

NOTES ON SOUTHEAST ASIAN AND AUSTRALIAN COREOPSIDINAE
(ASTERACEAE)*

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SUMMARY

Chrysanthellum L. C. M. Rich. (incl. *Eryngiophyllum* Greenm.) is distinguished from *Glossocardia* Cass. The genera *Glossogyne* Cass., *Guerreroia* Merr. and *Neuractis* Cass. are reduced to *Glossocardia*. *Diodontium* F. Muell. from Australia is resurrected, and *Glossogyne* sect. *Trioncinia* F. Muell. is raised to generic rank. Three new species are described and several new combinations are proposed. *Cosmos calvus* sensu Sherff is renamed to *Cosmos steenisiae* Veldk.

INTRODUCTION

In Malesia two species of the otherwise mainly American genus *Chrysanthellum* L. C. M. Rich. have been described: *Chrysanthellum leschenaultii* (Cass.) Koster and *Chrysanthellum smithii* Back.

Dr. J. Th. Koster and later Dr. C. G. G. J. van Steenis had for some years kept apart material of what they thought were two new species of *Chrysanthellum* and on the latter's instigation a revision was prepared.

One of the problems encountered was the generic disposition of the taxa involved. After a survey of the literature and inspection of the few representative specimens available in Leiden, we have come to the following observations.

GENERIC DELIMITATION

Chrysanthellum belongs to the Heliantheae–Coreopsidinae Less. Stuessy (1977) distinguished a number of informal groups in this subtribe, e. g.:

Group 2: Leaves very finely dissected, opposite (alternate in *Glossocardia*); heads homogamous (radiate in *Coreocarpus* and *Guardiola*); involucre funnelliform to cylindrical; pappus barbed (absent in *Guardiola*); anthers brown (green in *Guardiola*). — *Coreocarpus* Benth., *Dicranocarpus* A. Gray, *Glossocardia* Cass., *Guardiola* Humb. & Bonpl., *Heterosperma* Cav.

Group 3: Leaves alternate or nearly basal, finely dissected (sic!); heads heterogamous (discooid in *Isostigma*), small, solitary or in small clusters; involucre hemispheric; pappus absent or of 2 awns. — *Chrysanthellum* L. C. M. Rich., *Eryngiophyllum* Greenm., *Glossogyne* Cass., *Guerreroia* Merr., *Isostigma* Less.

* Dedicated to Ms. M. J. van Steenis-Kruseman for her 86th birthday.

We think *Glossocardia* is much better placed in Group 3, because of its overall resemblance to *Glossogyne*, viz. the alternate leaves, the radiate capitules (usually a single to few ray flowers, apparently easily caducous), the black, not brown anthers (i. s.), and the fact that it is the only Old World genus in a group of otherwise New World taxa.

It may be noted that in Group 3 the leaves are not always finely dissected. In *Chrysanthellum integrifolium* Steetz, *Chrysanthellum michoacanum* Turner, *Glossogyne filifolia* F. Muell., *Glossogyne integrifolia* Gagnep., and *Guerreroia monocephala* Merr. they are simple; they are simple to coarsely dissected in *Chrysanthellum americanum* (L.) Vatke; they are 3-foliolate with obtriangular leaflets in what is here described as *Glossocardia calva* (Miq.) Veldk., while the basal leaves of *Glossogyne bidens* (Retz.) Alston are occasionally simple.

Discoid flowers have also been reported for *Glossogyne condorensis* Gagnep. and *Glossogyne filifolia* (F. Muell.) Benth., about which more below.

The leaves of the species of *Chrysanthellum*, *Glossocardia*, *Glossogyne*, *Eryngiophyllum*, and *Guerreroia* appear to have the Kranz type of anatomy, i.e. the chlorenchyma is concentrated along the main and primary nerves. This agrees with the presence of C₄ metabolism for the four species studied by Smith & Turner (1975): *Chrysanthellum americanum*, *Chrysanthellum integrifolium*, *Chrysanthellum involutum* P.G. Wilson, and *Chrysanthellum mexicanum* Greenm. (now a variety of *Chrysanthellum indicum*) and the two analyzed by Sanchez et al. (leaves: 1986, stems: 1987): *Chrysanthellum argentinum* Ariza & Cerana and *Chrysanthellum tuberculatum* (Hook. & Arn.) Cabrera [forms of *Chrysanthellum indicum* var. *afroamericanum* Turner (Turner, 1988)].

Robinson (1981) has suggested that the presence of the Kranz syndrome would not have much taxonomic significance as it seems to have an independent origin in several places in the family, but Sanchez et al. (1986), discussing its presence in *Chrysanthellum argentinum* and *Chrysanthellum tuberculatum*, observed that these species had a type of leaf anatomy that differed from *Pectis* L. (another Kranz genus, but in the Helenieae–Tagetinae) by its radial, not dorsoventral, disposition of the surrounding parenchymatous cells. There might therefore be more to it than Robinson thought.

Within the Coreopsidinae the Kranz syndrome is also present in *Eryngiophyllum* and *Isostigma*. According to Smith & Turner (1975) these genera are also mutually more related in their floral parts than to the others of the subtribe. *Eryngiophyllum* is a poorly known genus of two species differing from *Chrysanthellum* mainly in being perennial, having capitules without phyllaries, and 3-lobed ray flowers. During this study the syndrome was also encountered in *Diodontium* F. Muell. and *Triodontium* (F. Muell.) Veldk. (see sub Species dubiae et excludendae).

In the Malesian species attributed to *Chrysanthellum* duration appears to be no criterium for generic distinction: *Chrysanthellum smithii* Backer being annual, *Chrysanthellum leschenaultii* (Cass.) Koster perennial. In America *Chrysanthellum perennans* Turner is also perennial! The capitules may or may not have phyllaries even within the same plant, and both 2- and 3-lobed ray flowers occur. *Eryngiophyllum* is therefore best included in *Chrysanthellum*, as was also suggested by Turner (1988); see Appendix on page 479.

Baagøe (1977) studied the adaxial epidermis of the ray flowers and observed the presence of the Helianthoid type of papillose epidermal cells. UV patterns were absent in the species studied. Only *Chrysanthellum* and *Guizotia* Cass. have stomata, but the latter belongs to the Milleriinae according to Robinson (1981).

Distinct infra-red patterns were observed in dry ray flowers of four Malasian species of *Chrysanthellum* originally studied by the junior author (LAK), the others were not checked.

Stebbins (1977: 101) casually remarked that in the Heliantheae "the receptacular paleae ... in some genera resemble the innermost involucre phyllaries." In fact this is the case in many Compositae (Turner, in litt.).

As was already observed by Cassini (1817) in most of the species of *Chrysanthellum*, *Glossocardia*, and *Glossogyne* a true involucre is virtually lacking if we define that as a whorl or spiral of sterile bracts or phyllaries. Most authors, however, have described the involucre as 1-, 2- or 3-seriate. In our species true phyllaries are few in number and in some species apparently entirely absent. The involucre is then formed by the outer pales. These are broad, leaf-like, and striate, and subtend the ray flowers and/or the outer disc flowers; following Carlquist (1959) we have called these involucre bracts. The more inner ones, the receptacular bracts, are more narrow, scarious, and 1-nerved. Such an involucre is not restricted to *Chrysanthellum* and its allies, but is found elsewhere as well in the Heliantheae. Its taxonomic implication ought to be more fully analysed.

Hoffmann (1891: 93, 248, f. 121A) reported the absence of phyllaries only for *Wilkesia* A. Gray of the Madinae, where the ray flowers are subtended by involucre bracts too. The disc flowers would lack the pales. Carlquist (1959) in his study of this subtribe reported that the least modified involucre has a single series of 'fertile phyllaries' (involucre bracts). There are no involucre bracts that are not associated with ray flowers. Interior to the ray flowers are disc flowers, each of which is axillary to a bract. This situation is found in four species of *Hemizonia*, while the other species have a reduction of the receptacular bracts. This remark suggests that the Madiinae have no 'true' involucre, either, and the 'least modified' situation is the same as encountered in *Chrysanthellum* et al. This reduction has a polytopic origin as there seem to be no other reasons to associate the two groups.

Hoffmann (1891: 181) reports a similar reduction of true phyllaries for members of the Inuleae-Filagoninae, e.g. in *Psilocarphus* Nutt. (Cronquist, 1955).

Carlquist furthermore mentioned the absence of an involucre in *Brachionostylum* Mattf., which possibly is congeneric with *Senecio* L., where the reduction of the phyllaries is well-known. Here, too, we have the impression that the apparent involucre consists of involucre bracts, while the actual phyllaries are much reduced to absent.

According to various authorities the receptacular bracts in the Heliantheae ought to be conduplicate around the achenes. This is not the case in *Chrysanthellum*, *Glossogyne*, *Glossocardia*, *Guerreroia*, and several other genera in North America (fide Turner, in litt.), where they are linear and flat.

The ray flowers are usually female and produce well-developed achenes. In *Chrysanthellum smithii*, however, they produced void achenes only. This was also so in the two collections of *Chrysanthellum pusillum* Hook. f. available to us (Turner, 1988: 424, described them as fertile.)

The disc flowers usually appear to be bisexual, but although the anthers and stigmas appear to be well-developed, the achenes are void in several species, so the flowers must be functionally male: *Chrysanthellum alorense*, *Chrysanthellum josephinae*, and sometimes in *Chrysanthellum leschenaultii*.

How variable the sexuality in *Chrysanthellum alorense* is, is not certain as only a few specimens were available. For the other species sufficient material seemed to be present to know what at least the usual state is.

In non-Malesian species of *Chrysanthellum* et al. such 'sterile' disc flowers have also been recorded in *Chrysanthellum filiforme* McVaugh, *Chrysanthellum integrifolium*, *Chrysanthellum involutum*, *Chrysanthellum michoacanum*, *Chrysanthellum perennans*, *Chrysanthellum pilzii* Strother, and *Glossogyne integrifolia*, while both 'fertile' and 'sterile' flowers occur in *Chrysanthellum pusillum* (Turner, 1988).

The anatomy of the achenes was studied by Sáenz (1981), who found no anatomical evidence to distinguish the Coreopsidinae from the Helianthinae.

The presence of e. g. anthochlors (Shimokoriyama, 1962, cited by Stuessy, 1977) indicates a firm position of our genera in the Coreopsidinae.

CHRYSANTHELLUM AND NEURACTIS

Chrysanthellum is best regarded as distinct from the Malesian taxa by the heteromorphous fruits: the ray achenes are much thickened and usually clavate, columnar, or more or less curved, and the discoidal ones, when developed, are more dorso-ventrally flattened and laterally callose and/or winged. This feature is correlated with the presence of appendaged anthers, subtire to more or less two-lobed ray flowers, and with the distribution: of the 11 species 9 are exclusively American, 1 occurs in the Galapagos Islands, and 1 extends in various vicariant forms from Mexico to Africa, Madagascar, and India. (Occurrence in America may be regarded as a plesiomorphy, as the Compositae are thought to have originated there.) All species but one are annual.

The Malesian taxa attributed to *Chrysanthellum* differ from the latter by their homomorphous fruits: all achenes are about straight, dorso-ventrally flattened, while the disc achenes, when present, do not have callose or winged sides. The ray flowers are usually 3-dentate to 3-fid. The species are either perennial or annual. It therefore seems to us, and Turner (1988) agreed with this, that two genera are involved. The oldest generic name apparently available for the Malesian taxa at this stage is *Neuractis* Cass. in which *Chrysanthellum leschenaultii* was originally described.

GLOSSOGYNE

Neuractis at first sight appears to differ from the related genus *Glossogyne* by 5-merous disc flowers and muticous achenes. In *Glossogyne* the disc flowers are 4-merous and the achenes usually have hamate awns. Species have been described from continental Asia and Australia, but not from Malesia; such distributions are known, but they are a priori suspect.

The merousness of the disc flowers is not of a generic and probably not even of specific value in *Chrysanthellum* as delimited here. Some species, apparently con-

centrated in Central America, usually have 5-, rarely 4-merous flowers, others, more peripheral, have 4-, rarely 5-merous ones. It is interesting to note that according to Swartz (1791) in *Verbesina mutica* L. (nom. superfl. for *Chrysanthellum americanum*) the central 4 or 5 flowers would be 5-lobed and the others (c. 12) 4-lobed. Turner (1988), too, mentioned the presence of 4-lobed flowers in *Chrysanthellum americanum* (rare), *Chrysanthellum indicum* s.l. (usually) and *Chrysanthellum pusillum* (always). In some capitules of *Chrysanthellum indicum* DC. var. *afroamericanum* and var. *mexicanum* (Greenm.) Turner seen by us the disc florets were usually 4-, rarely 5-lobed, so mixtures in merousness occur even within the same capitule.

That there may be another difference between the central and the more peripheral flowers is seen in *Chrysanthellum michoacanum*, where the first are nearly twice as large as the others.

Labillardière (1825) described the disc flowers of *Bidens tenuifolia* Labill. [= *Glossogyne bidens* (Retz.) Alston], as 5-merous and this statement has now and then independently been repeated by others, e.g. Safford (1905), Jessop (1981), and Rani & Matthew (1983), but all flowers we have seen had 4 lobes and anthers.

There are two collections of a distinct species in L, an ancient one by Reinwardt, labeled 'Moluccas' by Blume, and a recent one by Van Steenis from Timor. In view of the local distribution of all the other species in Malesia it may be assumed that the Reinwardt collection was made during his Moluccas tour when he stayed in Timor for some time. It is known that some of his records have been similarly mislabeled. Some related species show great disjunctions, however, e.g. *Glossocardia bosvallia* (L. f.) DC. and *Glossogyne condorensis*.

The most important difference between the two gatherings is, that Van Steenis' specimens have achenes with minute, hamate awns, while Reinwardt's have muticous ones.

If the distinction based on the presence or absence of hamate awns between *Glossogyne* and *Neuractis* is maintained, Reinwardt's collection with its 5-lobed disc flowers would be a *Neuractis*, while Van Steenis' specimens would belong to *Glossogyne*. When awns are so much reduced, specimens with awned and others with muticous achenes may be expected within the same species. This happens for instance in *Bidens tridentata* (*Guerreroia monocephala*) and *Glossogyne filifolia* (F. Muell.) Benth.

The discoidal achenes of African and South American representatives of *Chrysanthellum indicum* var. *afroamericanum* may or may not have awns, also (Turner, 1988: 433, where it is not said whether they are hamate or not).

A generic distinction based on merousness and the type of awns or even their presence or absence cannot be accepted and so *Glossogyne* should be united with *Neuractis*.

GUERREROIA

In an attempt to delimitate *Neuractis* further, the monotypic genus *Guerreroia* Merr. from Luzon was also studied. According to the original description the achenes would not have awns, and Merrill (1917) gave their absence as the main difference with *Glossogyne*. We did not see Merrill's specimens, but without question it may

be deduced from his extensive description, detailed plate, and provenance that *Bidens tridentata* Turcz., which he misinterpreted as a synonym of *Glossogyne tenuifolium* Cass., is an older synonym of *Guerreroia monocephala*. An isotype of that showed the presence of small hamate awns, while the ray flowers usually had 2, but occasionally 3 lobes! The disc flowers are 4-merous. Apparently both awned and mucicous fruits are present in this species. It seems not to be due to heteromorphy within the capitule as far as we could see. The other differences enumerated by Merrill are of a specific value, and we therefore have reduced *Guerreroia* to *Neuractis*.

GLOSSOCARDIA

In the related genus *Glossocardia* Cass. two species have been described. One, *Glossocardia bosvallia*, has smooth glabrous awns, the other, *Glossocardia setosa* Blatt. & Hallb., hairy, but not hamate, ones. This genus seemed distinct because of capitules with a single or few early caducous ray flowers and pubescent achenes.

Tadesse (1990) has regarded the Tanzanian *Bidens minuta* Bruneau de Miré & Gillet as a synonym of *Glossocardia bosvallia*. This species has been suggested to have discoid capitules and 'retorsely barbellate' awns (Adams, l.c. 226, a generic character of *Bidens* in the key). From the original figure the awns appear to be smooth and antorsely pilose as in *Glossocardia setosa*. Pradhan (1985) has shown that there is a whole range of glabrous to pubescent awns between *Glossocardia bosvallia* and *Glossocardia setosa* and joined the two. *Glossocardia bosvallia* may appear to have discoid capitules as well; in fact there are one to few ray flowers, which are apparently early caducous.

In *Glossogyne condorensis* some young capitules of the type material were dissected, some of which proved to be truly discoid, while in others a single ray flower was present. In a collection of that species from Thailand (*Kasem 636*, BK, L) some capitules also had a single ray flower.

The achenes of both collections of *Glossogyne condorensis* have hamate awns, in the type material the achenes are subglabrous, while those of the Thai material are moderately setulose all over. The achenes of *Glossocardia josephinae* are sometimes minutely ciliolate at the apex. Pubescence of the achenes turns out to be variable and cannot be used to distinguish genera. *Glossocardia* and *Neuractis* have to be merged, and as *Glossocardia* is the oldest generic name available, it is the name to be used for the complex.

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GLOSSOCARDIA

Glossocardia Cass., Bull. Sc. Soc. Philom., Paris (1817) 138. — T y p e: *Glossocardia linearifolia* Cass. [= *G. bosvallia* (L. f.) DC. in Wight.]
Neuractis Cass. in Cuvier, Dict. Sc. Nat., ed. 2, 34 (1825) 496; Boerl., Handl. Fl. Ned.-Ind. 2, 1 (1891) 212, 243, index (in syn.). — T y p e: *Neuractis leschenaultii* Cass. [= *Glossocardia leschenaultii* (Cass.) Veldk.]
Glossogyne Cass. [in Cuvier, Dict. Sc. Nat., ed. 2, 51 (1827) 475, sine statu claro.] in Cuvier, Dict. Sc. Nat., ed. 2, 59 (1829) 320. — *Gynactis* Cass. in Cuvier, Dict. Sc. Nat., ed. 2, 51 (1827) 475, nom. alt. — *Kerneria* Moench subg. *Glossogyne* Cass. in Cuvier, Dict. Sc. Nat., ed. 2, 51 (1827) 475, nom. alt. — T y p e: *Glossogyne tenuifolia* (Labill.) Cass. [= *Glossocardia bidens* (Retz.) Veldk.]
Guerreroia Merr., Philip. J. Sc., Bot. 12 (1917) 117. — T y p e: *Guerreroia monocephala* Merr. [= *Glossocardia tridentata* (Turcz.) Veldk.]
Chrysanthellum auct. non L.C.M. Rich. in Pers.: Benth. in Benth. & Hook. f., Gen. Pl. 2, 1 (1873) 389; C.B. Clarke, Comp. Ind. (1876) xiii, 142; Hoffm. in E. & P., Nat. Pfl. Fam. IV, 5 (1894) 244, fig. 118 K; Backer & Bakh. f., Fl. Java 2 (1965) 412; Robinson et al., Smithson. Contr. Bot. 52 (1981) 14.

Annuals or perennials with a taproot, branching sympodially. *Leaves* basal and cauline, alternate, simple to pinnatilobed or -sect, the uppermost sometimes opposite, reduced, simple (= leaf-like bracts!), sometimes more or less septate pubescent e. g. on the petioles, hairs sometimes bulbous based, teeth mucronate, main and secondary nerves surrounded by a bundle of chlorophyll ('Kranz syndrome'), the intervenium about colourless. *Inflorescence* monochasial. Capitules radiate. True phyllaries usually few to absent. Receptacle more or less flat, also in fruit. *Involucral bracts* resembling phyllaries, more or less in one row, broad, striate, subtending the ray and outer disc flowers, passing into the receptacular bracts, these usually narrower, longer, less nerved, more scarious. *Ray flowers* female or sterile, 0–10, tube short, limb rarely 2-lobulate, usually 3-lobulate to -fid, 5–7-nerved, yellow, white, cinereous, pink, reddish violet, or purple. Stigmas short, bifid, glabrous. *Disc flowers* functionally male or bisexual, 4- or 5-merous, white, orange yellow, brownish, lilac, or pale purple; lobes 4 or 5, each with a marginal nerve fusing at the apex. Anthers with an entire base, apex minutely appendiculate. Stigmas filiform, shortly papillose. *Achenes* more or less subequal, oblong to linear-lanceolate, dorso-ventrally flattened, 2-edged, sides 1- or 3-ribbed, black, muticous or with 2 usually hamate awns.

Distribution. Africa (Niger, Chad, Tanzania), tropical Asia (India to Vietnam, Malesia) to S Australia, Pacific; 11 species, many local endemics known from a single to few localities only.

KEY TO THE SPECIES

- 1a. Achenes straight to convex, awns, when present, erect to patent (rarely reflexed in the perennial *G. bidens*) 2
- b. Achenes strongly incurved, awns reflexed, pointing out from the capitule. — Annuals. Leaves (bi-)pinnatisect. Ray flowers 3-lobulate, yellow. Disc flowers 4-merous 9. *G. refracta*

1. *Glossocardia alorensis* Veldk. & Kreffer, *spec. nov.*

Plantae prostratae dictae basin non vidimus ergo forma vitae ignota verosimiliter perennes sparse septate puberulae. Folia caulina (bi-)pinnata. Braciae involucales erectae in fructu, herbaceae, marginibus anguste scariosis. Flores ligulares 5 pro capitulo feminei 6–6.5 mm longi 3-dentati pallide flavi. Flores tubulares velut masculini fungentes 5-meri aurantiaci. Achenia inermia, apice valde ut collum cygni curvato autem non constricto. — T y p u s: *Bouman-Houtman 167* (L, holo, BO), Lesser Sunda Islands, Alor, 'coast', 28 June 1929.

Plants said to be creeping, base not seen, probably perennial, up to 30 cm long, sparsely ciliolate and septate puberulous. *Leaves* scabridly puberulous. Petiole not winged, up to 4 by 0.8 mm. Blades (bi-)pinnate, elliptic, 10–20 by (5–)8–12 mm, Kranz-nervature distinct. Peduncles \pm glabrous. Capitules c. 4.5 by 6.5 mm diam. *Phyllaries* absent. *Involucral bracts* ovate-oblong, c. 4.75 by 1.25 mm, mucronate, striate, margins narrowly scariosus, herbaceous, glabrous or sparsely ciliolate and septate puberulous mainly at base and along the margins; receptacular bracts linear-lanceolate to linear, 3.5–3.75 by 0.35–0.75 mm, apiculate. *Ray flowers* female, 5, patent, 6–6.5 mm long, pale yellow, apex subequally 3-dentate, nerves 5 (or 6), dark, 3 running into the teeth. *Disc flowers* apparently bisexual, functionally male, 5-merous, trumpet-shaped, c. 2.5 mm long, orange yellow. Anthers c. 1.5 mm long. *Achenes* (of the ray flowers) slightly curved, up to 3.5 by 0.75 mm diam., black, mucicous, apex strongly incurved like a swan's neck, but not constricted into a neck, corona subglobose.

Distribution. Malesia: Lesser Sunda Islands: Alor, only known from the type collection.

Habitat. Along the coast.

2. *Glossocardia bidens* (Retz.) Veldk., *comb. nov.*

Zinnia bidens Retz., Obs. Bot. 5 (1788) 28; Roxb., Fl. Ind. 3 (1832) 435. — *Glossogyne pinnatifida* DC. ex Wight, Contr. Bot. India (1834) 19; DC., Prod. 5 (1836) 632; C.B. Clarke, Comp. Ind. (1876) 141; Hook. f., Fl. Br. India 3 (1881) 310; Trimen, Handb. Fl. Ceylon 3 (1895) 41; nom. superfl. — *Glossogyne bidens* Alston in Trimen, Handb. Fl. Ceylon 6, Suppl. (1931) 168; Wealth of India 4 (1956) 141; Shetty, Taxon 16 (1976) 569; Grierson in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1 (1980) 230; Mathew, Fl. Tamilnadu Carn. 3 (1983) 795; Ansari et al., J. Econ. Tax. Bot. 9 (1987) 345, 348. — *Neuractis bidens* Veldk. ex Tadesse, Kew Bull. 45 (1990) 144. — T y p e: *König s.n.* (LD, holo, n.v.), India, Bengala (but see Roxburgh, 1832). *Bidens tenuifolia* Labill., Sert. Austro-caled. (1825) 44, fig. 45; Cass. in Cuvier, Dict. Sc. Nat., ed. 2, 51 (1827) 475, comb. not made! ex Less., Syn. Gen. Comp. (1832) 212; Benth., Fl. Austr. 3 (1866) 544; Watt, Dict. Econ. Prod. India 3 (1890) 508; Safford, Contr. U.S. Nat. Hb. 9 (1905) 284; Gagnep., Fl. Gén. I.-C. 3 (1924) 595; Steenis, Bull. Jard. Bot. Buit. III, 12 (1932) 169, t. 4; Craib, Fl. Siam. Enum. 2/3 (1936) 281; Kitamura, Mem. Coll. Sc. Kyoto Imp. Univ. B, 16 (1942) 269; Ohwi, Fl. Japan (1965) 902; ; Anon., Icon. Corm. Sin. 4 (1975) 498, 791, fig. 6410; Li, Fl. Taiwan 4 (1978) 870, fig. 1229; Koster, Blumea 25 (1979) 256; Jessop, Fl. C. Austr. (1981) 379, fig. 481; Beadle et al., Fl. Sydney, ed. 3 (1982) 459; Jessop & Toelken, Fl. S. Austr. ed. 4, 3 (1986) 1437, fig. 647. — T y p e: *Labillardière s.n.* (FI, holo, n.v.; P), New Caledonia.

Coreopsis tannensis Forst. ex Spreng., Syst. Veg. 3 (1826) 614. — T y p e: *Forster s.n.* (K, holotype), appointed by Tadesse, Kew Bull. 45, 1990, 144; BM; no specimen in GOETT, fide Tadesse), New Hebrides, Tana Is.

Glossogyne pedunculosa DC., Prod. 5 (1836) 632. — T y p e: *Cunningham s.n.* (G, holo, n.v.), Australia, Queensland, Cape Cleveland.

Bidens denudata Turcz., Bull. Soc. Imp., Moscou 24 (1851) 183; Walp., Ann. 5 (1859) 224. — T y p e: *Cuming 1375* (CW, holo, n.v.; L, P), Philippines, Luzon, Prov. Cagayan.

Glossogyne bidentidea F. Muell., Linnaea 25 (1852) 402. — T y p e: *F. v. Mueller s.n.* (MEL, holo, n.v.), South Australia, Spencer Gulf, in sterile somewhat saline areas, 'spring'.

Perennial, subglabrous (some minute hairs especially on the base of the petioles), with a slender taproot. Branches few from the caudex, more or less erect to decumbent, up to 50 cm long, often almost leafless. *Leaves* mainly basal, alternate, also tufted at the nodes under lateral branches. Petioles 1–5 cm long, with some minute hairs at base. Lowermost blades (usually absent) sometimes simple, liguliform, the lower ones pinnatifid, deltoid in outline, 1–4 by 0.5–3 cm, lobes few, narrow, coriaceous, Kranz-nervation clear, apiculate, 1-nerved, the larger ones sometimes divided again, the uppermost simple, much smaller. Capitules few, on long peduncles, radiate, 5–8 mm diam. *Phyllaries* 0–2, ovate, c. 1.5 by 0.75 mm, margin not scarious, obtuse. *Involucral bracts* resembling the phyllaries, smallest, obtuse, increasing in size inwards, then striate, margins broadly scarious, the receptacular bracts longest, narrower, thinner, less striate, more acute. *Ray flowers* female, 5–12, up to 5 mm long, 3-lobulate, yellow, nerves 7, purple, 2 to the outer lobes, 3 to the inner. *Disc flowers* bisexual, 7–12, 4-merous (see note), 2.5–3 mm long, yellow. Anthers black. *Achenes* lanceolate, 5–8(–13) by 0.7–1.1 mm, glabrous, slightly ribbed, smooth, or with some barbs also along the ribs, dark brown to black, neck absent, apex bi-aristate, awns usually more or less erect, sometimes patent, rarely reflexed (see note), up to 5 mm long, variously retrorsely barbed, at least at the apex, with a small discoid tubercle in between.

Distribution. Tanzania (Tanga), India (Bhadwar, Punjab), Nepal, Sri Lanka, to Burma (fide Craib, 1936), Thailand (Chiang Mai), S Vietnam, S China (Chiangshi, Fukien, Hainan, Hong Kong, Kwangtung, Macao, Peihoi, Taishan), Taiwan, Bonin Is., Pescadores, Japan (Hachijo Is.), Korea (fide Craib, 1936); Malesia: Natuna Is. (P. Bunguran), Lesser Sunda Islands (Timor), Philippines (Luzon: Cagayan, Ilocos Norte, Benguet, Nueva Vizcaya, Albay); New Guinea (Morobe, Northern, Central, Milne Bay Prov.); New Hebrides (Tana Is.); Australia (Northern Territory, Queensland, New South Wales, Victoria, South Australia); New Caledonia; Pacific Islands: Carolines, Fiji, Marianas (Guam, Pagan, Rota).

Habitat. Roadsides, dry slopes in (burned) grasslands, open savannah, open Eucalypt forest, coconut plantations, rocky soil, on limestone crevices, lava, clay, apparently mainly along the coast, but inland up to 450(–1160) m altitude. Ansari et al. (1987) reported that *Glossocardia bidens* in Gorakhpur, India, flowers from April to December, growing in shady dry situations. In the same area *Chrysanthellum indicum* also occurs, but this flowers from September to February and grows in the grasslands. In the local seasonal climate, with a warm dry period from March to mid-June when the rainy season starts that ends in mid-September (or October).

Collector's notes. Aromatic. Fleshy taproot. Semidecumbent. Leaves greyish green, bright green above, silvery green below. Stems wiry. Flowers fragrant. Ray flowers (bright) yellow, golden, orange, red. Disc flowers brown. Young fruits chocolate brown.

U s e s. In India a preparation of the root is used against bites of snakes, stings of scorpions, and toothaches.

V e r n a c u l a r n a m e s. Bunga sisak prana (Anambas), Spanish needles (Guam, but this name is more commonly used for *Bidens pilosa* L.).

C h r o m o s o m e s. $n = 12$ (Shetty, 1967).

N o t e s. Although the combination *Glossogyne tenuifolia* is generally attributed to Cassini (1827), he did not coin it, but merely referred to *Bidens tenuifolia* Labill.

Bentham (1866) thought that *Glossogyne tenuifolia* would differ 'very little' from *Glossogyne pinnatifida*. According to De Candolle (1836) and Bentham (1861) the main difference would be that the awns would be erect in the first and longer, stiffer, and divergent in the second. A note by Ms. Koster on *Van Steenis 18130* (L) suggests that *Glossogyne pinnatifida* would have no barbs on the awns, while they would be present in *Glossogyne tenuifolia*, but in the specimen there are small barbs at the very top of them as is occasionally so in other specimens, too. Divergence of the awns is partly a matter of age, although it must be admitted that patent to reflexed awns are more common in Australia than elsewhere. We have found no other differences to speak of between material from India, Malesia, and Australia.

According to Bentham (1866), Safford (1905), and Matthew (1983) the lowermost leaves may be cuneate and 3-lobed. The latter also said that they were opposite. We have not seen such a disposition.

Safford (1905) and Beadle et al. (1972) said that the ray flowers are sometimes absent, while Matthew said that they might be entire, or 2-lobed as well.

Labillardière (1825) described the disc flowers as 5-merous and this statement has now and then independently been repeated by others, e.g. Safford, Jessop (1981), and Matthew, but all flowers we have seen had 4 lobes. During JFV's brief visit to P he neglected to check this on the isotype.

Halfway during the research a copy of the manuscript was sent to Mr. C. Jeffrey (K), where Mr. Tadesse happened to have discovered the occurrence of the species in Africa. Some correspondence ensued and only when it was too late it was discovered that *Neuractis* had to be sunk into *Glossocardia*, hence Tadesse's permitted use of the interim new combination *Neuractis bidens*.

When the flower is boiled, the water turns red.

3. *Glossocardia bosvallia* (L. f.) DC. in Wight

Glossocardia bosvallia DC. in Wight, Contr. Bot. India (1834) 19; DC., Prod. 5 (1836) 631; Wight, Icon. Pl. Ind. Or. 3 (1846) fig. 1110; C.B. Clarke, Comp. Ind. (1876) 139; Matthew, Fl. Tamilnadu 2 (1981) fig. 372; 3 (1983) 794, fig. 55e; Sharma & Sharma, Fl. Rajasthan (1989) 134; Tadesse, Kew Bull. 45 (1990) 142, fig. 1. — *Verbesina bosvallia* L. f., Suppl. Pl. (1787) 379; Roxb., Fl. Ind. ed. 2, 3 (1832) 44. — T y p e: *König s.n.* (G, holo), India.

Glossocardia linearifolia Cass., Bull. Sc. Soc. Philom., Paris (1817) 139; Cass. in Cuvier, Dict. Sc. Nat. [vol. 10 (1818) 419, nomen]; 19 (1821) 62; ed. 2, 59 (1829) 320 (identical with *Verbesina bosvallia*, without making the combination); C.B. Clarke in Hook. f., Fl. Br. India 3 (1881) 308. — T y p e: *Hb. Desfontaines* (FI, holo), no provenance.

Glossocardia setosa Blatter & Hallb., J. Bomb. Nat. Hist. Soc. 26 (1919) 536; Santapau, J. Bomb. Nat. Hist. Soc. 56 (1959) 280; Pradhan, J. Econ. Tax. Bot. 6 (1985) 477, fig. 1-14; Bhandari, Fl. Ind. Desert, rev. ed. (1990) 178, t. 66. — L e c t o t y p e: *Blatter & Hallberg 10083* (BLAT, holo), India, Rajasthan, Jodhpur Distr., Kailana (Santapau, 1959).

Bidens minuta Bruneau de Miré & Gillet, J. Agric. Trop. & Bot. Appl. 3 (1956) 703, f. 3; Adams, Fl. W. Trop. Afr. ed. 2, 2 (1963) 234. — Type: *De Miré & Gillet M N3-30* (P, holo, n.v.), Niger, Mt Bagezane, Aïr, 1220 m, 25 Nov. 1955.

Annual or perennial with a slender taproot, glabrous to minutely puberulous, hairs with bulbous bases. Branches several from the caudex, prostrate to more or less ascending. *Leaves* alternate, the lower bipinnatifid, the upper ones less compound, lobes very narrow (hence Kranz nervature invisible), apiculate, 1-nerved. Capitules campanulate in fruit, up to 8 by 8 mm diam. (excl. awns). *Phyllaries* 1–3 (sometimes a more leaf-like one a bit below the capitule on the pedicel), small, reduced, oblong, 1.75–4 by c. 1 mm, acute to obtuse, margin scarious, 1-nerved. *Involucral bracts* 4–6, increasing in size in fruit, 6.75–8 by 2–2.5 mm, obtusish to retuse, margin broadly scarious, striate, gradually passing into the receptacular bracts, these narrower, acute, less nerved, margins less scarious. *Ray flower* absent or 1 ('a few', Matthew, 1983), female, 2- or 3-lobed, yellow, nerves purple, 3 or 4 major and 3 minor ones. *Disc flowers* bisexual, 5–7, 4-merous, yellow. *Achenes* homomorphous, dorso-ventrally flattened, oblanceolate, up to 7.5 by 1.3 mm, black, not ribbed, edges with a dense row of stiff bristles, at least the midlines of the surfaces long hairy to more or less hairy all over, apex bi-aristate, awns erect to patent, 2.5–3 mm long, glabrous to setose, smooth, with a small tubercle in between.

Distribution. Chad, Niger, India (Punjab, Delhi, Rajasthan, Gujarat, Madhya Pradesh, Maharashtra, Karnataka, Andhra Pradesh, Tamil Nadu), Bangladesh.

Habitat. Floors of scrub jungles, stream banks, very poor gravelly ground, up to 700(–1000) m.

Paleynology. Tadesse (1990).

Collector's notes. Odour of fennel. Leaves glaucous. Flowers yellow.

Notes. No original material of *G. setosa* has been seen, but Pradhan (1985) has argued that there is a whole range of intermediates between this and *G. bosvallia*. The awns turn out to be variously pubescent, from glabrous to setose, while they range from erect to patent.

Tadesse (1990) has included *Bidens minuta* Bruneau de Miré & Gillet from Africa. This, also, was described as having clearly spreading antrorsely pilose awns. It is a clear element of the Saharo-Sindian Region showing the floristic affinity of the northern parts of Africa and the Indian subcontinent. The ray flowers are described as being 2-lobed, we only saw 3-lobed ones. Observations in the herbarium are difficult, as the flowers are usually absent. Matthew (1983) stated that there may be 'a few' to the capitule.

When a flower is boiled, the water turns red. This may be due to the anthochlors. When leaves are boiled the water remains clear.

4. *Glossocardia calva* (Schultz-Bip. ex Miq.) Veldk., *comb. nov.*

Adenolepis calva Schultz-Bip. ex Miq., Fl. Ind. Bat. 2 (1856) 79; in De Vriese, Pl. Ind. Bat. Or. 2 (1857) 136; Boerlage, Handl. Fl. Ned. Ind. 2, 1 (1891) 212. — *Bidens calva* Schultz-Bip. ex Miq. ex C.B. Clarke, Comp. Ind. (1876) 141, pro comb. — *Bidens artemisiifolia* (Jacq.) O. Ktze subsp. *calva* O. Ktze, Rev. Gen. Pl. 1 (1891) 321 ('*calvus*'), pro comb. incor. (epith. spec.

superfl.). — *Cosmos calvus* Sherff, Publ. Field Mus., Bot. 8 (1932) 405, pro comb. — *Cosmos sulfureus* Cav. forma *calvus* Backer, pro comb. [fide Backer & Bakh. f., Fl. Java 2 (1965) 413]. — T y p e: *Reinwardt s.n.* (L, holo, K), provenance uncertain: 'Moluccas', but probably Timor, April 1828, see note.

Perennial; branches ascending, up to c. 50 cm long, several together from a taproot. Innovations hirtellous with septate hairs to glabrous. *Leaves* not tufted at base, cauline, the lower usually alternate, the upper (leaf-like bracts!) usually opposite. Petioles 6–40 by 0.3–0.75 mm. Blades 3-foliolate or deeply 3-partite, leaflets sessile or narrowed into a short petiolule, obovate to broadly obtriangular, up to 15 by 15 mm, base cuneate, apex coarsely lobed, teeth mucronate, Kranz-nervation distinct (i. s.), the upper leaves becoming simple, coarsely lobed, the 0–5 immediately underneath and surrounding the capitules oblanceolate to linear, resembling phyllaries, entire, up to 6.5 by 1.5 mm. *Inflorescences* monochasial, each branch with a solitary capitule. Peduncles up to 8.5 cm long, usually naked. Capitules 3–6 by 3–5 mm diam. *Phyllaries* c. 2, lanceolate, 1–1.75 by 0.25–0.4 mm. *Involucral bracts* erect in fruit, 3–6, lanceolate, 2.25–4 by c. 1 mm, striate, margin narrowly scarious, apex obtuse to acutish with a more or less distinct, c. 0.25 mm long, scarious appendage; receptacular bracts linear, 3.25–3.75 by 0.25–0.3 mm, scarious but for the midrib and the obtuse apex. *Ray flowers* female, 3–6, patent, 3-lobed, white with red nerves, 4.25–5.5 mm long, nerves about 7. *Disc flowers* many, bisexual, 5-merous, yellow, 2.5–2.75 mm long. Anthers c. 1.25 mm long. *Achenes* more or less lanceolate, concavo-convex, slightly curved to straight, the discoid ones longest and narrowest, up to 5.5 by 1 mm, smooth, adaxial side with a faint midrib, margins with a hyaline line, neck absent, apex mucicous or with two minute, c. 0.25 mm long, hamate awnlets, corona minute, discoid.

Distribution. Malesia: Lesser Sunda Islands: Timor, S Coast near Lorè.

Habitat. Sandflats behind the beach together with grass and *Ionodium*, surrounded by *Borassus* forest, very common.

Collector's notes. Most stems dark wine-red. Leaves partly opposite. Ray flowers nearly white with red longitudinal nerves, disc flowers yellow.

Notes. The description given above is based on two collections, that of Reinwardt, and *Van Steenis 18185*. These differ in some respects, but on the other hand are so similar, that we are certain a single species is involved, presumably originating from different localities on Timor.

The Reinwardt specimens are slightly pubescent, with smaller, strictly 3-lobed, more or less petiolulate leaflets, smaller capitules and floral parts, achenes with a microscopically bidentate apex, and no nerve on the adaxial side, which is slightly tuberculate. *Van Steenis'* specimens are glabrous but for some hairs at the very base of the petioles, the leaves are coarser and at least the larger ones have more than 3 lobes, the capitules are larger, and the ovaries and achenes have two hamate awnlets.

The combination here by necessity proposed is rather unfortunate, as the epithet has always been attributed to a cultivated species of *Cosmos*, which now has to change its name. Article 69.1 of the Code might be applied, but we have no inclination to go through the process of rejection and conservation of a case that is weak in the first place, as will be explained.

The epithet was first used by Schultz 'Bipontinus' (Flora 30, 1847, 375) in *Adenolepis calva* Schultz-Bip. in a list of mere names of Indian plants collected by Metz (ed. Hohenacker 344) without descriptions, although it contained new species (also new combinations), e.g. *Oiospermum metzianum*, *Gymnanthemum metzianum*, etc. Zollinger '2945' was the same species. According to Sherff (1932) these collections belong to '*Cosmos calvus*' sensu Sherff.

The next time *Adenolepis calva* was used was by Zollinger for Zollinger 2594 (!) (Syst. Verz., 1854, 123). A field note 'Fl. lutei' was cited, but this is not a diagnosis in the sense of Art. 32.3, with which previous authors have agreed (Miquel, 1856; C.B. Clarke, 1876; Sherff, 1932). A diagnosis has to be a statement of that which in the opinion of its author distinguishes the taxon from another. The only species then known was *A. pulchella* Less., which also has yellow flowers.

Miquel (1856, nearly verbatim in 1857) cited these two publications, noting that he had not seen their vouchers, but that a Reinwardt collection from Java belonged to the same taxon. This specimen is present in L, annotated by Miquel himself, by Boerlage, Jeffrey, and Van Steenis, but Blume labeled it 'Arch. Molucc.' As Reinwardt's collections from his Moluccan expedition (during which he also stayed in Timor) are very badly labeled, and since the species, Miquel thought, had been collected by Zollinger in Java, it seems likely that he 'corrected' this locality.

Miquel's description, as was also pointed out by Boerlage (1891), is clearly based on the Reinwardt specimen and certainly not on a representative of '*Cosmos calvus*'. The description clearly refers to a quite different species, as can be seen when it is compared with those given by C.B. Clarke and Sherff. The *Cosmos* is a large glabrous plant, with bi- to tri-pinnate leaves with linear lobes, and not a small puberulous one (as *A. pulchella*) with ternate leaves, and obtriangular coarsely lobed leaflets. In Leiden there is no other specimen labeled by Miquel as '*Adenolepis calva*', nor is there any specimen of a *Cosmos* collected by Reinwardt from Java, or elsewhere, as far as we have been able to discover.

How Miquel obtained his identification may be explained by the combination of two factors: the combination proposed by Schultz and a comparison of the Reinwardt specimen with Lessing's description of *Adenolepis pulchella*, which seemed to fit his material apparently quite well. Compare for instance the drawing of *A. pulchella* given by Sherff sub *Bidens pulchella* (Publ. Field Mus., Bot. 16, 1937, fig. 6, j-p). This is a synonym of *B. sandvicensis* Less. subsp. *sandvicensis* (Dr. S.H. Sohmer, Honolulu, in litt.) to be published in the Manual of the Hawai'i Flora 1 (1990) 281.

As there seems to be no junior, heterotypic specific epithet available for '*Cosmos calvus*' a new one is needed: see Appendix.

It may be noted that *Adenolepis* has been regarded as a homonymous section of *Bidens* L. It was first reduced to this by Boerlage (1891: 212, 243), i.e. before Hoffmann in Engler & Prantl (1894) did so. Sherff (1932: 30) regarded it as a synonym of sect. *Campylotheca* (Cass.) Nutt. (1841).

5. *Glossocardia condorensis* (Gagnep.) Veldk., *comb. nov.*

Glossogyne condorensis Gagnep., Bull. Soc. Bot., France 68 (1921) 118; Fl. Gén. I.-C. 3 (1924) 594, t. 64, f. 15, 16; Craib, Fl. Siam. Enum. 2 (1936) 281. — T y p e: *Harmand 937* (P, holo), Vietnam, Poulo Condor, no date.

Annuals, subglabrous, with a slender taproot. Branches several from the caudex, more or less decumbent to erect, up to 25 cm long. *Leaves* basal and cauline, alternate. Petioles up to 1 cm long. Blades pinnatifid to 3-fid, trullate in outline, up to 2 by 2.5 cm, lobes linear, apiculate, 1-nerved. Capitules few, terminal on the branchlets, discoid or with 1 ray flower (early caducous), ellipsoid to campanulate in fruit, then up to 7 by 5 mm (excl. awns). *Phyllaries* c. 2, oblong, 2.75–3.25 by 0.5–0.75 mm, margin narrowly scarious, acute, 1-nerved. Involucral bracts 4–6, increasing in size in fruit, up to 5 by 2.25 mm, bluntly acute, margin scarious, striate. Receptacular bracts longer, narrower, up to 6 by 0.75 mm, acute. *Ray flower* female, c. 3 mm long, 3-dentate, yellow, nerves 5, three running into the teeth, the other two lateral to these. *Disc flowers* bisexual, 4–9, 4-merous, c. 3 mm long, yellow. Anthers with a rounded unappendaged base, apex with a minute triangular scale. *Achenes* homomorphous, dorso-ventrally flattened, adaxially more or less concave with a central ridge, abaxially nearly flat, striate, neck absent, oblong, up to 6 by 1.5 mm, black, shortly setulose, especially on the edges and adaxial ridge, apex biaristate, awns more or less erect, hamate, 2–2.75 mm long, with a small tubercle in between.

Distribution. Thailand (Kanchanaburi; Rachaburi), Vietnam (Poulo Condor).

Habitat. Poor sandy soil.

Collector's note. Flowers yellow.

Note. Gagnepain described the species as having discoid capitules. Inspection of a few young capitules showed that some are truly discoidal, while others have a single ray flower. In a Thai specimen (*Kasem 636*, BK, L) a few capitules were seen also with a single ray flower, similar to the situation in *Glossocardia bosvallia* (L. f.) DC.

6. *Glossocardia integrifolia* (Gagnep.) Veldk., *comb. nov.*

Glossogyne integrifolia Gagnep., Bull. Soc. Bot., France 68 (1921) 119; Fl. Gén. I.-C. 3 (1924) 595, t. 64, f. 10–14. — **T y p e:** *Harmand s.n.* (P, holo), Thailand, Udawn, Lakhon Mts, left bank of Mekong River, Sept. 1877.

Perennial, subglabrous (some minute hairs along the leaf margins), with a slender taproot. Branches few from the caudex, virgately erect, up to 45 cm long, few-leaved. *Leaves* mainly basal, alternate. Blades simple, liguliform, up to 5 cm by 2 mm, gradually narrowed into the petiole, apiculate, 1-nerved, Kranz-nervature not clear. Capitules on long peduncles, radiate, up to 7 mm diam. *Phyllaries* c. 2, ovate, c. 0.75 by 0.25 mm, margin not scarious, acutish. Involucral bracts oblong, c. 2.5 by 0.75 mm, acutish, striate, margins scarious; receptacular bracts lanceolate, c. 2.5 by 0.5 mm, acute. *Ray flowers* female, 6–8, c. 3 mm long, 3-lobulate, colour not recorded (yellow?), nerves 7, dark (purple?). *Disc flowers* functionally male, c. 10, 4-merous, 2–2.5 mm long. Anthers brownish. *Achenes* lanceolate, 3.5–5.5 by c. 1 mm, glabrous, ribbed, smooth, black, neck absent, awns hamate, erect to patent, 1–1.5 mm long, with a small discoid tubercle in between.

Distribution. Thailand (only known from the type).

Habitat. Not noted.

7. *Glossocardia josephinae* Veldk. & Kreffer, *spec. nov.*

Perennes erectae foliis moderate septate puberulis. Folia pinnatilobata radicalia caulinaque alterna. Bracteae exteriores interioresque carnosae reflexae in fructu, marginibus non scariosis. Flores ligulares feminei 4 vel 5 (vel 6) per capitulo 10–15 mm longi, limbo flavo 3-lobulato nervis majoribus 5 et minoribus compluribus. Flores tubulares velut masculini fungentes 5-meri flavi. Achenia recta inermia. — **T y p u s:** *Jaag 20* (L, holo; ZT, n.v.), Lesser Sunda Islands, Sumba, 7 km from Waingapu, 150 m alt., 25 April 1938.

Perennials, erect, 10–23(–30) cm long, with a slender taproot. Stem subglabrous. *Leaves* in a radical rosette or alternate, moderately septate-hairy. Petiole very gradually passing into the blade, up to 6(–10) by 0.8(–2) mm, upper leaves sessile. Lower blades about linear, pinnatilobed, oblong to lanceolate in outline, 10–14(–18) by 2–6 mm, lobes short, broad to linear, mucro 0.5–0.75 mm long, midrib slightly protruding on both sides. Peduncles glabrous. Capitules 4–6 by 5–8 mm diam., yellow. *Phyllaries* absent. Involucral bracts curved out in fruit, linear, 3.5–4.25 by 0.4–0.5 mm, mucronate, mucro c. 0.5 mm long, margins not scarious, rather fleshy, 1-nerved, (sub)glabrous; receptacular bracts spatulate-linear, 3–3.5 by 0.2–0.3 mm, apiculate, mucro 0.15–0.25 mm long. *Ray flowers* female, 4 or 5, rarely 6, patent, 10–15 mm long, bright yellow, tube 0.75–0.9 by c. 0.15 mm diam., limb oblanceolate, 9–14 by 3.6–5 mm, apex truncate, 3-lobulate, middle lobe smallest, with 5 major and several minor dark nerves, the inner major ones running into the apical lobes. *Disc flowers* functionally male, 5-merous, trumpet-shaped, c. 2.5 mm long, yellow. Anthers c. 1.75 mm long. Style c. 2.5 mm long, stigmas c. 1.4 mm long. *Achenes* (of the ligular flowers) c. 3 by 0.5 mm, glabrous or upwards ciliolate, base truncate, apex muticous, straight, slightly attenuated into a c. 0.3 mm long neck, corona discoid or with 2 hook-shaped teeth.

D i s t r i b u t i o n. Malesia: Lesser Sunda Islands: Sumba, 7 km from Waingapu, Jundu Kabuku (Melolo).

H a b i t a t. Locally common in dry, grassy, calcareous places, 50–200 m altitude.

C o l l e c t o r ' s n o t e. Flowers yellow.

V e r n a c u l a r n a m e. Pau maràda (Melolo).

N o t e. This species was already provisionally recognized by the late Dr. J.Th. Koster, specialist in the Malesian Compositae, and we are pleased to name it after her.

8. *Glossocardia leschenaultii* (Cass.) Veldk., *comb. nov.*

Neuractis leschenaultii Cass. in Cuvier, *Dict. Sc. Nat.*, ed. 2, 34 (1825) 496; Miq., *Fl. Ind. Bat.* 2 (1856) 82; Vorderman, *Geneesk. Tijdschr. Ned.-Ind.* 40 (1900) 184. — *Chrysanthellum leschenaultii* Backer ex Koster [Bekn. *Fl. Java* 13a (1953) 93, ineff. publ., see note], *Blumea* 12 (1963) 65; Backer & Bakh. f., *Fl. Java* 2 (1965) 412. — **T y p e:** *Leschenault s.n.* (P, holo, n.v.), Madura ('Java').

Chrysanthellum indicum auct. non DC.: Koord., *Exk. Fl. Java* 3 (1912) 338; Heyne, *Nutt. Pl. Indon.* 1 (1950) 1441.

Chrysanthellum procumbens auct. non L.C.M. Rich.: Boerlage, *Handl. Fl. Ned.-Ind.* 2, 1 (1890) 213, 243.

'Kemanden sawo': Van Blokland-Gunsch, *Doekoen Djawa* (1885) 127, recipe 1001.

Perennial, prostrate, rarely erect, up to 30 cm long and 10 cm high, with a thick taproot, completely glabrous. Stems rooting from the nodes, scaly by the leaf scars. *Leaves* usually tufted on the nodes, alternate, the upper (leaf-like bracts) sometimes (sub)opposite, smooth. Petiole 2–15 by 0.2–0.4 mm, narrowly winged, wings upwards narrowing. Blades broadly ovate, 3-partite, nearly bipinnate, 8–10 by 10–16 mm, lobes c. 10 times as long as wide, nerves not immersed above, slightly protruding beneath. Peduncles ribbed, smooth. Capitules 4–6(–8) by 5–8(–10) mm diam. *Phyllaries* 0–2, linear, up to 2.75 by 0.25 mm. Involucral bracts erect in fruit, 5–7, lanceolate, 2–4 by 0.5–1.2 mm, shorter than the receptacular bracts, which are narrower and more blunt, margins narrowly scarious, glabrous to ciliolate, apex mucronate. *Ray flowers* female, 2–4, patent, 3-fid for c. 0.67th of their length, (1.2–)3.5–5.5 mm long, 5–7-nerved, cinereous to pale pink with bluish to purple nerves and/or margins. Style 2.5–3 mm long. *Disc flowers* functionally male or bisexual, 5-merous, (2.5–)3.3–5(–6) mm long, pale purple. Anthers c. 1.75 mm long. *Achenes* muticous, 2.5–3.3 by 0.4–0.8 mm, smooth, black, neck short, corona a small erose collar.

Distribution. North coast of Madura. (Cultivated in Bogor at least between 1869 and 1893.)

Habitat. Grassy sunny localities on the driest limestone rocks, in rock crevices, along the coast, locally abundant, up to 100 m altitude.

Collector's notes. Stem creeping and rooting. Ray flowers usually 3, pale pink or cinereous, with bluish to purple veins and/or margins. Disc flowers pale purple with darker veins. Anthers dark purple.

Vernacular names. David's flower (Heyne, 1950), kemandèn sèwo ['thousand blisters', as the herb is part of a medicine for 'kamandhin', or allergy due to black magic (see Van Blokland-Gunsch, 1885), mistakenly spelled as 'penganthèn sèwu' ('herb of a thousand brides': *Zollinger 3830*).

Uses. According to Vorderman (1900) sold as a medicinal herb in Surabaya. Dr. M. Rifai (BO) visited several shops in 1987, but the herb was unknown (Rifai, in litt.).

Notes. Bentham [in Benth. & Hook. f., *Gen. Pl.* 2, 1 (1873) 389], not having seen a representative from its description thought that *Neuractis* might be identical with *Chrysanthellum* but for the deeply trifid ligules. Although Hoffmann (1891) most likely did not see anything, either, he united the two without making the necessary combination. This was apparently first done by Backer on his field labels, which combination Ms. Koster then introduced in Backer's *Beknopte Flora van Java*. However, Backer and his collaborators always have regarded this work as ineffectively published and regarded as a safe keeping of his precious manuscripts and as work copies for collaborators of the Flora Malesiana Project (Van Steenis, pers. comm.) when Ms. Koster used the combination again in 1963.

9. *Glossocardia refracta* Veldk., *spec. nov.*

Ab omnibus *Glossocardiæ* speciebus in acheniis abrupte incurvatis aristis refractis bene distincta. — **Type** s: *Pedley 2282* (K, holo, BRI, L), Australia, Queensland, Cook Dist., near Granite Creek, c. 12 miles SSW of Mareeba, 23 April 1967.

Annuals (see note), subglabrous (some minute hairs especially on the base of the petioles), with a slender taproot. Branches few from the caudex, more or less erect, up to 40 cm long, often almost leafless. *Leaves* mainly basal, alternate. Petioles up to 4.5 cm. Blades (bi-)pinnatisect, trullate in outline, up to 4 by 3 cm, lobes narrow, Kranz-nervation not clear, apiculate, 1-nerved, the uppermost blades reduced to simple. Capitules few, on long peduncles, radiate, up to 10 mm diam. *Phyllaries* c. 1, ovate, c. 1.5 by 0.5 mm, margin narrowly scarios, acute. *Involucral bracts* oblong, 2.25–2.75 by 1–1.25 mm, erosely obtuse, striate, margins scarios, the receptacular bracts similar, 2.75–4 by c. 1 mm, margin more scarios. *Ray flowers* female, c. 5 (? see note), c. 2 mm long, 3-lobulate, yellow, nerves 5 or 7, dark (i.s.). *Disc flowers* bisexual, 10–16, 4-merous, c. 2 mm long, yellow. Anthers c. 0.75 mm long. *Achenes* lanceolate, adaxially strongly involute, 5.25–5.5 by c. 0.75 mm, glabrous, ribbed, smooth, black, neck absent, apex bi-aristate, awns strongly reflexed, 2.5–3 mm, hamate, with distinctly prolonged tubercle in between.

D i s t r i b u t i o n. Australia, Queensland, Cook District.

H a b i t a t. Low hilly area with *Eucalyptus melanophloia*–*Petalostigma banksii* woodland on shallow stony soil with rocky outcrops.

C o l l e c t o r ' s n o t e s. Perennial erect herb. Flowers, rays yellow.

N o t e s. In the herbarium confused with *Glossogyne retroflexa* F. Muell. because of the curious incurved achenes with reflexed awns.

Although annotated as a perennial, it seems an annual to us by the presence of only a thin taproot and the absence of sterile branches or remnants of growth of a previous season.

Apparently, the capitules quickly fructify during the drying process, because no capitules in anthesis were seen: the number of ray florets therefore could only be guessed at.

10. *Glossocardia smithii* (Backer) Veldk., *comb. nov.*

Chrysanthellum smithii Backer, Bull. Jard. Bot. Buit. II, 12 (1913) 39; Backer & Bakh. f., Fl. Java 2 (1965) 412. — **T y p e:** *Backer 8217* [BO, holo, no. 24238, B (lost), K, L, P, PNH (lost), SING, UJ, Java, Besuki, G. Ijen foothills, Asembagus, 150 m alt., 29 May 1913.

Annuals, erect, up to 60 cm long. Root system strongly branched, not very extensive. Stem moderately septate-hairy, scabrid, slightly angular. Leaves alternate, very scabrid, hairs 0.4–0.9 mm long. Petiole not winged, up to 6 by 3 mm. Lower blades 30–32 by 20–25 mm, trifid, lobes pinnatifid, upper blades smaller, sometimes reduced and sessile, simple, linear, 4–6 by 1–1.5 mm, 3-nerved; midrib not immersed above, slightly protruding beneath. Peduncles moderately to densely, bulbous-basedly septate-hairy. Capitules 5–8 by 3–5 mm diam., purple to lilac. *Phyllaries* few, linear, up to 4 by 0.5 mm. Involucral bracts erect in fruit, ovate-lanceolate, 4.6–7.3 by 1–1.25 mm, acuminate, margins broadly scarios, herbaceous, sparsely septate-hairy; receptacular bracts as the outer ones, about as long, narrower, glabrous. *Ray flowers* sterile or female, c. 5, patent, 7.5–9 mm long, apex equally 3-dentate, reddish violet, 5-nerved. *Disc flowers* bisexual, 5-merous, (4–)6.2–7 mm long, white to lilac. Anthers c. 1.75 mm long. *Achenes* muticous, oblanceolate, up to 4.5 by 1 mm diam., obtuse, black, glabrous, adaxially with a central longitu-

dinal ridge, concavely impressed along this, abaxially usually smooth, sometimes furrowed, convex, neck absent, corona adaxially incurved, subapical, callose, smooth, entire.

Distribution. Java, only known from the type collection.

Habitat. Dry hilly area, "the driest district of Java" (Backer, 1913), abundant in the grass, c. 150 m altitude.

Collector's notes. Erect herb, up to 50 cm high, much-branched. Ray flowers 5, blade 7–8 mm long, red purple, 5-nerved, the 3 middle nerves running nearly to the apex, the outer ones much shorter. Disc flowers pale purple to nearly white with dark purple nerves.

Note. The species is peculiar for having apparently female, but actually sterile ray flowers and bisexual discal ones, as was already observed by Backer (1913).

11. *Glossocardia tridentata* (Turcz.) Veldk., *comb. nov.*

Bidens tridentata Turcz., Bull. Soc. Nat., Mosc. 24 (1851) 183; in Walp., Ann. 5 (1859) 224; Benth. in Benth. & Hook. f., Gen. Pl. 2, 1 (1873) 389 (in syn. sub *Glossogyne*, comb. not made). — *Glossogyne tridentata* Benth. ex F.-Vill., Nov. App. (1880) 119; Vidal, Phan. Cum. Philip. (1885) 112; Benth. & Hook. f. ex Jackson, Kew Ind. 1 (1895) 1035. — *Guerreroia tridentata* Steen., Blumea 30 (1985) 429. — **Type:** *Cuming 1239* (CW, holo, n.v.; K, L), Philippines, Luzon, North Ilocos.

Guerreroia monocephala Merr., Philip. J. Sc., Bot. 12 (1917) 118, f. 2; Enum. Philip. Fl. Pl. 3 (1923) 613. — **Type:** *BS 27526 (Ramos)* (PNH, lost), Philippines, Luzon, North Ilocos Prov., Bangui, 9 March 1917.

Glossogyne tenuifolium auct. non Cass.: Merr., Enum. Philip. Fl. Pl. 3 (1923) 613, p.p.

Acaulescent perennials, tufted and stoloniferous (stolons up to 5 cm long), up to c. 10 cm high, with a thick taproot, subglabrous. *Leaves* basally tufted, sometimes a few on the peduncle, alternate, simple, cuneate, gradually narrowing into the petiole, up to 6 cm by 7 mm, fleshy, margins thickened, in the lower part with a row of septate hairs, apex coarsely 3- or 5-dentate, not apiculate. *Inflorescences* 1-flowered, peduncles up to 10 cm long, smooth, glabrous. Capitules c. 7 by 7 mm diam. *Phyllaries* 0–2, linear, c. 1.5 mm long, or resembling the involucre bracts. *Involucre bracts* few, oblong, c. 4 by 1.5 mm, more or less fleshy, margins narrowly scarious, apex obtuse, finely erose; receptacular bracts narrower, thinner. *Ray flowers* (see note) female, 4 or 5, 5.5–6 mm long, blade 2.5–4 mm wide, apex 2- (or 3-) lobulate, yellow with 5 or 6 dark nerves (i.s.). Style c. 1.75 mm long, stigmas 0.5–1 mm long. *Disc flowers* bisexual, numerous, 4-merous, 3–3.5 mm long, white. Anthers c. 1.5 mm long, brownish (i.s.). *Achenes* lanceolate, c. 4 by 1 mm, black, neck absent, mucicous or with 2 hamate awnlets up to 1 mm long, with a very minute callus in between.

Distribution. Philippines, Luzon (Ilocos Norte; Cagayan, fide F.-Vill.).

Habitat. Dry open hills at low and medium altitudes.

Collector's note. Flowers white and yellow.

Note. Only a single specimen, an isotype of *Bidens tridentata*, could be studied; only one immature capitule could be dissected. Part of the description is therefore based on that of Merrill of *Guerreroia monocephala*.

APPENDIX

Because of the reduction of *Eryngiophyllum* a few species need a new name, as well as '*Cosmos calvus* sensu Sherff', as explained under *Glossocardia calva*.

1. *Chrysanthellum rosei* (Greenm.) Veldk., *comb. nov.* — *Eryngiophyllum rosei* Greenm., Proc. Am. Acad. Arts 39 (1903) 113 = Contr. Gray Hb. n.s. 25 (1903) 113. — T y p e: *J.N. Rose 1618* (A, holo, US), Mexico, Sinaloa State, between Rosario and Calomas, 12 July 1897.

2. *Chrysanthellum pinnatisectum* (P.G. Wilson) Veldk., *comb. nov.* — *Eryngiophyllum pinnatisectum* P.G. Wilson, Kew Bull. 13 (1958) 165. — T y p e: *G.B. Hinton 6598* (K, holo), Mexico, Guerrero, Coyuca Dist., Arcelia, 15 Sept. 1934.

3. *Cosmos steenisiae* Veldk., *nom. nov.* [Fl. Males. Bull. 9 (1987) 383, nomen]. — T y p e: *Zollinger 2945* (P, holo), Java, Besuki, Bondowoso, Maësan, garden, 13 June 1845, 485 m alt.

[*Adenolepis calva* Schultz-Bip., Flora 30 (1847) 374, nomen; Schultz-Bip. ex Zoll., Syst. Verz. (1854) 123 ('Zoll. 2594'), nomen.]. — *Cosmos calvus* auct., non Sherff: Sherff, Publ. Field. Mus., Bot. 8 (1932) 405, quoad descr. lat., excl. basion.

Bidens artemisiifolia (Jacq.) O. Ktze var. *calva* auct. non O. Ktze: O. Ktze, Rev. Gen. Pl. 1 (1891) 321, excl. basion.

Cosmos sulfureus Cav. forma *calvus* auct. non Backer: Backer, fide Backer & Bakhuizen f., Fl. Java 2 (1965) 413; excl. basion.

See under *Glossocardia calva* for the reasons for this name change. Named after Ms. M.J. Van Steenis-Kruseman to commemorate her incomparable achievements for Malesian botany in this border plant so commonly cultivated in the tropics.

SPECIES DUBIAE ET EXCLUDENDAE

1. *Glossogyne brasiliensis* Gardn. in Hook., London J. Bot. 7 (1848) 408. — *Isostigma brasiliense* [Benth., in Benth. & Hook. f., Gen. Pl. 2 (1876) 389, in syn., comb. not made]; Benth & Hook. f. ex Jacks., Ind. Kew. 2 (1895) 1285. — T y p e: *Gardner 4253* (BM, holo), Brazil, Prov. Goyaz, near Nossa Senhora d'Abbadia, May 1840.

= *Isostigma brasiliensis* (Gardn.) Benth. & Hook. f. ex Jacks.

Contrary to general citation Bentham (1876) did not make the combination, but merely cited the basionym as belonging to *Isostigma*. It is well possible that prior to Jackson's the combination was formally made in a local account.

2. *Glossogyne chinensis* (L.) Less., Syn. Gen. Comp. (1832) 212. — *Bidens pilosa* L. var. *chinensis* L., Mant. Alt. (1771) (281: 'β') 463. — Type: *Hb. Linné* 975-10 (LINN, holo), Sweden, Uppsala, cultivated.

= *Bidens pilosa* L. (var. *chinensis* L.)

Linné did not publish the varietal name on p. 281, where '*chinensis*' must be regarded as a uninomial strophe name. In the *Observationes*, p. 463, he mentioned "pilosa varietas chinensis", which may be regarded as the validation of the epithet. The material in LINN, judging from the descriptions and the microfiche is the type of this combination, although it was questioned by Sherff [Publ. Field Mus. Nat. Hist., Bot. 16, 2 (1937) 428–429]. If Sherff's variety *minor* (Blume) Sherff is accepted, Linné's combination has priority, while the one proposed by Sherff is superfluous in any case.

3. *Glossogyne filifolia* (F. Muell.) F. Muell. ex Benth., Fl. Austr. 3 (1866) 544. — *Diodontium filifolium* F. Muell. in Hook., Kew J. 9 (1857) 19. — Type: *F. v. Mueller s.n.* (MEL, holo, K), Australia, N Territory, sources of Hooker's Creek, between Sturt Creek and Victoria River.

= *Diodontium filifolium* F. Muell. in Hook.

Perennial, glabrous. Root not seen. Branches virgately erect, at least 35 cm long. Leaves opposite and close-set at the base of the branches. Blades simple, linear, up to 8 cm by 0.75 mm, apiculate, Kranz-nervation not clear, 1-nerved. Capitules corymbose, apparently discoid, up to 7 mm diam. *Phyllaries* c. 2, ovate, 1.5–2.5 by 0.3–0.75 mm, margin not scarious, acutish. *Involucral bracts* lanceolate, c. 4 by 0.75 mm, acutish, striate, margins not scarious; receptacular bracts lanceolate, c. 4–4.75 by 0.5 mm, abruptly shortly acuminate. acute. *Disc flowers* bisexual, 3–10 per capitule, 5-merous, c. 4.75 mm long. Anthers brownish, base rounded, apex with a small triangular scale. *Achenes* homomorphous, obovoid, narrowly winged in the lower half, concave, 4–5.5 by 3–4 mm, glabrous, smooth, not ribbed, yellowish brown, neck absent, awns smooth or with a few barbs at the apex, patent, c. 0.6 mm long, without a small tubercle in between.

Distribution. Australia, N Territory, only known from the type.

Habitat. Granite hills, sandstone table-land.

Collector's notes. Bush, strongly smelling, flowers yellow, achenes shiny with yellow wings.

Anatomy. Dr. P. Baas (L) reported (oral comm.) that the leaves have a well-developed Kranz anatomy.

Note. From Von Mueller's description it can be observed that this cannot be a *Glossocardia*. No species there has a bushy habit, opposite leaves (not fascicled, as described), discoid capitules (not a strong argument), and such fruits: not ± straight, oblong to linear-lanceolate, dark brown to black, and more or less distinctly ribbed, but strongly concave, obovoid, little longer than wide, narrowly winged in the lower half, pale brown, and smooth. We have been unable to find a genus in or outside Australia in which it would fit, so Von Mueller's *Diodontium* must be resurrected.

4. *Glossogyne hennedyi* R. Br. III, Trans. New Zeal. Inst. 15 (1882) 259, fig. — Type: *Kirk s.n.* (?) (WELT, holo), New Zealand, South Island, Banks Peninsula.

= *Calotis lappulacea* Benth.

The collector of the type apparently is Kirk [cf. Students' Fl. New Zeal. (1899) 262], although the combination was published by R. Brown III, a name not found in the Index Herb. II, 2 (1954), nor in TL-2. Kirk said that it would flower from February to April, Brown said from September to March.

The Kew Index mistakenly has '*kennedyi*' as the epithet.

5. *Glossogyne orthochaeta* F. Muell., Vict. Natural. 8 (1891) 116; Bot Centr. Bl. 48 (1891) 363. — Type: *Johnson s.n.* (MEL, holo), Australia, Queensland, Cook Dist., South Coen River.

Not enough is known to us of this taxon to identify it with certainty. It could well be identical with *Glossocardia bidens* (Retz.) Veldk.

6. *Trioncinia* (F. Muell.) Veldk., *gen. nov.* — *Glossogyne* section *Trioncinia* F. Muell., *Fragm.* 1 (1858) 51. — Type: *Trioncinia retroflexa* (F. Muell.) Veldk.

6.1. *Trioncinia retroflexa* (F. Muell.) Veldk., *comb. nov.*

Glossogyne retroflexa F. Muell., *Fragm.* 1 (1858) 51; Benth., *Fl. Austr.* 3 (1866) 544. — Type: *F. v. Mueller s.n.* (MEL, holo, K), Australia, Queensland, Leichhardt Dist., Darling Downs, 22° 56' S, 148° 5' E.

Perennials, branched, glabrous, with a thick woody taproot. Branches few from the caudex, more or less erect, up to 40 cm long, almost leafless. *Leaves* mainly basal, alternate. Petioles up to 4 cm. Blades (bi-)pinnatifid, trullate in outline, up to 3.5 by 2 cm, lobes narrow, Kranz-nervation not clear, apiculate, 1-nerved, the larger ones sometimes divided again, the uppermost reduced to simple. Capitules few, on long peduncles, radiate, up to 7 mm diam. *Phyllaries* c. 1, ovate, c. 1.75 by 0.5 mm, margin narrowly scarious, acute. *Involucral bracts* ovate-oblong, c. 3.25 by 1.75 mm, striate, acutish, margins scarious, the receptacular bracts lanceolate, c. 3.5 by 1 mm, obtuse. *Rayflowers* female, apparently sterile, at least 5 (see note), c. 3.25 mm long, 2-lobulate, yellow (?), nerves 5 or 7, dark (i.s.). *Disc flowers* bisexual, 10 or more, 4-merous, c. 2.5 mm long. Anthers c. 1. mm long, base rounded, unappendaged, apex with a small triangular scale. *Achenes* lanceolate, adaxially slightly curved inward, c. 5.5 by 1 mm, glabrous, ribbed, with many warty transversal ridges, dark brown, black, neck absent, apex tri-aristate, awns strongly reflexed, 2.5–3 mm, hamate, with an indistinct tubercle in between.

Distribution. Australia, Queensland, Leichhardt Dist., Peak Downs; only known from the type.

Habitat. 'Basaltic plains'.

A n a t o m y. Dr. P. Baas (L) reported (oral comm.) that the leaves have a well-developed Kranz anatomy.

N o t e s. This is not a *Glossocardia* because of the ornamented achenes and the 3 or 4 awns. For the latter reason it is not a *Chrysanthellum*, either. Nor is it a *Bidens*, because of the alternate leaves. At present there seems to be no genus in which this species can be placed, therefore Von Mueller's section *Trioncinia* is raised to generic rank.

INDEX TO COLLECTORS

Numbered and dated collections have been included. Specimens not seen, but of which the identity seemed certain, have been included with the identity number between brackets.

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