-lenticellate. *Leaves* 1-jugate; petiole semiterete, 1–1.75 cm long, 1 mm broad; petiolules 3 mm long; leaf axes slightly puberulous, glabrescent. *Leaflets* 7.5–9.5 by 2–3 cm, 3–3.75 times as long as wide, widest slightly above the middle, pergamentaceous, above slightly puberulous on the base of the midrib, furthermore glabrous; apex mostly tapering into a short, broad, rounded acumen, sometimes narrowly rounded; nerves 0.75–1 cm distant along the midrib, mostly strongly curved, only the few uppermost ones looped and joined, above prominulous, beneath slightly more so; veins and veinlets above laxly, beneath rather densely reticulate, prominulous. *Young inflorescences* like erect catkins, densely minutely hairy. *Flowers* and *fruits* unknown.

Field notes. Tree 28 m high, bole 17 m; bark brown with reticulate cracking, underbark redbrown; sapwood cream.

Distribution. SE. New Guinea, Northern Prov., Managalase area, S. side of Hydrographers Ra. near Siurane, *R. Pullen 5452* (L).

Ecology. Rain forest at c. 1100 m altitude.

Note. The present collection resembles *S. planitiei* but is different. If the disk might be glabrous it comes nearest to or might even represent *S. cuneata* Radlk., one of the Australian species.

4. TOECHIMA IN MALESIA

Contrary to several allied genera that are also mainly E. Australian, in Malesia restricted to New Guinea, and of which the number of New Guinea collections available is very small, e.g. *Diploglottis*, *Sarcotoechia*, and *Synima*, I could dispose of 53 collections of *Toechima* from all over New Guinea. Among these were the types of all three species mentioned by Radlkofer (in Engl., Pflanzenr. 98, 1933: 1249 ff.) as occurring in Malesia, viz. *T. hirsutum*, *livescens*, and *subteres*. (A fourth one, *T. plurinerve* Radlk., based upon material of unknown origin cultivated in the Bogor Botanic Garden, seems identical with the Australian species *T. daemelianum* (F. Muell.) Radlk.)

As to the variability, the great majority of the material agrees very well with *T. livescens* Radlk. *Toechima subteres* Radlk. should differ only by the about terete petioles; in *T. livescens* these are more or less semiterete, but the difference is not sharp and only very few specimens have the petiole really terete.

The hairiness is restricted mostly to the youngest part of the twig, above the youngest leaf, and to the inflorescences, also in fruit, and consists of appressed hairs. The axes of the youngest leaves remain often sparsely puberulous for some time. The pistil is hairy too, but the fruit is soon glabrous or nearly so. The fruit is the first part that may remain tomentellous, followed by the axes of the younger leaves. In these cases the indumentum becomes more dense and the hairs sometimes more patent. There is no clear correlation between hairiness and other characters, and the more hairy specimens are neither geographically nor ecologically restricted. Accordingly, I consider *T. hirsutum*, like *T. subteres*, synonymous to *T. livescens*.

A more puzzling variation was found in the flower. Normally, the petals are hardly clawed, the plate is transverse-elliptic, and the petal scales are broad. Correlated with this are stamens with a completely woolly filament. In a few cases the petals are long-clawed, the claw is tapering into an elliptic plate, the scales are narrow, and the filaments of the stamens are sparsely patent-hairy in the lower three fourths only. The most typical examples of the latter kind are: *LAE 56334* (Morobe Prov., Lae, Sankwep logging Rd., alt. 90 m), *NGF 7149* (Central Prov., Brown R.), *R. Pullen 7644* (Central Prov., c. 12 km N of Amazon Bay, alt. c. 30 m), and *8225* (Central Prov., Mori R., c. 15 km NE of Cape Rodney, alt. c. 30 m). These collections are rather uniform but in vegetative characters not distinguishable from many collections of *T. livescens*. For the moment I see neither reason nor possibility to separate this group.

Radlkofer mentioned in his description of *T. livescens* the great resemblance to *T. erythrocarpum* (F. Muell.) Radlk. from N. Queensland. In my opinion the mutual relationships can better be expressed by uniting them into one species and giving them the rank of subspecies, as follows:

Toechima erythrocarpum (F. Muell.) Radlk., Sapind. Holl.-Ind. (1879) 60. — *Cupania erythrocarpa* F. Muell., Fragm. 5 (1865) 7.

subsp. *erythrocarpum*

Twigs mostly medium brown; petiole strongly flattened above; nerves 2–5 cm distant along the midrib; inflorescences relatively lax mainly as the cymules are distinctly stalked; anther oblong, 0.8 mm long. — N. Queensland.

subsp. *papuanum* Leenh., *nov. subsp.*, based upon *T. livescens* Radlk., Sitzungsber. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. München 20 (1890) 266.

Twigs purple brown to black; petiole ± semiterete; nerves 1–3 cm distant along the midrib; inflorescences relatively dense mainly because the cymules are sessile or nearly so; anther orbicular, 0.4 mm long. — New Guinea.

Even these characters are not always clean-cut; some collections from New Guinea have partly *erythrocarpum* characters. However, as a whole the two subspecies are well distinguishable.

5. TRIGONACHRAS

TRIGONACHRAS

Trigonachras Radlk., [Sitzungsber. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. München 8 (1878) 299, 304, nom. inval.] Sapind. Holl.-Ind. (1879) 46; in Engl., Pflanzenr. 98 (1933) 1243. — **L e c t o t y p e** (present author): *T. acuta* Radlk.

Trees. *Indumentum* consisting of solitary simple hairs; no glandular scales. *Leaves* paripinnate with 1–9 opposite to alternate leaflets per side; no stipules; leaf axes and

leaflets either glabrous, or sometimes the former fairly densely hairy, the latter sparsely hairy on the basal part of the midrib, mainly beneath; neither petiole nor rachis winged. *Leaflets* often variably falcate, pergamentaceous; base mostly oblique, nearly always attenuate; margin entire; midrib above prominulous; nerves nearly always ending free, prominulous on both sides. *Inflorescences* axillary, together mostly pseudoterminal, by the shifting aside and suppression of the terminal bud sometimes seemingly truly terminal, thyrsoid, hairy, \pm glabrescent. *Flowers* regular, unisexual, monoecious. *Calyx* 5-merous, the sepals free, slightly imbricate, all about equal or sometimes the outer two slightly smaller, sometimes thinned out to the margin, out- and inside variably hairy or exceptionally inside nearly glabrous, sometimes ciliolate, no glands, margin entire. *Corolla* 5-merous, the petals longer than the calyx, distinctly clawed, glabrous or outside on the claw and the basal part of the plate sparsely hairy, the claw densely ciliate, the plate entire, inside with 2 or exceptionally 1 erect, densely woolly, not crested scale(s) nearly as long as the petal. *Disk* annular, \pm erect, \pm swollen, glabrous. *Stamens* 8 (rarely 7 or 9), in male flowers long exserted; filament filiform, broadened to the base, woolly in the lower 1/2–3/4; anther obovoid, hairy or glabrous, dehiscence latero-introrse to lateral. *Pistil* sessile, densely hairy, the ovary 3-locular with 1 ovule per locule, ascendent, apotropous, anatropous; style apical, about as long as the ovary; stigma grooved or slightly lobed. *Fruits* nearly always distinctly stiped, capsular, loculicidal, smooth, outside minutely hairy or glabrous, inside hairy, mostly densely and woolly so; pericarp hard-fleshy. *Seeds* ellipsoid, testa smooth, shining, black to brown; hilum nearly basal, elliptic, fairly big; no aril or sarcotesta. *Embryo* notorrhizal.

D i s t r i b u t i o n. Malesia: the Malay Peninsula, Sumatra, Borneo, the Philippines, Celebes, and New Guinea; 8 species.

E c o l o g y. Lowland forest, as well primary as secondary, often in marshes.

N o t e s. 1. Radlkofer's first publication of the then monotypic genus *Trigonachras* was invalid as he gave neither a generic nor a specific description but only a reference to a former description (ICBN Art. 42.1).

2. The first species published under *Trigonachras* was *T. cultrata* in 1878. This name was then invalid as at that time the genus was not yet validly published (ICBN Art. 43.1). When in 1879 the genus was validated, two species were mentioned, *T. acuta* and *T. cultrata*. As the genus is mainly characterised by the fruit, and as at that time fruits were only known from *T. acuta*, I choose this species as the lectotype of the genus.

3. Among the five new species three were represented by one very incomplete collection only. These have not been named but are indicated as *T. nov. sp. A, B, and C* respectively.

KEY TO THE SPECIES

- | | |
|--|-----------------------|
| 1a. Mature fruits hairy | 2 |
| b. Mature fruits glabrous. | 4 |
| 2a. Fruits 2–3 by 1.5–2 cm. <i>Philippines</i> | 3. <i>T. cultrata</i> |
| b. Fruits 4.5 by 2.25 cm or more. <i>Not Philippines</i> | 3 |

- 3a. Fruits up to 3 cm wide, the wall c. 1 mm thick. *West Malesia* 1. *T. acuta*
 b. Fruits 4 cm wide, the wall c. 10 mm thick. *New Guinea* 8. *T. papuensis*
 4a. Leaflets tapering into an acute acumen 5
 b. Leaflets not acuminate. 6
 5a. Leaves 7-jugate; petiolules 3–5 mm long. *Borneo* 4. *T. nov. sp. B*
 b. Leaves 1–4-jugate; petiolules 7–10 mm long. *Philippines* 5. *T. cuspidata*
 6a. Leaves 1- or 2-jugate; petiole flat above. *Celebes* 7. *T. celebensis*
 b. Leaves 3–5-jugate; petiole terete. *Borneo, Philippines* 7
 7a. Petiolules 3–9 mm long; leaflets 5–10 by 1.75–4 cm. *Borneo*
 2. *T. nov. sp. A*
 b. Petiolules 12–15 mm long; leaflets 11–15 by 5–6 cm. *Philippines*
 6. *T. nov. sp. C*

1. *Trigonachras acuta* (Hiern) Radlk.

Trigonachras acuta Radlk., Sapind. Holl.-Ind. (1879) 46; in Engl., Pflanzenr. 98 (1933) 1245; Corner, Wayside Trees (1940) 596, f. 212. – *Sapindaceae* Wall., Cat. (1848) nr. 9036. – *Cupania acuta* Hiern in J.D. Hook., Fl. Brit. India 1 (1875) 677. – Synonyms: *Maingay* KD 445, Malay Peninsula (CGE, K, L); *Wallich* 9036, Singapore (K).

Tree. *Twigs* subterete, when young \pm angular, 3–6 mm ϕ , grey to black, brown tomentellous, glabrescent. *Leaves* 3–8-jugate; petiole semiterete to terete, 1.5–6 cm long, 1–2 mm broad; petiolules semiterete to grooved above, 3–6 mm long; axes sparsely puberulous, mostly early glabrescent. *Leaflets* opposite to alternate, 4.5–12 by 1.5–4 cm, 2.25–4.5 times as long as wide, widest near the base to in the middle, slightly falcate, thin- to rather stiff-pergamentaceous, glabrous or with some appressed hairs on the lower side of the midrib, often with small glands in the nerve axils beneath; base equalsided to oblique (narrower at the basicopic side), blunt to acute or sometimes rounded, slightly attenuate; apex mostly tapering into an acute acumen, sometimes acute to blunt; nerves 0.5–1.5 cm distant, spreading, strongly curved, ending free; reticulation fairly coarse, equally raised on both sides. *Inflorescences* pseudoterminal and sometimes terminal, 10–20 cm long, without or with few long branches, mostly few-flowered, fulvous puberulous. *Sepals* broad-ovate, 1.3–1.75 by 1.25–1.75 mm, out- and inside fairly densely, or inside rather sparsely, appressed short-hairy, margin ciliate. *Petals* 2–3 by 1.6–2.5 mm, the plate orbicular, the claw outside sometimes with a few hairs, furthermore glabrous, inside with 2 scales somewhat more than half as long as the petal. *Stamens* 7 or 8; filament up to 5.5 mm long, fairly densely patently long-hairy but for the upper fourth; anther 1 mm long, glabrous. *Pistil* 3- (exceptionally 4-)merous, shortly brown hairy; ovary slightly 3-gonous, tapering into the at least equally long style which is slightly twisted in the upper half; stigma grooved. *Fruits* \pm triangular-clavate, apiculate, 4.5–5 by 2.25–3 cm, brown tomentellous (red when fresh), wall c. 1 mm thick, hard (thick and fleshy when fresh), endocarp wrinkled, sparsely to densely woolly. *Seeds* 1.5 by 1 cm, dark purple brown, hilum basal, transversely elliptic, c. 7 by 5 mm.

Field notes. Tree up to 25 m high by 50 cm d.b.h.; bole straight or crooked, smooth or sometimes fissured, at the base with buttresses up to 1.20 m high,

1.50 m spreading, and 7.5 cm thick; crown spreading. Bark lenticellate to scaly, grey to yellowbrown or reddish; inner bark soft, fibrous, white, reddish, yellowish or yellowbrown, with sticky white latex; sapwood white, medium hard. Flowers whitish yellow. Fruits yellowish when young, red when ripe, fleshy, with creamy sticky sap. Seeds shiny, black.

Distribution. Sumatra, the Malay Peninsula, and Borneo (Sabah).

Ecology. In primary and secondary forests, often in swamps, also along river banks, along roads, on slopes and ridges, often on sandy soils; altitude 0–225 m. *Fl.* April–June; *fr.* Febr., July–Sept., Nov.

SUMATRA. North: *Lörzing 14587*, Serdang, estate Gallia above Bangunpurba (L). – Riouw-Lingga Archipelago: *Teysmann s.n.*, P. Bintang (M).

MALAY PENINSULA. Kelantan: *Maingay 1381* = *KD 445* p.p., P. Besar (K). – Pahang: *KEP 94628*, *KEP FRI 2086*, along Nenasi-Pekan Road (K, L, resp. K, L, SAN). – Selangor: *A. Denny Tulong Dain 130*, Sepang (K). – Malacca: *Maingay 2924 A* (K), *B* (K), *C* (L) = *KD 445* p.p. – Johore: *SF 28630*, Sungai Sedili Kechil (K, SING). – Singapore: 4 collections (Bt. Timah and Golf Course).

BORNEO. Sabah: 11 collections.

2. *Trigonachras* nov.sp. A

Tree 30 m high. *Twigs* terete, 5 mm \varnothing , grey, glabrous. *Leaves* 3–5-jugate; petiole terete, 3.5–4 cm long, 1.5–2 mm thick; petiolules above slightly grooved, 3–9 mm long; axes glabrous. *Leaflets* opposite, 5–10 by 1.75–4 cm, 2.5–3 times as long as wide, widest about the middle, slightly falcate, stiff-pergamentaceous, glabrous, without glands; base hardly to distinctly oblique, acute, strongly attenuate; apex acute; nerves 1–1.5 cm distant, spreading, straight, ending free; reticulation coarse, on both sides prominent. *Inflorescences* pseudoterminal, 12–15 cm long, in fruit sparsely branched, fairly densely puberulous. *Flowers* only known from remains under the fruit. *Sepals* outside sparsely, inside densely hairy. *Fruits* (probably young) triangular-obovoid, 2.75 by 1.5 cm, narrowed to the base, at apex apiculate, glabrous; pericarp somewhat fleshy, at least 1 mm thick, endocarp densely woolly.

Field notes. Tree 30 m high, bole 24 m by 35 cm d.b.h. Outer bark smooth, rather lenticellated; inner bark brownish; sapwood grey. Young fruits reddish yellow.

Distribution. Borneo (Sabah).

Ecology. Hill side at 180 m altitude. Young fruits in July.

Note. Apparently allied with *T. acuta*. Not yet named as the (important) fruits of the only specimen known appear to be still immature.

BORNEO. Sabah: *NBFD SAN 75360*, Dist. Sandakan, 2 miles up microwave station (L).

3. *Trigonachras cultrata* (Turcz.) Radlk.

Trigonachras cultrata Radlk., [Sitzungsber. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. München 8 (1878) 299, nom. inval.] Sapind. Holl.-Ind. (1879) 46; in Engl., Pflanzenz. 98 (1933) 1246. –

- Sapindus cultratus* Turcz., Bull. Soc. Imp. Naturalistes Moscou 31 (1858) 403. — **T y p e**: *Cuming 1304*, Luzon (iso in FI, L, M, P, SING).
- Trigonachras brachycarpa* Radlk., *Leafl. Philipp. Bot.* 5 (1913) 1614; in Engl., *Pflanzenr.* 98 (1933) 1248. — **T y p e**: *Elmer 10949*, Mindanao, Dist. of Davao, Todaya, Mt Apo (M; iso in FI, K, L, NY, U).
- Trigonachras obliqua* Radlk., *Philipp. J. Sci.* 8 (1914) Bot. 467; in Engl., *Pflanzenr.* 98 (1933) 1245. — **T y p e**: *Bernardo FB 13108*, Luzon, Cagayan Prov. (M).
- Trigonachras rigida* Radlk., *Philipp. J. Sci.* 8 (1914) Bot. 467 p.p.; in Engl., *Pflanzenr.* 98 (1933) 1247 p.p. — **L e c t o t y p e** (present author): *Merrill 2967*, Luzon, Zambales, Botolan (M; iso in BM, K, NY).
- Trigonachras membranacea* Radlk., *Philipp. J. Sci.* 8 (1914) Bot. 468; in Engl., *Pflanzenr.* 98 (1933) 1248. — **S y n t y p e s**: *Clark FB 1073*, Is. of Ticao (M, NY); *Vidal 2488*, ditto (K); *Vidal 2500*, Is. of Panay, Prov. Ilo-ilo, Miagas (K).
- Trigonachras spectabilis* Radlk., *Philipp. J. Sci.* 8 (1914) Bot. 469; in Engl., *Pflanzenr.* 98 (1933) 1248. — **T y p e**: *C.M. Weber 1194*, Mindanao, Butuan Subprov., Vereula (M; iso in BM, K).

Tree. *Twigs* terete, when young angular, 3.5–9 mm ϕ , light to purplish grey, early to late glabrescent. *Leaves* 5–9-jugate; petiole terete, mostly flattened at the base, to semiterete, 3–13.5 cm long, 1–4 mm thick; petiolules slightly grooved above, 2.5–8 mm long; axes glabrous, often with the exception of the base of the petiole, to tomentose. *Leaflets* opposite to alternate, 3.5–18 by 1.5–7 cm, 2–4 times as long as wide, widest below or sometimes about the middle, straight to falcate, (mostly thin-)pergamantaceous, glabrous to sometimes sparsely hairy on the base of the midrib above, on its basal half beneath, mostly with domatia or small glands in some to most of the nerve axils beneath; base oblique to sometimes equalsided, rounded to acute, attenuate; apex acute to sometimes rounded; nerves 1–3 cm distant along the midrib, widely to steeply spreading, variably curved, ending free; reticulation rather coarse or sometimes beneath dense, beneath mostly more prominent than above. *Inflorescences* around the apex in the axils of caducous leaves, together pseudoterminal, up to 40 cm long, with few spreading branches, rather densely ferruginous puberulous, \pm glabrescent. *Sepals* ovate, 2–2.2 by 1.6–2 mm, outside densely, inside densely to sparsely hairy, not ciliate. *Petals*: claw 1 mm long, plate transverse-elliptic, in total 3–3.5 by 2–3 mm, claw and basal half of plate outside sparsely woolly, inside glabrous, inside with 2 scales. *Stamens* 8; filament 6.5–7.5 mm long, in the lower half variably woolly; anther 1.4–1.5 mm long, glabrous. *Fruits* globular to triangular-obovoid, mostly narrowed into an up to 1 cm long stipe, mostly apiculate, in total 2–3 by 1.5–2 cm, densely ferruginous or fulvous puberulous to tomentose, wall 1–3 mm thick, fleshy, endocarp finely transversely wrinkled, sparsely to sometimes densely woolly. *Seeds* 11–12.5 by 7–8 mm, brownish black, hilum suborbicular to transverse-elliptic, 2–6 by 2–6 mm.

Field notes. Tree up to 22 m high by 50 cm d.b.h. Bark smooth, greyish white mottled; sapwood white, rather soft, without smell or taste. Flowers: calyx yellowish brown; corolla white; filaments pinkish white, anthers yellow. Fruits yellow to dark ferruginous; seeds black.

Distribution. The Philippines.

Ecology. In primary forest, on ridges, along rivers, and near the sea shore; altitude 0–500 m. *Fl.* April and May; *fr.* June–Aug.

Note 1. Whereas most of the collections are nearly glabrous, four collections from Luzon, viz. *BS 45471*, *Clemens 16756*, *FB 13108*, and *FB 77135*, have the twigs, leaf axes, and inflorescences densely tomentose.

2. The collection *PNH 37151* deviates from the other collections in the fruit with a thin horny wall. I have the impression that this is an aberration.

3. The species as here delimited encompasses six of Radlkofer's species. Radlkofer based these six species on nine collections, the present author had 17 collections at his disposal. Radlkofer's species were mainly characterised by differences in the shape of the fruit and of the leaflets. As for the fruits, these were mainly differences between immature and mature fruits. As to the leaflets the relatively slight differences given by Radlkofer in his key turned out to fall within the individual variability. In only two cases Radlkofer could see more than one sheet of a collection, whereas the present author could often compare four or five sheets of the same collection and found a relatively wide variation especially in the shape and size of the leaflets.

PHILIPPINES. LUZON: 8 collections. – Ticao Is.: *FB 1073* (M, NY); *Vidal 2488* (K). – Panay: *BS 35525*, Capiz Prov., Libacao (BM, P); *Vidal 2500*, Ilo-ilo Prov., Miagao (K). – MINDANAO: 5 collections.

4. *Trigonachras* nov.sp. B

Tree. Twigs terete, 4 mm ϕ , brownish black, thin-tomentellous, early glabrescent. *Leaves* c. 7-jugate; petiole subterete, c. 5 cm long, 2 mm thick; petiolules above slightly grooved, 3–5 mm long; axes thin-tomentellous. *Leaflets* (sub)opposite, 7.5–11.5 by 3–4 cm, 2.5–3 times as long as wide, widest below the middle, slightly falcate, membranaceous (but probably young), above glabrous, beneath tomentellous on the midrib, with small domatia in the lower nerve axils; base oblique, the basispic side acute and strongly attenuate, the acroscopic side rounded and hardly attenuate; apex tapering into an acute acumen; nerves c. 1 cm distant along the midrib, spreading, straight to slightly curved, ending free; reticulation above dense, beneath coarse, on both sides prominulous. *Inflorescences* and *flowers* unknown. *Fruits* triangular ellipsoid, 3 by 2 cm, at base tapering into a short stipe, the apex apiculate, wrinkled, glabrous.

Field notes. Tree 25 m high by 65 cm ϕ , with buttresses 3.60 m high and 1.20 m spreading. Fruits brown.

Distribution. Borneo (Sarawak).

Ecology. On limestone slope, grey sandy soil; altitude 250 m. *Fr.* Sept.

Note. Possibly nearest to *T. nov. sp. C* from Mindanao. As the leaves are young and as there is only one probably immature fruit which I did not like to destroy I decided to leave this species unnamed.

BORNEO. Sarawak: *Sarawak Forest Department S 28037*, Serian Dist., Tebakang Road, Lobang Mawang, Bt. Selabor (L).

5. *Trigonachras cuspidata* Radlk.

Trigonachras cuspidata Radlk., Philipp. J. Sci. 6 (1911) Bot. 182; in Engl., Pflanzenz. 98 (1933) 1246. — Type: *E. Hagger FB 1411*, Polillo Is. (M).

Trigonachras falcatocuspudata Radlk., Philipp. J. Sci. 20 (1922) 661; in Engl., Pflanzenz. 98 (1933) 1247. — Lectotype (present author): *Ramos BS 14920*, Luzon, Prov. Laguna, San Antonio, fr. (M; iso in BM).

Trigonachras rigida Radlk., Philipp. J. Sci. 8 (1914) Bot. 467 p.p., excl. type.

Tree. *Twigs* terete, 4–5 mm ϕ , blackish, glabrous. *Leaves* 1–4-jugate; petiole semiterete to terete, 3–6.5 cm long, 1–2 mm broad; petiolules above slightly grooved, 7–15 mm long; axes glabrous. *Leaflets* opposite, 5–14 by 2–4.75 cm, 2–3 times as long as wide, widest about the middle, slightly falcate, stiff-pergamentaceous, glabrous, without glands; base oblique, acute, attenuate; apex \pm tapering long acute acuminate; nerves 1–2 cm distant along the midrib, spreading, strongly curved, ending free; reticulation coarse, prominulous on both sides. *Inflorescences* seemingly terminal as the vegetative terminal bud is mostly shifted aside and suppressed, c. 12 cm long, sparsely branched, densely appressedly shortly brown hairy. *Sepals* broad-ovate, 1.5 by 2 mm, out- and inside sparsely hairy. *Petals*: plate 1.5–3 by 1.3 mm, broad-ovate, glabrous, inside with 2 short scales. *Stamens* 8; filament 5 mm long, woolly in lower two thirds; anther 1.5 mm long, sparsely ciliate. *Pistil* 3-merous. *Fruits* triangular-ellipsoid, stiped and apiculate or not, 4–5 by 2–3 cm, glabrous, wall fleshy, c. 5 mm thick, endocarp densely brown woolly. *Seeds* 1.5 by 0.75 cm, brown, hilum basal, suborbicular.

Field notes. Tree up to 15 m high by 40 cm d.b.h. Fruits yellow to orange.

Distribution. The Philippines (Luzon, Polillo). Acc. to Merrill (Enum. Philipp. Fl. Pl. 2, 1923: 511, sub *T. falcatocuspudata*) also known from Mindanao; this must have been based upon *BS 28633* and/or *34738*, collections not seen by the present author, and may refer to *T. cultrata*.

Ecology. Behind mangrove and in lowland forests. *Fl.* Febr.–March; *fr.* June–July.

PHILIPPINES. LUZON: *BS 14920*, Prov. Laguna, San Antonio (BM, M); *BS 20467*, ditto (K, L, M, NY); *FB 18727*, Prov. of Camarines, Paracale (M). — Polillo Is.: *FB 1411* (M); *FB 30981*, Hook Bay (NY, SING).

6. *Trigonachras* nov. sp. C

Tree. *Twigs* terete, c. 8 mm ϕ , dark grey, glabrous. *Leaves* 5-jugate; petiole terete, 9.5 cm long, 2.5 mm ϕ ; petiolules above broadly shallowly grooved, 12–15 mm long; axes glabrous. *Leaflets* (sub)opposite, 11–15 by 5–6 cm, 2–3 times as long as wide, widest about the middle, straight to subfalcate, pergamentaceous, glabrous, with some glands in the lower nerve axils beneath; base hardly oblique, acute, attenuate; apex acute or the very apex rounded; nerves 1.75–2.25 cm distant along the midrib, spreading, moderately curved, ending free; reticulation rather coarse, beneath more prominent than above. *Inflorescences* and *flowers* unknown. *Infructescences* pseudoterminal, c. 30 cm long, hardly branched, puberulous, glabrescent.

Fruits globular, abruptly narrowed into a c. 5 mm long stipe, in total 3–3.25 by 2.25–2.5 cm, apiculate at the apex, slightly wrinkled, glabrous; wall fleshy, 1–2 mm thick; endocarp densely woolly. *Seeds* unknown.

Field notes. Tree up to 20 m high by 40 cm d.b.h. Fruit orange.

Distribution. The Philippines (Mindanao).

Ecology. In dry forest at low altitude.

Note. Apparently a good species from the alliance of *T. cuspidata*, nearest to *T. nov. sp. B* and also allied with *T. celebensis*. As this species is represented by only one rather incomplete collection, I refrain from naming it.

PHILIPPINES. Dinagat Is.: BS 83920 (NY).

7. *Trigonachras celebensis* Leenh., *nov. spec.*

Description typi: Arbor. *Ramuli* teretes 3–4 mm crassi, glabri. *Folia* 1- vel 2-jugata; petiolus semiteres 3–6 cm longus, 1,5 mm latus; petioluli supra applanati, 5–12 mm longi; axes foliorum glabri. *Foliola* opposita vel alterna, 6–13 cm longa, 2–5 cm lata, oblonga, non vel vix falcata, pergamentacea, glabra, vix vel eglandulifera; basis non vel vix obliqua, acuta ad rotundata, attenuata; apex anguste rotundatus ad acutus; nervi secundarii inter sese 1–2 cm distantes, subpatentes, curvati, ad marginem liberi; venae intercalares distinctae, venae venulaeque laxae reticulatae supra et subtus prominulae. *Inflorescentiae* pseudoterminales 6–12 cm longae, pauce ramosae, subdense adpresse crinitae. *Sepala* late ovata, 1,3 mm longa, 1,6 mm lata, extus sparse adpresse crinita intus glabra. *Petala* longe unguiculata, 2,5 mm longa, 1,5 mm lata, glabra unguem ciliatum excepta, bisquamata; lamina elliptica. *Stamina* 8; filamentum 6 mm longum, in parte basali lanatum; anthera 1,25 mm longa, subdense adpresse crinita. *Fructus* triangulato-ellipsoidei, 2,75–3 cm longi, 2 cm lati, glabri, abrupte 5–7,5 mm longe stipitati, subapiculati; pericarpium ca. 3 mm crassum carnosum; endocarpium dense lanatum. – *T y p u s:* *S. Prawiroatmodjo & S. Soewoko 1747*, SE. Celebes, around Opa Swamp, Mt Makaleo, 122° E 4°5' S (L).

Tree. *Twigs* terete, 3–4 mm \varnothing , dark redbrown to blackish, glabrous. *Leaves* 1- or 2-jugate; petiole semiterete, 3–9 cm long, 1.5 mm broad; petiolules above flattened, 5–12 mm long; axes glabrous. *Leaflets* opposite to alternate, 6–15 by 2–6 cm, 2–3.5 times as long as wide, widest below or in the middle, straight to subfalcate, variably pergamentaceous, glabrous, with some small glands along the basal part of the midrib beneath; base hardly to distinctly oblique, acute or rounded, attenuate; apex rounded to acute; nerves 1–2 cm distant along the midrib, spreading, rather strongly curved or at first nearly straight, ending free; intercalated veins rather strongly developed, reticulation rather coarse, prominulous on both sides. *Inflorescences* pseudoterminal, 6–c. 15 cm long, sparsely branched, rather densely appressedly shortly yellowish brown hairy. *Sepals* broad-ovate, 1.3–2.25 by 1.2–1.6 mm, outside sparsely appressed-hairy, inside the same to glabrous. *Petals* long-clawed, 1.6–2.5 by 1–1.5 mm, the plate elliptic, claw and base of plate outside sparsely appressed-hairy to glabrous, inside glabrous, with 2 scales or sometimes 1 entire scale. *Stamens* 8 or 9; filament 6 mm long, woolly in the lower two thirds; anther 1.1–1.4 mm long, subglabrous to fairly densely appressed-hairy. *Fruits* triangular-ellipsoid, 2.75–3 by 2 cm, abruptly narrowed into a c. 0.5–0.75 cm long stipe, \pm apiculate, glabrous; wall c. 3 mm thick, fleshy; endocarp densely woolly. *Seeds* unknown.

Field notes. Tree up to 25 m high by 35 cm d.b.h., with buttresses 85 cm high, 67 cm spreading, and 9 cm thick. Outer bark 1.5 mm thick, outside dark brown, without grooves or scales, inner bark 4 mm thick, in section and inside brown. Young leaves light green. Flowers white; anthers brown. Fruits green via yellow to orange.

Distribution. Celebes.

Ecology. Primary and secondary dryland forest on limestone or clay; altitude up to c. 250 m. *Fl.* Nov.–Dec.; *fr.* Nov.

CELEBES. Central: *Kjellberg 2386*, Waraoe (BO); *NIFS Cel.III-230*, Malili, near Oesoe (A, BO); *NIFS Cel.III-400*, Malili, Kawatta (BO, L, U). – Southeast: *Prawiroatmodjo & Soewoko 1747*, near Opa Swamp, Mt Makaleo, 122° E 4°5' S (L); *s.n.*, hills W of Polipolia, 122° E 4°5' S (L sh. nr. 983.296-346).

8. *Trigonachras papuensis* Leenh., *nov. spec.*

Descriptio typi: Arbor. *Ramuli* teretes, juveniles angulati, 5 mm diam., tomentulosi, glabrescentes. *Folia* 4-jugata; petiolus teres, 7–11 cm longus, ca. 2 mm crassus; petioluli supra sulcati, 5–10 mm longi; axes foliorum glabri. *Foliola* opposita ad alterna, 6–14 cm longa, 2–5 cm lata, oblongo-ovata, falcata, pergamentacea, glabra, subtus in axilla nervorum glandulifera; basis aequalis acuta attenuata; apex acute acuminatus; nervi secundarii inter sese 0,75–1,5 cm distantes, oblique patentes, subcurvati, ad marginem non coniuncti; venae venulaeque laxae reticulatae, supra et subtus prominulae. *Inflorescentiae* pseudoterminales ad 12 cm longae, pauce ramosae, puberulae. *Fructus* triangulato-obovoidei, astipitati, non apiculati, 5 cm longi, 4 cm diam., fusco-tomentulosi, pericarpio carnosus ca. 1 cm crasso, endocarpio rugoso ferrugineo-tomentoso. – **T y p u s:** *E. E. Henty NGF 20513*, SE. New Guinea, Milne Bay Prov., Harada R. below Waigani Pltn., 10°20' S 150°17' E (L; iso in K).

Tree. *Twigs* terete, when young ± angular, 4–7 mm ø, grey to blackish, brown tomentellous, early fully glabrescent. *Leaves* 3–5-jugate; petiole terete, flattened to the base, 5–11 cm long, 1.5–2.5 mm broad; petiolules above slightly grooved, 5–15 mm long; axes glabrous. *Leaflets* opposite to alternate, 5.5–14 by 2–5.25 cm, 2–3 times as long as wide, widest in the lower half, falcate, thin- to rather stiff pergamentaceous, glabrous, often with glands in the nerve axils and sometimes in the branching of the veins beneath; base oblique or sometimes equalsided, acute to sometimes blunt, attenuate; apex acute to sometimes tapering into an acute acumen; nerves 0.75–1.5 cm distant along the midrib, widely spreading, mostly strongly curved, ending free or sometimes ± looped and joined; reticulation coarse, above more prominent than beneath. *Inflorescences* pseudoterminal, up to c. 12 cm long, sparsely branched, fulvous puberulous. *Sepals* broad-ovate, out- and inside sparsely sericeous. *Petals* glabrous, inside with 2 scales. *Stamens* 8; anther ciliate. *Pistil* 3-merous, densely brownish hairy. *Fruits* ellipsoid to obovoid, not or shortly stalked, not apiculate, 4.5–6 by 4 cm, light brown tomentellous, ± glabrescent, pericarp c. 1 cm thick, ± fleshy, endocarp wrinkled, ferruginous tomentose. *Seeds* unknown.

Field notes. Tree up to 30 m high by 100 cm d.b.h., buttresses up to 1 m high. Bark pustular, grey brown to brown or patchy dark grey, light grey, and pale green; inner bark pink straw to light brown, brittle, without smell, sometimes with some clear sticky exudate. Sapwood white to straw, medium hard; heartwood light

pinkish straw. Leaves mid to dark green, above darker than beneath, glossy above, dull beneath, sometimes with yellowish veins. Flower buds yellowish. Fruits brown.

D i s t r i b u t i o n. SE. New Guinea.

E c o l o g y. Rain forest or secondary vegetation on hills, flood plains, and river banks, altitude up to 200 m. *Fl.* Dec.; *fr.* March, June, Nov.

NEW GUINEA. SE: *Brass* 28919, Milne Bay Prov., Modewa Bay, Harala-ama R. (K, L); *NGF* 20513, Milne Bay Prov., Harada R. below Waigani Pltn., 10°20' S 150°17' E (K, L); *NGF* 38612, Central Prov., Abau Subdist., Cape Rodney, TP 107, 10°7' S 148°18' E (K, L); *NGF* 42923, Milne Bay Prov. and Subdist., Gumine R., 10°22' S 150°15' E (K, L); *R. Pullen* 7660, Central Prov., Nunumai c. 12 km N of Amazon Bay, 10°11' S 149°23' E (L). – D'Entrecasteaux Is.: *LAE* 68754, Fergusson Is., track between Gamwabila and Tutubes (K, L).