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A REVISION OF CROSSONEPHELIS (SAPINDACEAE)

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CROSSONEPHELIS

Crossonephelis Baill., Adansonia 11 (1874) 245; Hist. Pl. 5 (1874/5) 352, 400; Radlk., Pfl. R. Heft 98 (1932) 818; Capuron, Mém. Mus. Nat. Hist. Nat., n.s., B 19 (1969) 83. — Type: *C. pervillei* Baill.

Melanodiscus Radlk. in Durand, Ind. Gen. (1888) 75; Sitz. Ber. K. Bayer. Ak. Wiss. M.-Ph. Kl. Münch. 20 (1890) 244, 285; in E. & P., Nat. Pfl. Fam. 3, 5 (1895) 321; Pfl. R. Heft 98 (1932) 816. — Type: *M. africanus* Radlk. (= *Crossonephelis africanus* Leenh.).

Cnemidiscus Pierre, Fl. Coch. (1894) t. 320 A, text; Radlk., Pfl. R. Heft 98 (1933) 1016; Gagnep., Fl. Gén. I.-C. Suppl. 1 (1950) 976. — *Nephelium* sect. *Cnemidiscus* Pierre *ex* Lecomte, Fl. Gén. I.-C. 1 (1912) 1052. — Type: *C. thorelii* Pierre (= *Crossonephelis thorelii* Leenh.).

Hedyachras Radlk., Bot. Jahrb. 56 (1920) 258; Pfl. R. Heft 98 (1932) 870. — Type: *H. philippinensis* Radlk. (= *Crossonephelis philippinensis* Leenh.).

Tress or shrubs, exceptionally scandent; monoecious or dioecious; indument either consisting of solitary simple hairs, sometimes intermingled with some pairs or small tufts, or mainly consisting of small stellate tufts; neither glandular-capitate hairs nor glandular scales present. *Leaves* either all spiral or partly decussate, unifoliolate or paripinnate, 1—6-jugate, the lowermost pair sometimes stipule-like; neither petiole nor rachis winged. *Leaflets* opposite to alternate, beneath smooth, glabrous or variably hairy, mostly with hair tufts in (part of) the nerve axils beneath; base equalsided to slightly oblique; margin entire to undulate, exceptionally (in *C. africanus*) coarsely dentate towards the apex; nerves usually looped and joined in the upper part only, veins and veinlets finely reticulate, prominulous at both sides (in *C. palawanicus* sometimes hardly visible above). *Inflorescences* terminal and mostly in the upper leaf axils, thyrsoid or paniculate (exceptionally racemose), with few spreading often densely flowered branches. *Flowers* actinomorphic. *Calyx* (3- or) 4- or 5-merous, the lobes connate at base, induplicate-valvate to nearly imbricate in bud, spreading during and persistent and recoiled after anthesis, equal, deltoid, not petaloid, outside densely tomentose, inside variably hairy to sometimes glabrous. *Petals* absent. *Disk* for the greater part adnate to the base of the calyx, complete, broad and flat, more or less distinctly lobed, without appendage, yellowish or reddish when fresh, purplish black when dry, glabrous or rarely variably pubescent. *Stamens* 4—7, equal, exserted, glabrous (except in *C. adamii*); filament threadlike, in ♂ flowers in nearly mature bud probably always bent twice, first to the back downward, up again to the ventral side; anther basifixed, emarginate at base, dehiscing lateral to introrse; staminodes short. *Pistil* 2- (in *C. africanus* very rarely 3-) merous; ovary sessile,

J'ai dédié cette révision à la mémoire de M. R. Capuron, connaisseur excellent de la flore malgache, auteur d'une révision très importante des Sapindacées de Madagascar et des Comores, le premier qui, dans ladite révision, exprimait des opinions assez divergentes par rapport à la place systématique de même qu'à la circonscription du genre Crossonephelis, opinions confirmées complètement dans ma révision du genre.

about cordate to flattened-ovoid, densely hairy, inside cells with a few hairs at base (except in *C. penangensis*; unknown in *C. philippinensis* and *C. thorelii*); style apical, conical and short to subulate and about as long as the ovary, variably hairy; stigma principally 2-lobed, the lobes nearly always erect (recurved in *C. palawanicus*), inside papillose, often apparently connate in which case the upper part of the style bears two thick, often slightly twisted stigmatic lines; ovules 1 per cell, inserted on a knob on the base of the axis, erect, apotropous, subcampylotropous; pistillode small, white woolly. *Fruit* hardly to distinctly 2-lobed (1 lobe often not developed), the lobes slightly or not compressed, rounded, not winged, indehiscent, tomentose, scurfy, or glabrous, pericarp mostly rather thick and fleshy (thin in *C. palawanicus*, fibrous in *C. penangensis*, unknown in *C. thorelii*), endocarp membranous to thin-crustaceous. *Seed* with a thin-crustaceous to thin-coriaceous testa, closely adhering to the endocarp; no aril. *Embryo* straight to slightly curved, cotyledons transverse or obliquely superposed, about equal or the upper one slightly bigger, thick, seemingly superficially ruminate (mainly when dried), radicle ventral, minute (see also Capuron, l.c.).

Distribution: 6—8 species, 2 or 3 of which in tropical continental Africa, 1 in Madagascar, 1 in Indo China, 1 on the Malay Peninsula, 1 in the Philippines, and 1 throughout Malesia from Sumatra to New Guinea.

Ecology: Apparently, all species are confined to the tropical rain forest, but as to the further ecological conditions there seems to be a lot of variation within and differentiation between the species.

Morphology. *Monoecism and dioecism.* The situation is probably as in many *Sapindaceae*: all flowers are originally potentially bisexual and only in a relatively late stage of development some factor (probably an external one) is decisive whether a certain bud will develop into a ♂ or a ♀ flower (see Mustard, Liu & Nelson, Proc. Florida Hort. Soc. 66, 1954, 212—220). In the many-flowered thyrsoid inflorescences of most *Sapindaceae* this will usually lead to monoecism with ♂ and ♀ flowers in the same inflorescence. In *Crossonephelis* we find this situation in *C. penangensis*, *pervillei*, and *philippinensis*. In the other species, however, with the poorer, essentially racemose inflorescences, all flowers make the impression of being of nearly the same age, and all flowers in one herbarium specimen seem to be of the same sex. It remains possible, however, that these species too are not really dioecious but that either inflorescences of a different age are also different in sex, or that the same tree may at one time bear mainly inflorescences of the one sex, at an other time those of the other sex. This problem can be solved in the field only.

I am not sure whether *glandular hairs* are present, as stated by Radlkofer, or not. Especially in the rather dense indumentum of the inflorescences one gets the impression of glandular hairs between the normal ones, but all I could really identify were either fungal threads with sporangia, or was dirt attached to the hairs. The latter, however, may point to stickiness and hence to the presence of glands.

Capuron (l.c.) may be right in his observation that the *stamens* of the continental African species, if there are as many as sepals, are alternisepalous. As the number of stamens in these species is nearly always higher than the number of sepals, this is very difficult to check in the herbarium without destroying too much material. In *C. pervillei*, where the stamens are nearly always isomerous, they are oppositisepalous. (The Asian species have always more stamens than sepals.)

Pseudostipules are present only in *C. africanus*, and even here they are rather variable: from a lower pair of smaller leaflets, inserted only slightly above the base of the petiole but furthermore normal, they may vary to a pair of typical 'stipules' at the base of the leaf, in the inflorescence even replacing the bracts (as the leaf breaks off just above the

'stipules'). See also Weberling & Leenhouts, Abh. Akad. Wiss. Lit. Mainz, Math.-Naturw. Klasse, 1965, 10, p. 499—584.

Systematics. The genera *Crossonephelis*, *Melanodiscus*, *Hedyachras*, and *Cnemidiscus* were kept separate by Radlkofer (1932), the former two in the tribe *Lepisantheae*, *Hedyachras* in the *Melicocceae*, and *Cnemidiscus* in the *Nephelieae*. The position of *Hedyachras*, based exclusively on the shape of the fruit, was doubtless wrong. Capuron (1969, p. 84), who was the first to unite the former two genera, already pointed to the close relationship of *Hedyachras* with this complex. Independently, the present author had also reached the conclusion that *Hedyachras* should be placed near *Melanodiscus* instead of among the *Melicocceae*. As to *Cnemidiscus*, which was (and still is) very incompletely known, Radlkofer followed Pierre who even hesitated between making it a separate genus or a section of *Nephelium*.

Even though the elements included in the present concept of *Crossonephelis* have been derived from 6 genera divided over 3 tribes, the coherence is so strong and the variation in most characters so slight that it is difficult to reach a conclusion on the mutual relationships of the species. I have the impression that as a whole *C. pervillei* (Madagascar) is the most primitive among the living species. It seems distinctly allied on the one hand with the continental African species, on the other with *C. palawanicus*, the most wide-spread and least specialized among the Malesian ones. The species of the African continent are mutually closely allied: *C. africanus* is wide-spread and shows the greatest morphologic plasticity, including as well the most primitive (pistil exceptionally 3- merous) as the most advanced characters (pseudostipules). *C. unijugatus* and *adamii* are both morphologically as well as geographically far more restricted. The latter is geographically isolated from the rest of the genus and shows in its hairy stamens a character further unknown in the genus. These two species are at least mutually closely allied, if really separate. Among the Malesian species, *C. palawanicus* may be the oldest. *C. thorelii* is doubtless very close to it, if specifically different. *C. penangensis* and *C. philippinensis* appear to be more specialized, especially in their fruits.

Geographically, the picture sketched may lead to the conclusion that the origin of *Crossonephelis* may have been in Madagascar (or Africa), that it spread to the west through Africa, to the east possibly via the old track south of the Asian continent towards Malesia where it still could reach New Guinea.

This picture, though rather subjective and not very well founded, is as a whole in good accordance with the one reached by my colleague Mr. J. Muller independently on palynological grounds (Blumea 21, 1973, 105—117). The same holds true for the systematic position of *Crossonephelis*. The inclusion in the *Lepisantheae*, in accordance with Capuron and even mainly with Radlkofer, seems fully justified. It is one of the most derived genera of this alliance. Morphologically, it comes closest to *Chonopetalum*, *Lepisanthes*, and *Placodiscus*. The former two of these appear to be a little more primitive as a whole, *Chonopetalum* because of the presence of petals, whereas *Lepisanthes* differs mainly by the free, imbricate sepals and the presence of petals (with very few exceptions), whereas the ovary is often 3-merous. *Placodiscus* stands at about the same level as *Crossonephelis*: sepals distinctly higher up connate, but ovary 3-merous. *Lepisanthes* may, on geographical grounds, probably be excluded as directly connected with *Crossonephelis*: its centre of origin seems to be in W. Malesia from where it reached Africa only in one of its most derived species, possibly via the younger continental Asian track. Mr. J. Muller also concludes that *Crossonephelis* seems allied with *Placodiscus* rather than with *Lepisanthes*.

The present revision is based upon material from the following herbaria: BM, BO, BR,

K, L, M, NY, P, SING, UC. My thanks are due to the directors of these institutes for placing this material at my disposal.

KEY TO THE SPECIES

1a. Lowermost pair of leaflets attached near or at the base of the leaf, ± stipule-like. Margin of leaflets entire to wavy, sometimes coarsely sinuate to dentate. *Tropical Africa* . . . . . **2. C. africanus**
b. Lowermost pair of leaflets not stipule-like. Leaflets entire. 2
2a. Leaflets thin, papyraceous. Inflorescences up to 10—15 cm long 3
b. Leaflets ± stiff, chartaceous to subcoriaceous. Inflorescences up to 15—25 cm long 5
3a. Midrib sunk above. *W. Africa* . . . . . **8. C. unijugatus**
b. Midrib prominent above 4
4a. Petiole terete; leaflets short-acuminate. Calyx usually 5-merous; disk and stamens hairy. *Liberia*. . . . . **1. C. adamii**
b. Petiole flattened above; leaflets long-acuminate. Calyx usually 4-merous; disk and stamens glabrous. *Indo China*. . . . . **7. C. thorelii**
5a. Dioecious. Inflorescences sparsely hairy with scattered few-flowered cymules to solitary flowers. *Malesia* . . . . . **3. C. palawanicus**
b. Monoecious. Inflorescences densely hairy, densely set with many-flowered cymules 6
6a. Leaflets chartaceous. Bracts narrowly lanceolate to subulate, curled upwards to recurved, *ca.* 4 mm long. Stamens 4, exceptionally 5. Fruits up to 3 × 4 cm, tomentose. *Madagascar*. . . . . **5. C. pervillei**
b. Leaflets stiff-chartaceous to subcoriaceous. Bracts triangular to triangular-lanceolate, up to 2.5 mm. Stamens 6 or 7. Fruits 6 × 4.5 cm or more, glabrous or scurfy. *SE. Asia* 7
7a. Fruit faintly didymous or subglobular to ellipsoid, outside scurfy, pericarp dry, mealy when fresh, rather fibrous when dry. Leaves 2- or 3-jugate, often partly decussate. Bracts minute, inconspicuous . . . . . **4. C. penangensis**
b. Fruit pear-shaped, smooth, pericarp fleshy. Leaves usually 4—6-jugate, always spirally arranged. Bracts 2—2.5 mm long, exserted from the buds in the young parts of the inflorescence . . . . . **6. C. philippinensis**

1. **Crossonephelis adamii** Fouilloy

C. adamii Fouilloy, Adansonia II, 12 (1973) 551, pl. 1. — Type: *J. G. Adam 26139*, Liberia, Mts. Nimba, Sept., ♂ fl. (P, *n.v.*).

Tree, 15 m high. Twigs terete. *Leaves* spirally arranged, 2-jugate, without pseudostipules; axial parts glabrous; petiole terete, (2—)5—8 cm; petiolules 5 mm. *Leaflets* subopposite, 8—15 × 3—5.5 cm, ratio 2.5—3, widest about the middle, papyraceous (?), midrib near base at both sides with some appressed hairs; base equalsided to slightly oblique, acute; margin entire; apex tapering acuminate, acumen up to 5 mm long; midrib prominent above; nerves mutually *ca.* 2 cm distant along midrib, angle to midrib *ca.* 50°, strongly curved. *Inflorescences* 4—15 cm long with up to 4 branches up to 5 cm long, hairy; flowers in sessile, 1—3 (♀) or 3—9 (♂) -flowered cymules; pedicels 1 mm long; bracts narrowly deltoid, 0.5—1 mm. *Calyx* (4- or) 5-merous, sepals 1.5 mm long, inside tomentellous. *Disk* densely puberulous. *Stamens* (4) 5 (6); filament 3—5 mm, hairy; anther ovoid, apically with a few hairs. *Ovary* tomentose; style short, with 2 stigmatic grooves. *Fruits* 2-lobed, slightly compressed, *ca.* 4 × 5.5 × 2.5 cm, yellow, glabrous.

LIBERIA. See Fouilloy (1973).

Ecology. Evergreen forests, from the lowlands up to *ca.* 600 m alt. Fl. Sept.; fr. Nov.

Notes. Just before my paper went to the press I came across the publication of the present species. I had no time to study the material; on the basis of the description and drawing, however, I tried to include *C. adamii* as complete as possible.

The alliance of the present species is doubtless with *C. unijugatus*, as also suggested by Fouilloy's key. Comparison of the two may even lead to the conclusion that the differences are on a subspecific rather than on a specific level. As the variation of *C. unijugatus* is a little bit wider than given by Fouilloy in his key, I may enumerate the characters in which *C. adamii* seems to be different from that species: petiole terete, leaflets short-acuminate, midrib raised above, flowers in cymules, pedicels and bracts short, calyx predominantly 5-merous, filaments and anthers hairy, fruits bigger and glabrous.

2. **Crossonephelis africanus** (Radlk.) Leenh., *nov. comb.*

Melanodiscus africanus Radlk. in Durand, Ind. Gen. (1888) 75; Pfl. R. Heft 98 (1932) 817; Hutch. & Dalz., Fl. W. Trop. Afr. ed. 2, 1 (1958) 720. — [*C. africanus* Capuron *ex* Fouilloy, Adansonia II, 12 (1973) 554, *nom. inval.*[1]]. — Type: *Moloney s.n.*, Nigeria, Western Reg., Lagos, —4—1883, ♂ (K).

Melanodiscus oblongus Radlk. *ex* Taubert in Engl., Pfl. Welt Ostafr. C (1895) 250; Radlk. in E. & P., Nat. Pfl. Fam. 3, 5 (1895) 321; Pfl. R. Heft 98 (1932) 817; Haum., Fl. Congo Belge 9 (1960) 366; Dale & Greenway, Kenya Trees & Shrubs (1961) 515; Exell, Fl. Zambesiaca 2 (1966) 528, t. 110. — [*C. oblongus* Capuron *ex* Fouilloy, Adansonia II, 12 (1973) 554, *nom. inval.* (Art. 33).] — Type: *Kersten s.n.*, Tanganyika, Kilimandjaro, Dschaggaland, 1800—2600 m alt., 1861—62 (B, *n.v.*).

Melanodiscus sp. F. W. Andrews, Fl. Pl. Anglo-Egyptian Sudan 2 (1952) 342.

Melanodiscus sp. nov? Eggeling & Dale, Indig. Trees Uganda ed. 2 (1952) 381.

Melanodiscus sp. nov. Dale & Greenway, Kenya Trees and Shrubs (1961) 515.

Small to medium-sized tree, mostly to 12 m, exceptionally to 25 m high, up to *ca.* 45 cm ∅, sometimes a shrub, exceptionally scandent; dioecious; indument consisting of solitary hairs often intermingled with some pairs or small tufts. *Twigs* terete, 3—4 mm ∅, canaliculate, exceptionally smooth, mostly light greenish- or yellowish-, sometimes purplish-brown, glabrous or rarely velutinous, lenticels mostly inconspicuous, sometimes many, conspicuous, orbicular, small, and white. *Leaves* spirally arranged, 2—4-jugate, the lowermost pair much smaller and more or less stipule-like and attached near or at the base of the leaf; axial parts originally velutinous, mostly early glabrescent; petiolules (1½—) 3—6(—10) mm, terete to slightly grooved above. *Leaflets* mostly opposite, middle and upper pairs 7—19 × 3—9 cm, ratio 1¾—3½, widest about to above the middle, lowermost pair 1½—7 × 1¼—5 cm, ratio 1—2, mostly widest below the middle, chartaceous, exceptionally papyraceous, glabrous or sometimes hairy on the midrib above and sparsely hairy on midrib and nerves beneath, hair tufts mostly present in the nerve axils beneath; base equalsided and cuneate to blunt, in the lowermost pair sometimes slightly oblique and often rounded to cordate; margin entire to irregularly undulate, rarely coarsely sinuate to dentate towards the apex, the upper teeth resembling lateral apices; apex rounded, blunt, or gradually acuminate, acumen mostly short, broad, and blunt, sometimes slender and/or acute; midrib above prominulous to flat or towards the base slightly sunk; nervation rather irregular, nerves mutually 1—3.5 cm distant along midrib, angle to midrib 40—80°, curved to nearly straight and rather abruptly curved to margin, at least

[1] The new combinations proposed by Fouilloy are invalid as no basionym was cited.

upper ones vaguely looped and joined, above rather inconspicuous, prominulous to slightly sunk, beneath slightly prominent; intercalated veins often strongly developed. *Inflorescences* 10—20 cm long, usually mainly from (near) the base with few long, erect-patent to spreading, racemoid, often thin-flowered, mostly simple branches, velutinous; pedicels slender, *ca.* (1—)4—5 mm long, patent; bracts linear-lanceolate to narrowly triangular, *ca.* 1—3 mm long. *Calyx* 4-(rarely 3- or 5-)merous, sepals 1.5—2 × 1.5—1.75 mm, inside variably tomentose to sometimes glabrous. *Disk* glabrous or rarely puberulous. *Stamens* 4—7, glabrous; filament 4—9 mm; anther oblong to ovate, *ca.* 1.25 mm, dehiscing laterally to latero-introrse, connective narrow to broad. *Pistil* exceptionally 3-celled (*Eggeling 1509*); ovary woolly; style conical to columnar, 0—1 mm, mostly sparsely hairy up to the back of the stigmatic lobes; stigma 2-lobed, lobes free or mostly connate, together ovate with a thick stigmatic groove all around, 0.65—1 mm. *Fruits* globular to faintly bilobed, 1.5—1.8 × 1.8—2.3 cm, tomentose, dried pericarp 3—4 mm thick.

NIGERIA. Western Reg.: *A. Binuyo FHI 40885, 40899*, Abeokuta Prov., Ilaro For. Res.; *Moloney s.n.*, Lagos, type of *Melanodiscus africanus*; *Onochie & Latilo FHI 32448*, Abeokuta Prov., Egbado Dist., Ilaro For. Res. — Eastern Reg.: *D. Lobe Babute Cam. 52/36*, Cameroons Prov., Bombe (K).

SUDAN. Equatoria Prov.: *J. K. Jackson 747, 1231*, Torit, Talanga For., 4° N 32°45′ E (K); *J. G. Myers 11813*, Lotti For. (BR, K); *T. Trought s.n.*, Imatong Mts., 2—1—1933 (K).

ZAIRE. Prov. Orientale: *Claessens s.n.*, Lac Albert, Mahagi.

UGANDA. Northern Prov.: *G. J. Leggat 77*, E. Madi, Zoka For., 840 m alt. (EA, FHO, K). — Western Prov.: 12 collections, mainly Budongo For. — Buganda Prov.: *R. Dummer 3023*, Fort Kiwala (K); *C. B. Ussher 95*, Mabira For. (BM, K). — Eastern Prov.: *G. Scheffler 343*, Kibwezi, 1000 m alt. (K, L); *G. H. S. Wood 12*, Busoga, Butembe Bunya, 1 mile N. of Lubani Hill, 1150 m alt. (K).

KENYA. Southern Prov.: *H. M. Gardner 3710*, Kibwezi, 900 m alt. (BR, K). — Coastal Prov.: *E. Battiscombe 57* (K).

TANZANIA. Northern Prov.: *H. A. Lewis 236*, Moshi, 690 m alt. (K). — Tanga Prov.: *Verdcourt & Greenway 258*, valley of the Mkulumusi R. near the Amboni Caves (K). — Southern Prov.: *Chapman 2105*, Malawi Hills (FHO, SRGH) (acc. to Exell, l.c.).

RHODESIA. Eastern Prov.: 7 collections from Umtali, Melsetter, and Chipinga Districts.

MOZAMBIQUE. Sul do Save Dist.: *Gomes & Sousa 1922*, Massinga (K); *Grandvaux, Barbosa & de Lemos 8028*, Chipenhe, Régulo Chiconela, Chirindzeni For. (K); *8090*, Vila de João Belo, Chipenhe, Chachuene For. (K); *8449*, ditto, Chiconela For. (K).

Ecology. Mainly an understorey tree in closed high forest; in Mozambique a dominant of the climax forest, also in secondary forest; on basic as well as on acid soils; alt. 690—1200 m (type of *M. oblongus* 1800—2600 m). *Fl.* and *fr.* throughout the year. Fruits eaten by monkeys.

Uses. The timber is once mentioned as hard, once as useless; the fruits are once called edible.

Notes. A variable species, but even though the West- and the Eastafrican populations seem to be separated by a wide gap it seems impossible to distinguish them as infraspecific taxa. If one compares e.g. the series of 14 specimens I had from Uganda with the 4 collections from Nigeria there is a distinct overlap in variation. The type of *M. africanus* shows extremely big and deeply cordate 'pseudostipules' and unusually dense inflorescences; *M. oblongus* represents the normal kind in E. Africa with small 'pseudostipules' nearly of the same shape as the normal leaflets and with more lax, clearly racemoid inflorescences. These characters as well as others like leaf shape and several characters in the flower seem to vary independently and uninterruptedly.

The bark is described as smooth or rough, whitish, grey, or brown; flush apparently very conspicuous, from pale yellow via pink and scarlet finally to green; the inflorescences are reddish, the buds are brownish or reddish, the flowers creamy to pinkish, filaments

white or pale cream, anthers brown, disk yellowish, pistil pale yellow tipped by the red stigmas; fruits orange to brownish.

3. **Crossonephelis palawanicus** (Radlk.) Leenh., *nov. comb.*

Lepisanthes palawanica Radlk., Elm. Leafl. Philip. Bot. 5 (1913) 1604; Merr., En. Philip. 2 (1923) 500; Radlk., Pfl. R. Heft 98 (1932) 741; Merr. & Perry, J. Arn. Arb. 21 (1940) 512. — Type: *A. D. E. Elmer 13046*, Philippines, Palawan, Puerto Princesa, Mt. Pulgar, —3—1911, fr. (M; iso in A, BO, E, FI, L, NY).
Cnemidiscus thorelii Pierre *sensu* Gagnep., Fl. Gén. I.-C. Suppl. 1 (1950) 976 *p.p., typo excl.*
Alectryon sp. Leenh., Blumea 17 (1969) 88.

Tree up to 30 m × 50 cm ∅, sometimes buttressed; probably dioecious; indument mainly consisting of small stellate tufts. *Twigs* terete, 2—4 mm ∅, canaliculate, dark purplebrown, sparsely fulvous appressedly short-hairy, early glabrescent, with many small white lenticels. *Leaves* spirally arranged to, often, nearly to fully decussate, unifoliolate or 1- or 2-jugate; no pseudostipules; petiole in cross-section triangular to terete, 2.5—10 cm long, puberulous at base; petiolules 0.3—1.5 cm, above with a shallow broad groove, puberulous. *Leaflets* (sub)opposite, 6—26 × 3—13.5 cm, ratio 1.5—3, widest about the middle, chartaceous, glabrous except for occasional hair tufts in some of the nerve axils beneath; base equalsided to slightly oblique, cuneate to rounded, attenuate; margin entire; apex (blunt or) gradually to abruptly, shortly, broadly, and bluntly acuminate; midrib above prominulous, towards the base sometimes sunk; nerves mutually 1.2—6 cm distant along midrib, angle to midrib 50—90°, mostly strongly curved, above and beneath about equally prominulous; intercalated veins faintly to sometimes strongly developed. *Inflorescences* up to *ca.* 25 cm long, with few about opposite, spreading, long and slender branches, these sparsely to rather densely set with sessile, few-flowered cymules or sometimes with solitary flowers, puberulous to tomentellous; pedicels rather thick, up to 5 mm long; bracts triangular, up to 1 mm long. *Calyx* 4- or 5-merous, sepals 1.5—2.5 × 1.5—2.5 mm, inside tomentose or with glabrous longitudinal strips. *Disk* glabrous to velutinous. *Stamens* 6 or 7, glabrous; filament 3.5—5 mm; anther ovate, 1 mm, dehiscing latero-introrse, connective broad. *Ovary* slightly 2-lobed, velutinous; style short and thick, hairy in the lower part; stigma from 2-lobed with short, thick, recurved lobes to about capitate, slightly 2-knobby. *Fruits* bilobed, 1.2 × 2 × 1 cm, often one lobe suppressed, then transversely ovoid and 1.25 × 1.5 × 1.25 cm, smooth and glabrous, pericarp thin-fleshy.

SUMATRA. Indragiri: *P. Buwalda NIFS bb 30138*, near Peranap. — Palembang: 6 collections, all from Lematang ilir and Lematang ulu.

BORNEO. West Indonesian: *Becking 61*, Palo, on beach. — Southeast: *A. Atjil NIFS bb 11059*, P. Tjahu, Kalapeh, alt. 200 m; *G. W. Ferns NIFS bb 25598*, Balikpapan, Sepan, alt. 30 m; *C. J. v. d. Zwaan NIFS bb 11523*, Tandjong redeb, Labanan, alt. 25 m; *v. d. Zwaan NIFS bb 18484*, Berauw, Long Lanoeh, alt. 75 m; *v. d. Zwaan NIFS bb 18998*, Berauw, Betemoe aer, alt. 200 m. — Sabah: *Orolfo NBFD 4156*, Tawau, Batu Mapan, alt. 15 m (BO, SING).

PHILIPPINES. Palawan: *A. D. E. Elmer 13046*, type; *E. D. Merrill 9376*, Taytay (L, M, NY). — Mindanao: *M. Ramos & G. Edaño BS 49205* (A, BO, NY, UC), *49326*, Davao Prov., Mati, low alt. (NY, UC).

NEW GUINEA. Vogelkop Peninsula: *Ch. Koster BW 1147*, Oransbari; *A. Kostermans NIFS bb 33449*, Momi, alt. 10 m; *E. Lundquist NIFS bb 32690*, Fakfak, near Dusun Anakasi, alt. 50 m; *F. A. W. Schram BW 2983, 12374*, Warsamson R. 25 km E. of Sorong, alt. 60. — Southeast: *L. J. Brass 7980, 8058, 8074*, Lower Fly R., east bank opp. Sturt I. (A, BO, L).

Ecology. Primary forest on alluvial plains, slopes, or ridges, also on river banks, at up to 200 m alt. *Fl.* April, Oct., Dec.; *fr.* March, Sept.

U s e s. For the timber see Desch, Mal. For. Rec. 15 (1954) 529. The bark is easily inflammable and is used for kindling fires.

N o t e s. There is some difference between on the one hand the material from Sumatra and Borneo, on the other that of the Philippines and New Guinea. The former has the smaller leaves and flowers, often (especially in Sumatra) hair tufts in the nerve axils on the lower side of the leaflets, usually thyrsoid inflorescences, the disk glabrous or nearly so, always 6 stamens, and the stigma distinctly lobed; the latter is more coarse, lacks the hair tufts on the leaflets, the inflorescences are less-branched and bear less and nearly always solitary flowers, the disk is always densely hairy, the number of stamens is often 7, and at least in New Guinea the stigma is knobby. As, however, the differences are slight and grading, whereas the accordance in all other characters is excellent, and as the number of good flowering specimens is very small, I do not like to make any subdivision. It is interesting that Mr. J. Muller, in his accompanying palynological study, independently concluded to the same division of the present species into two groups.

The systematic position of the present species has been doubtful for a long time. Radlkofer already, when describing it, and also lateron, included it in *Lepisanthes* with doubt, but without any comment. Merrill and Perry (1940) were on the track when they wrote: 'We find that the flowers .... closely resemble those of *Hedyachras*'. The same holds true for Gagnepain (1950) who, without any comment, reduced it to *Cnemidiscus thorelii*. I myself, when revising the genus *Lepisanthes* (1969), wrongly referred it to *Alectryon*.

For nomenclature, see also under *C. thorelii*.

4. **Crossonephelis penangensis** (Ridl.) Leenh., *nov. comb.*

Tristira penangensis Ridl., J. Str. Br. R. As. Soc. 82 (1920) 181; Fl. Mal. Pen. 1 (1922) 496; ditto 5 (1925) 302; Radlk., Pfl. R. Heft 98 (1932) 870, (1934) 1497; Desch, Mal. For. Rec. 15 (1954) 535; Wyatt-Smith & Kochummen, ditto 17, rev. ed. (1965) 360. — Type: *Curtis 1086*, Malay Pen., P. Penang, Government Hill, 360 m alt., —4—1889, fl. (SING).

Tree up to 36 m × 70 cm ∅; monoecious; hairs solitary, but tufted on the young fruits. *Twigs* at first angular, later terete, 3.5—6 mm ∅, at first canaliculate, later smooth or finely striate, dark purplish- or reddish-brown, fulvous-puberulous, with many minute light lenticels. *Leaves* mainly spirally arranged but in some twigs decussate or nearly so; 2- or 3-jugate; without pseudo-stipules; axial parts fulvous-velutinous to -puberulous; petiole mostly strongly flattened above, 4—14 cm long; petiolules 0.5—1 (—2) cm, usually with a broad flat groove above. *Leaflets* mostly opposite, 7—18 × 3—11 cm, ratio *ca.* 1½—2½, widest about or slightly below the middle, stiff-chartaceous to subcoriaceous, (sub)glabrous; base often more or less oblique, (blunt to) rounded (to truncate), attenuate; margin entire to slightly undulate towards the apex; apex emarginate, rounded, blunt, or shortly, broadly, and bluntly acuminate; midrib above prominulous, slightly sunk towards the base; nerves mutually 1½—2½ cm distant along the midrib, angle to midrib *ca.* 60—65°, slightly curved, above prominulous, beneath prominent; intercalated veins hardly developed. *Inflorescences* 15—20 cm long, sparsely branched, the branches spreading, densely set with many-flowered, sessile, glomerulous cymes, fulvous-velutinous to -tomentose; pedicels 2—3 mm long; bracts triangular, up to 1 mm long. *Calyx* 4-merous, sepals 1.5 × 2 mm, inside thin-tomentose. *Disk* with a few hairs. *Stamens* 6 or 7, glabrous; filament 3 mm; anther broad-ovate, 0.9 mm, dehiscing laterally, connective broad. *Pistil* tomentose; ovary tapering into the conical sturdy style which is 1½ mm long; stigma of 2 connate lobes, *ca.* 0.75 mm. *Fruits* faintly didymous or (if only 1 seed

develops) subglobular to ellipsoid, up to 9×7 cm, brown, scurfy, finally glabrous, pericarp when dried *ca.* 0.5—1 cm thick, hard, very fibrous, when fresh mealy and yellow. *Seed* probably about globular, *ca.* 4—4.5 cm ∅, testa brown, smooth, glabrous, slightly ruminate.

MALAY PENINSULA. Perak: *Kochummen KEP FRI 2439*, Kuala Kangsar, Piah For. Res. — Trengganu: *Cockburn KEP FRI 8467*, Ulu S. Trengan near K. Petang; *Corner SF 30415*, Kemaman, B. Kajang. — Pahang: *Strugnell KEP 23457*, Rotan Tunggal Raub; *G. H. S. Wood KEP 76126*, Kerantan. Beserah For. Res. — Negri Sembilan: *KEP 4212*, Port Dickson For. Res. — Malacca: *Goodenough* = *1781* (SING sh. 23166). — P. Penang: *Curtis 1086*, d.d. —10—1886 (BM), d.d. —4—1889, type; s.n., —3—1892 (SING sh. 23161), —4—1894 (SING sh. 23162), without date (SING sh. 23163).

Ecology. Lowland rain forest, up to 360 m alt. *Fl.* Apr., Aug., Oct., *fr.* Febr., June-July.

Notes. Ridley (ll.cc.) described the ovary as 3-angular and the number of stigmas as 3. This seems to be a mistake: I found only 2-merous pistils, well in accordance with the other species of this genus.

Originally, Ridley placed the present species in *Tristira*, though with some doubt. Later, when fruits became available, he became aware that it could not be accomodated in that genus (1925, l.c.), but he did not make any further suggestion. This is the more surprising as in a note to the original description (repeated in Fl. Mal. Pen. 1) he stressed the overall resemblance to *Erioglossum* and *Lepisanthes*, which in my opinion was far nearer to the truth, whereas he gave no argument at all for the inclusion in *Tristira*.

The bark is described as smooth to rough, grey, inside yellow, the wood as creamy.

5. **Crossonephelis pervillei** Baill.

C. pervillei Baill., Adansonia 11 (1874) 245; in Grandidier, Hist. Madag. Atlas (1893) t. 249 (*n.v.*); Choux Mém. Ac. Malgache 4 (1927) 38; Radlk., Pfl. R. Heft 98 (1932) 818; Capuron, Mém. Mus. Nat. Hist. Nat. n.s. B, 19 (1969) 83, t. 20 f. 1—7. — Type: *Pervillé 448*, Madagascar, Nossi bé, 24—1—1841, *fl.* (P).

Tree up to 30 m×70 cm ∅; monoecious; young parts and inflorescences short-velutinous, hairs solitary. *Twigs* terete, 2—4 mm ∅, finely grooved, light greyish brown (older branches brown to black), early glabrescent, lenticels many, small, inconspicuous. Phyllotaxis irregular, normally 2/5, sometimes 1/2 to nearly decussate; *leaves* 2—4-jugate, without pseudostipules; axial parts glabrous to puberulous; petiole flattened above, 1.25—6 cm long, slender; petiolules 0.5—3 mm, slightly grooved above. *Leaflets* (sub)opposite, 3—10×1.5—4.5 cm, ratio *ca.* 2—3, widest about (sometimes below, rarely above) the middle, chartaceous, glabrous or with hair tufts in part of the nerve axils beneath; base equalsided to slightly oblique, acute to rounded; margin entire to sometimes slightly undulate; apex usually rounded, rarely emarginate, sometimes blunt to acute; midrib above prominulous; nerves mutually 0.5—1.5 cm distant along midrib, angle to midrib *ca.* 60—70°, straight to faintly curved, looped and joined towards the margin or not, prominulous at both sides; intercalated veins well-developed. *Inflorescences* up to 15—20 cm long, bearing 1 or few erecto-patent or spreading, rather long branches, rather densely set with (sub)sessile, several-flowered cymules; pedicels up to 3 mm long; bracts narrowly lanceolate and boat-shaped to subulate, curled upwards to recurved, *ca.* 4 mm long. *Calyx* 4-merous, sepals 1.5—2×1.5—2.5 mm, inside variably tomentose. *Disk* glabrous or rarely with a few marginal hairs (acc. to Capuron, l.c.). *Stamens* 4 (exceptionally 5), opposite to the sepals, glabrous; filament *ca.* 3—4.5 mm; anther broad-ellipsoid to -ovoid, *ca.* 1 mm, dehiscence introrse, connective broad. *Ovary* tomentose;

style subulate, slender, *ca.* 1.25—2 mm long, hairy at base, bearing 2 erect to spreading, inside stigmatic lobes *ca.* 0.75 mm long, or exceptionally these lobes may be connate and the stigma then consists of 2 thick lines. *Fruits* bilobed and deeply emarginate at base and apex, or, if only 1 cell is developed, about transversely ovoid, up to 3 × 4 cm, tomentose, with a thick fleshy pericarp.

MADAGASCAR. West: from Vohémar and Diégo Suarez to the Massif of Analavelona, 15 collections. — Sambirano: Nossi bé: *Hildebrandt 3296* (K); *Perrillé 448*; *Rés. Nat. et Parcs Nat. de Madagascar 4325 RN* (P). — Northeast: *Capuron 9018 SF*, forêt d'Antandrokolaka, between Aditavolo and Morafeno (P); *Humbert 24241*, Massif du Betsomanga, lower valley of the Androranga R., near Antongondriha (P).

Ecology. Forests on limestone rocks and volcanic soils, from sea-level to 700—1000 m. *Fl.* Oct.-Jan., May; *fr.* Dec.-Jan.

Note. The bark is described as smooth and greyish, the perianth is greyish to greenish, the disk greenish-yellow as are the stamens, the fruits when fresh are at first light green to yellowish, later brownish, the pulp is yellowish and sweet.

6. **Crossonephelis philippinensis** (Radlk.) Leenh., *nov. comb.*

Hedyachras philippinensis Radlk., Bot. Jahrb. 56 (1920) 258; Pfl. R. Heft 98 (1932) 871; Brown, Useful Pl. Philip. 2 (1950) 364, f. 177; Monsalud et al., Philip. J. Sc. 95 (1969) 543. — Type: *A. Villamil FB 20635*, Philippines, Luzon, Laguna Prov., Mt. Maquiling, —11/12—1913, fr. (M; iso in BM, K, L).
Sapindus sp. Ceron, Cat. Pl. Herb. Manila (1892) 54, no. 2521.

Tree up to 18 m × 40 cm ∅; monoecious; hairs mainly solitary, intermingled with some pairs or small tufts. *Twigs* terete, *ca.* 5 mm ∅, striate, dark purplish brown, fulvous-velutinous, gradually glabrescent, not conspicuously lenticellate. *Leaves* spirally arranged, (1—)4—6-jugate; no pseudostipules; axial parts velutinous (rarely glabrous); petiole 3—9 cm, in the basal part flat to grooved and with marginal ribs, higher up more or less flattened; petiolules 2—10 mm, above with a broad and flat to narrow and deep groove. *Leaflets* opposite to alternate, 5—22 × 2.75—9 cm, ratio 1.75—3.5, widest about or somewhat below the middle, stiff-chartaceous, hairy above on midrib, beneath on midrib and sometimes nerves, bearded in the nerve axils beneath, rarely fully glabrous; base ± equal-sided, rounded in the lower leaflets, usually acute and attenuate in the upper ones; margin entire; apex blunt to shortly, broadly, and bluntly acuminate; midrib prominulous above; nerves mutually 1—3.5 cm distant along midrib, angle to midrib *ca.* 70—75°, slightly to distinctly curved, those in the upper half of the leaflet more or less distinctly looped and joined at some distance from the margin, above prominulous, more so beneath; intercalated veins occasionally more or less strongly developed. *Inflorescences* up to *ca.* 20—25 cm long, with few spreading branches, densely set with sessile, several-flowered, glomerulous cymules; pedicels 1.5—2(—4) mm; bracts triangular-lanceolate, 2—2.5 mm. *Calyx* 4-merous, sepals 2—3 × 1.5—2.5 mm, inside tomentose. *Disk* glabrous. *Stamens* 6, glabrous; filament *ca.* 5 mm; anther broad-ellipsoid, 1 mm, dehiscence introrse, connective broad. *Pistil* tomentose; style conical, very short, with stigmatic grooves. *Fruits* pear-shaped, when dry 6—7 × 4.5—6 cm, yellow to red when fresh, glabrous, pericarp thick, fleshy. *Seed* subovoid, 3—3.5 × 1.75—2.25 cm, testa brown, smooth, glabrous.

THAILAND. Southeast: *Put 2742*, Chantaburi, Rayawng, Ban Pe (BM).
INDO CHINA. Vietnam: *Chevalier 38463*, Rés. For. de Lang-Co (P).
PHILIPPINES. Luzon: Laguna Prov., Mt. Maquiling, 6 collections. — Panay I.: *S. Vidal 2521*, Prov. Ilo-ilo, Igbaran (K). — Dinagat I.: *Ramos & Convocar BS 83806* (NY).

E c o l o g y. 'In thickets and forests along streams at low altitudes' (Merr., En. Philip. 2, 1923, 502). *Fl.* June, Sept.; *fr.* May-Dec.

U s e s. The fruits are edible.

7. **Crossonephelis thorelii** (Pierre) Leenh., *nov. comb.*

Cnemidiscus thorelii Pierre, Fl. Coch. (1894) t. 320 A, text; Radlk., Pfl. R. Heft 98 (1933) 1016; Gagnep., Fl. Gén. I.-C. Suppl. 1 (1950) 976 *p.p.*, excl. syn. *Lepisanthes palawanica.* — *Xerospermum thorelii* Pierre, Fl. Coch. (1894) t. 320 A, *nom. illeg.* — *Nephelium thorelii* Lecomte, Fl. Gén. I.-C. 1 (1912) 1052. — Type: *L. Pierre 4089*, S. Vietnam, Prov. Bienhoa, Pong lu, —3—1877, ♂ bud (P).

Treelet, 2—8 m high; dioecious; indument consisting of small hair tufts. *Twigs* terete, 2 mm ∅, canaliculate, light brown, early glabrescent, with scattered, small, white lenticels. *Leaves* spirally arranged, 1-jugate; no pseudostipules; axial parts puberulous; petiole flattened above, 1—4 cm; petiolules 5—10 mm, above with a broad shallow groove. *Leaflets* opposite, 10—30 × 2.7—9.5 cm, ratio *ca.* 3, widest about the middle, papyraceous to thin-chartaceous, glabrous; base nearly equalsided, cuneate; margin entire; apex tapering acuminate, acumen long, blunt; midrib above prominulous; nerves mutually 1—2 cm distant along midrib, angle to midrib 50—65°, straight to slightly curved, strongly curved towards the margin, above prominulous, beneath prominent, intercalated veins rarely developed. *Inflorescences* 6—8 cm long, near the base with 1 or few rather short erecto-patent branches, racemoid, flowers mainly solitary, in the lower part in few-flowered cymules, puberulous; pedicels slender, 2—5 mm long; bracts narrowly triangular to lanceolate, 1—2 mm long. *Calyx* 4-, rarely 5-merous, inside partly glabrous. *Disk* glabrous. *Stamens* 6 or 7, glabrous; anther ovate, dehiscing latero-introrse. *Pistil* and *fruit* unknown.

Known from the type only.

N o t e s. The systematic position of the present species has been uncertain for a long time, primarily because of the lack of fruits. Pierre himself was of the opinion that it represented one of the *Nephelieae*; at first he included it in *Nephelium*, as is shown by the labelling of the type, lateron he preferred placing it in *Xerospermum* (as revealed by the illegitimate name under the plate), finally he published the genus *Cnemidiscus*, noting that in several characters it was intermediate between *Nephelium* and *Xerospermum*, that it seemed nearer to the former, and that, if only fruits were known, it might be reduced to a section of that genus. This reduction was made by Lecomte (1912), though without any new evidence. Radlkofer reinstated the genus, kept it in the *Nephelieae*, but remarked that it showed a clear resemblance to *Aphania* or *Lepisanthes*.

As far as can be judged from the material available, a rather poor specimen with some ♂ buds, I am of the opinion that the present species clearly represents *Crossonephelis*, hence belongs to the *Lepisantheae*. Actually, Gagnepain (1950) was on the same track when he reduced *Lepisanthes palawanica* to *Cnemidiscus thorelii* (his description of the fruit is derived from *Lepisanthes palawanica*!). It is well possible that he was right in combining these two. My arguments for keeping them separate, after much hesitation, are: 1. there are slight differences; 2. *C. palawanicus* is a well-circumscribed and well-known entity based upon a good type, whereas *C. thorelii*, the older name, is based upon a very poor type and is quite incompletely known; 3. my colleague Mr. J. Muller, who studied the pollen of *Crossonephelis*, informed me that the palynological differences between these two are on the same level as between good species in this genus.

8. Crossonephelis unijugatus (Pellegr.) Leenh., *nov. comb.*

Melanodiscus unijugatus Pellegr. in Aubréville & Pellegr., Bull. Soc. Bot. Fr. 85 (1938) 293; Haum., Fl. Congo Belge 9 (1960) 367. — [*C. unijugatus* Capuron *ex* Fouilloy, Adansonia II, 12 (1973) 554, *nom. inval.* (Art. 33).] — Lectotype: G. *Le Testu 1865*, Gabon, Tchibanga, 15—11—1914, ♀ fl. (P; iso in BR).
Melanodiscus sp. nov. ? Exell & Mendonça, Consp. Fl. Angol. 2 (1954) 92.

Shrub or treelet, to 5 m × 10 cm ∅; dioecious; twigs, petioles, and inflorescences puberulous. *Twigs* terete, *ca.* 2 mm ∅, finely grooved, brownish to greyish-green, with many inconspicuous, small, oblong, whitish lenticels. *Leaves* spirally arranged, 1- or 2-jugate; without pseudostipules; axial parts densely puberulous; petiole 1.25—5.5 cm, (flattened to) grooved above; petiolules 1—10 mm, grooved above. *Leaflets* opposite, 7.5—20 × 2.75—6.5 cm, ratio 2½—3, widest about or above the middle, papyraceous, glabrous or midrib near base on both sides puberulous; base equalsided or slightly oblique, acute; margin entire; apex fairly abruptly acuminate, acumen rather long, broad to slender, blunt; midrib above slightly sunk; nerves mutually 1.5—2.5 cm distant along midrib, angle to midrib 60—75°, strongly curved, above prominulous, beneath rather prominent; intercalated veins inconspicuous. *Inflorescences* 3—10 cm long, with few short branches, flowers solitary; pedicels filiform, 3—4 mm long; bracts ovate to narrowly deltoid, 1.5—2 mm long. *Calyx* 4- (rarely 5-)merous, sepals 1.5—2 mm long, inside tomentellous. *Disk* glabrous or sometimes puberulous, in vivo reddish. *Stamens* 5(—7), glabrous; filament 3—4 mm; anther broad-ellipsoid to broad-ovoid, dehiscence latero-introrse, connective broad. *Ovary* tomentose; style flattened-conical, 1—1.25 mm, with 2 stigmatic grooves. *Fruits* 2-lobed, compressed, 2.5 × 3 × 1 cm, pinkish when fresh, tomentellous.

GABON. *Le Testu 1451*, Dabilila (P); *1865*, lectotype; *1866*, Tchibanga, syntype (P); *s.n.*, ditto (L. sh. 951.65—564).
ZAIRE. Mayumbe: *Donis 2081*, *2268*, Luki, Kinkoko Valley (BR); *2215*, Singa Valley (BR); *Wagemans 1827*, Ineac-Luki (BR).
ANGOLA. Cabinda: *J. Gossweiler 6782*, Maiombe, Buco Zau (BM).

Ecology. Humid forests. *Fl.* Oct.-Nov.; *fr.* Dec.

Note. The present species is doubtless closely allied with *C. adamii*; for differences see there.

INDEX OF COLLECTIONS

J. G. Adam 24748 (1), 24792 (1), 26120 (1), 26139 (1), 26318 (1); A. Atjil NIFS bb 11059 (3).
J. S. Ball 811 (2); E. Battiscombe 57 (2); Becking 61 (3); A. Binuyo FHI 40885 (2), FHI 40899 (2); L. J. Brass 7980 (3), 8058 (3), 8074 (3); P. Buwalda NIFS bb 30138 (3).
R. Capuron 851 (5), 6803 SF (5), 6817 SF (5), 9018 SF (5), 11256 SF (5), 18413 SF (5); N. C. Chase 4419 (2), 4523 (2), 4590 (2), 7353 (2), 7721 (2); A. Chevalier 38463 (6); P. F. Cockburn KEP FRI 8467 (4); E. J. H. Corner SF 30415 (4); C. Curtis 1086 (4).
C. Donis 2081 (8), 2215 (8), 2268 (8); L. J. W. Dorst NIFS T 3 P 973 (3); R. Dummer 3023 (2).
W. J. Eggeling 1500 (2), 1509 (2), 1600 (2), 1611 (2), 1761 (2), 2178 (2), 3072 (2), E 3451 (2), E 3463 (2), S 444 (2); A. D. E. Elmer 13046 (3), 18288 (6).
G. W. Ferns NIFS bb 25598 (3).
H. M. Gardner 3710 (2); B. Goldsmith 47/62 (2); Gomes & Sousa 1922 (2); J. Goodenough = 1781 (4); J. Gossweiler 6782 (8); L. A. Grandvaux Barbosa & F. de Lemos 8028 (2), 8090 (2), 8449 (2).
C. M. Harris 1268 (2), H 181 (2); J. M. Hildebrandt 3296 (5); H. Humbert 18833 (5), 24241 (5).
J. K. Jackson 747 (2), 1231 (2).
KEP 4212 (4); K. M. Kochummen KEP FRI 2439 (4); Ch. Koster BW 1147 (3); A. Kostermans NIFS bb 33449 (3).

P. M. Lambach 1336 (3); J. Léandri 2090 (5), 2146 (5); G. J. Leggat 77 (2); G. Le Testu 1451 (8), 1865 (8), 1866 (8); H. A. Lewis 236 (2); D. Lobe Babute Cam. 52/36 (2); E. Lundquist NIFS bb 32690 (3).
C. Mabesa FB 25719 (6), FB 26180 (6); E. D. Merrill 9376 (3); J. G. Myers 11813 (2).
O. F. A. Onochie & M. G. Latilo FHI 32448 (2); Orolfo NBFD 4156 (3).
H. Perrier de la Bâthie 4524 (5), 6276 (5), 18799 (5); Pervillé 448 (5); L. Pierre 4089 (7); Put 2742 (6).
M. Ramos & P. Convocar BS 83806 (6); M. Ramos & G. Edaño BS 49205 (3), BS 49326 (3); Réserves naturelles et Parcs nationaux de Madagascar 4325 RN (5).
R. G. Sangster S 19 (2), S 20 (2); G. Scheffler 343 (2); F. A. W. Schram BW 2983 (3), BW 12374 (3); Service des Eaux et Forêts de Madagascar 6172 SF (5), 12060 SF (5), 13490 SF (5), 19443 SF (5); E. J. Strugnell KEP 23457 (4); Sulit FB 29747 (6).
A. Thorenaar NIFS T 3 P 327 (3).
M. Ursch 196 (5); C. B. Ussher 95 (2).
Verdcourt & Greenway 238 (2); S. Vidal 2521 (6); A. Villamil FB 20635 (6).
J. Wagemans 1827 (8); G. H. S. Wood 12 (2), KEP 76126 (4).
C. J. v. d. Zwaan NIFS 114 T 3 P 513 (3), NIFS 114 T 3 P 593 (3), NIFS bb 11523 (3), NIFS bb 18484 (3), NIFS bb 18998 (3), NIFS T 428 (3).

INDEX OF NAMES

The references are to the general part of the genus ('gen.') or to the species (by number). **New names** are in bold type, further accepted names in plain type, *synonyms* in italics.