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A SYNOPSIS OF THE AFRICAN AND MADAGASCAN RUBIACEAE — NAUCLEEAE

C. E. RIDSDALE[1])

in collaboration with

R. C. BAKHUIZEN VAN DEN BRINK JR.[2])

The centre of distribution of the *Naucleeae* is Malesia and Asia, there are but a few African and Madagascan representatives. The revision of the group for Flora Malesiana entailed an extensive nomenclatural evaluation and typification of the genera (Bakhuizen van den Brink Jr., 1970). This has been followed by detailed taxonomic investigations and a re-evaluation of the tribal and generic limits. The *Naucleeae*, as conceived by K. Schumann (1891), have mostly been considered a highly natural group (Verdcourt, 1958) and have even been raised to family status (Airy Shaw, 1973). Bremekamp (1966) has been the only botanist ever to question the homogeneous nature of the *Naucleeae*.

However, after re-examination of materials of most representatives of all genera and sections of genera one could only come to a conclusion similar to Bremekamp's. The only character that the genera of the tribe have in common is the arrangement of the inflorescence in a spherical head, a feature recurring independently in many tribes. The genera *Mitragyna* and *Uncaria* are here placed together in a subtribe *Mitragyninae* and transferred to the tribe *Cinchoneae*; *Cephalanthus* is transferred into a separate tribe, a move first suggested by Bremekamp (1966). These groups will be treated separately in papers shortly to appear. The remaining genera, as far as can be judged, form a somewhat homogeneous tribe.

The last world-wide revision of the group was by Haviland (1897), who, considering the material available at the time, provides an extensive detailed survey of the group and of the problems involved. The work of Merrill (1915), who attempted to clarify the situation in *Nauclea* and *Neonauclea*, has created great confusion, particularly in typification (Bakhuizen van den Brink Jr., 1970). It also served to draw away the attention from many of the problems of the group, particularly of the genus *Adina s.l.* All subsequent authors have accepted Merrill's interpretation without critically re-examining the group on a world-wide basis. The availability of more extensive recent collections has considerably added to our knowledge of the group but at the same time has increased the problems of generic distinction. In the taxonomic studies on the Malesian genera it became clear that either the generic concepts, as presently recognized, would have to be modified or that all taxa should be returned to one highly variable genus. A rapid glance at the synonymy will show that previous experienced workers have also been faced with the same problem. Thus the old generic concepts have been re-modeled.

The generic limits of the Malesian and Asiatic genera have been revised and, as a consequence, it became apparent that certain changes were also necessary in the African and Madagascan taxa. The isolated nature of *Adina microcephala* is no new discovery, being previously emphasized by Baillon (1879) and Haviland (1897). Two of the new Madagascan genera were recently published (Capuron, 1972) as *Neonauclea*'s, although one was some time ago placed by Homolle under manuscript names in *Adina*.

1. B. A. Krukoff botanist of Malesian Botany, Rijksherbarium, Leiden.
2. Rijksherbarium, Leiden.

It is considered that the *Naucleeae* are a relatively ancient group, with closest affinity to the tribe *Cinchoneae*. The inflorescences are highly modified and may be viewed as condensed or reduced, and they are all very similar. However, there is strong evidence to suggest that the group is composed of many genera each with a few species, as is accepted for some well-defined genera e.g. *Burttdavya* (monotypic), *Anthocephalus* (2 species), *Nauclea* (4 African, ±5 Malesian species). The diversity of the stipules of the vegetative apices, the nature of the reduced or modified organs on the node of the flowering axis, and the placentation, are all constant in the well-delimited genera. In the remaining little-studied genera these features are highly variable. Thus, within *Adina s.l.*, the diversity and variation within the genus is greater than between other genera of the *Naucleeae*. It has been concluded (Ridsdale & Bakhuizen van den Brink Jr., unpublished data) that such genera are unnatural heterogeneous assemblages of taxa which cannot readily be accomodated elsewhere. Thus, new, more acceptable generic limits have been drawn for all taxa of the tribe. This synopsis of the African and Madagascan genera is intended as the first in a series of papers on the *Naucleeae*. The keys and descriptions will interlock with those to be published in a revision of the Asiatic and Malesian representatives. In this synopsis full descriptions and other details are not included: for Continental Africa these are readily available in the local floras, the Madagascan genera will shortly be treated in full by Professor J. F. Leroy, the first preliminary note being in the press (Leroy, 1975).

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PRESENTATION OF DATA

In many *Rubiaceae* differentiated shoot systems occur, the main axis being orthotropic and the lateral axes plagiotropic. These plagiotropic branches may obligatory produce vegetative branches or may, under the influence of flowering factors, produce a flowering axis bearing reduced leaves, stipules, and inflorescences, or only develop a solitary inflorescence. Different authors have used a rather variable terminology to describe this situation. It is considered that the inflorescence is, in principle, always terminal, either terminal on the orthotropic and plagiotropic shoots, or terminal on the plagiotropic branch and terminal on short lateral branches of the plagiotropic shoot. Where such a

short shoot is unbranched and bears a solitary inflorescence head, the stalk has generally be termed 'peduncle'. Here this is considered to be a short shoot with one or two nodes, the stalk above the uppermost node being termed the 'true peduncle', and that below being the 'flowering axis'. In the descriptions such inflorescences are termed 'lateral' for convenience. It is considered that a flowering plagiotropic shoot may bear reduced leaves at the various nodes; the stipules or more rarely stipules and leaves of the node subtending the inflorescence may simply be small and reduced or may sometimes be modified into foliaceous bracts which surround the young inflorescence. The receptacle may bear small filamentous to spathulate 'interfloral bracteoles' between the flowers. All these different organs have, at varying times, been called bracts.

KEY TO THE GENERA OF THE NAUCLEEAE SENSU K. SCHUMANN

1a. The two placentas variously attached to the septum; if attached in the upper third, then either Y-shaped with 2 short ascending arms and a long descending foot, or a small, short, obovoid boss; if medianly attached to the septum then either discoidal with central attachment, or oblong to slightly bilobed and unbranched; placentas pallid in colour; ovules and seeds of each placenta either (predominantly) pendulous, or spreading in all directions, never upwardly imbricate along the whole length of the placenta. Fruitlets either free on the receptacle and then the endocarp splitting from bottom to top, or loosely cohering and indehiscent, or ovaries and fruitlets fused into a (pseudo-)syncarp. Corolla lobes imbricate (in Asia and Malesia also valvate) 3

b. The two placentas adnate to the septum, or attached in the upper third, long and pendulous, thick, dark brown to black; ovules and seeds of each placenta upwardly imbricate along the whole placenta. Fruitlets free on the receptacle, endocarp of fruit splitting from top to bottom. Corolla lobes valvate.
tribe **Cinchoneae**: subtribe **Mitragyninae** 2

2a. Climbers, short flowering axes modified into hooks, seeds alate, long tailed, one tail deeply bipartite . . . . . **Uncaria**

b. Trees, short flowering axes not modified into hooks; seeds alate, not long tailed, one tail sometimes shallowly notched. . . . . **Mitragyna**

3a. Ovules solitary, funiculus with a well-developed arillus.
tribe **Cephalantheae**: **Cephalanthus natalensis**

b. Ovules solitary to numerous, arillus absent.
tribe **Naucleeae** *s.s.* 4

4a. Ovaries and fruitlets persistently connate into a syncarp. 5

b. Ovaries and fruitlets free 8

5a. Inflorescences lateral; stigma clavate to globose. *Madagascar and? Mauritius*. . . 6

b. Inflorescences terminal; stigma spindle-shaped. *Continental Africa* 7

6a. Terminal vegetative bud conical, sometimes volute, stipules broadly to narrowly triangular; inflorescences enclosed by strongly cohering calyptra-like bracts, these usually rupturing circumscissile, true peduncle short, slightly or not elongating; hypanthium connate, lower part of calyx tubes mutually free . . . . **1. Breonia**

b. Terminal vegetative bud strongly flattened, not volute, stipules ovate to obovate; inflorescences enclosed by loosely adpressed ovate bracts, these later separating, true peduncle elongating; hypanthium and lower portion of calyx tube connate, lower part of calyx tubes mutually fused . . . . . **2. Neobreonia**

7a. Stipules deltoid or short, obtuse, subpersistent. Placenta attached to the middle of the septum, somewhat discoidal, ovules spreading in all directions **3. Sarcocephalus**

b. Stipules ovate, elliptic, or obovate, deciduous or subpersistent. Placenta attached to the upper third of the septum, Y-shaped, ovules spreading in all directions but predominantly pendulous . . . . . **4. Nauclea**

8a. Inflorescences terminal. Placentas attached to the middle of the septum, oblong to slightly bilobed; ovules and seeds spreading in all directions but predominantly ascending and descending . . . . . **5. Burttdavya**

b. Inflorescences lateral. Placentas attached to the upper third of the septum, a short obovoid boss; ovules and seeds pendulous 9

9a. Interfloral bracteoles present. Leaves arranged in whorls of 3 or 4. *Continental Africa and Madagascar.* . . . . . **6. Breonadia**

b. Interfloral bracteoles absent. Leaves in pairs. *Madagascar and? Mauritius* 10

10a. Terminal vegetative bud conical, stipules narrowly triangular, superobvolute, deciduous . . . . . **7. Gyrostipula**

b. Terminal vegetative bud strongly flattened, stipules elliptic to obovate, adpressed, subpersistent . . . . . **8. Janotia**

1. BREONIA A. Rich.

Small to large trees. *Terminal vegetative buds* conical, sometimes volute; stipules broadly to narrowly triangular, deciduous. *Leaves* opposite, petiolate, axils of the nerves with or without domatia. *Inflorescences* lateral, axes unbranched, node with stipules which are modified into calyptra-like bracts, these strongly cohering, surrounding the young inflorescence, later usually rupturing circumscissile, deciduous; true peduncle short, glabrous or pubescent, slightly or not elongating, the bract scars thus remaining apically on the axis. *Flowers* 4- or 5-merous, hypanthium connate. *Calyx* tubes mutually free, outside upper part pubescent, lower part glabrous but sometimes with a few scattered hairs at the base, inside sparsely to densely pubescent; lobes triangular to oblong, obtuse or sometimes somewhat filiform. *Corolla* tube hypocrateriform, lobes oblong, imbricate in the bud. *Stamens* inserted in the throat, exserted; anthers basifixed, introrse; filaments short, glabrous. *Style* exserted, stigma clavate to globose. *Ovary* 2-locular, placentas attached to the upper third of the septum, short obovoid bosses, pendulous; ovules (1)3—10 per locule, pendulous. Ovaries and *fruitlets* connate into an indehiscent syncarp; *seeds* ovoidal to ellipsoidal, sometimes somewhat bilaterally compressed, not alate.

Type: *B. madagascariensis* A. Rich.

Distribution: Madagascar (and Mauritius, cultivated).

KEY TO THE SPECIES

1a. Terminal vegetative bud broadly conical, stipules broadly triangular, up to 7 mm long, often drying pallid brown. 4

b. Terminal vegetative bud narrowly conical, stipules narrowly triangular, generally over 7 mm long, drying dark brown to black 2

2a. Stipules over 20 × 5 mm. Leaves generally over 20 cm long. Mature heads with diameter across calyces over 15 mm, across corollas over 25 mm, across syncarps over 25 mm . . . . . **1. B. madagascariensis**

b. Stipules generally less than 20 mm long, up to 5 mm broad. Leaves generally less than 20 cm long. Mature heads with diameter across calyces up to 15 mm, across corollas up to 25 mm, across syncarps up to 25 mm 3

3a. Leaves elliptic to elliptic-lanceolate, less frequently obovate to obovate-lanceolate, generally up to 7 cm wide, glabrous, coriaceous, persistent; base rounded to obtuse or cuneate to attenuate. Terminal vegetative bud usually highly volute **2. B. citrifolia**

3b. Leaves orbicular to broadly elliptic, less frequently broadly obovate, generally over 7 cm wide; glabrous or pubescent, membraneous to subcoriaceous, deciduous; base emarginate to cordate. Terminal vegetative bud not or rarely slightly volute **3. B. perrieri**

4a. Leaves deciduous; base emarginate to cordate. Petiole long, generally over 4 cm. Mature heads with diameter across calyces 8—12 mm, across corollas 20—25 mm, across syncarps 15—25 mm . . . . . **3. B. perrieri**

b. Leaves persistent; base cuneate to attenuate, rarely truncate and ultimately attenuate. Petiole short, generally up to 4 cm. 5

5a. Leaves generally obovate, 4—8 × 2—4 cm. Mature heads: diameter across calyces 2—5 mm, across corollas 8—16 mm, across syncarps 10—15 mm **4. B. sphaerantha**

b. Leaves generally elliptic to elliptic-oblong, rarely obovate, 10—20 × 5—9 cm. Mature heads: diameter across calyces 10—15 mm, across corollas 20—35 mm, across syncarps 25—30 mm . . . . . **5. B. boivinii**

1. **Breonia madagascariensis** A. Rich. *ex* DC.

B. madagascariensis A. Rich. *ex.* DC., Prodr. 4 (Sept. 1830) 620; A. Rich., Mém. Fam. Rubiacées (Dec. 1830) 210. — *Sarcocephalus madagascariensis* Baill., Adansonia 12 (1879) 311. — L e c t o t y p e: *Chapelier s.n.* (K; P, iso). S y n t y p e s: *Breon s.n.* (P); *Commerson s.n.* (P).

B. macrophylla Homolle, Bull. Soc. Bot. Fr. 84 (1937) 461. — L e c t o t y p e: *Perrier de la Bâthie 3933* (P). S y n t y p e s: *Perrier de la Bâthie 5270* (P), *SF (Madagascar) Thouvenot 117* (P).

N o t e: *B. macrophylla* appears to be a hairy-leaved form of *B. madagascariensis*; forms with intermediate degrees of hairiness occur.

2. **Breonia citrifolia** (Poiret) Ridsd., *comb. nov.*

Nauclea citrifolia Poiret in Lamk., Encycl. Méth. 4 (1789) 435. — *Cephalidium citrifolium* A. Rich. *ex* DC., Prodr. 4 (Sept. 1830) 672; A. Rich., Mém. Fam. Rubiacées (Dec. 1830) 210. — *Samama citrifolia* O. K., Rev. Gen. Pl. 1 (1891) 297. — T y p e: in Herb. Lamarck (P—LA).

Sarcocephalus richardianus Baill., Adansonia 12 (1879) 312. — *B. richardiana* Havil., J. Linn. Soc. Bot. 33 (1897) 36. — T y p e: *Chapelier s.n.* (P—BA; P, iso).

Nauclea cuspidata Baker, J. Linn. Soc. Bot. 25 (1890) 319. — *B. cuspidata* Havil., o.c. 37. — T y p e: *Baron 5563* (K; P, iso).

B. membranacea Havil., o.c. 35. — L e c t o t y p e: *Perrottet s.n.*, 1820 (P).

B. stipulata Havil., o.c. 35. — T y p e: *Pervillé s.n.* (P).

B. mauritiana Havil., o.c. 35. — T y p e: ?*Commerson s.n.* (P), Mauritius.

Sarcocephalus richardii Drake in Grand., Hist. Pl. Madag. 36 (1897) t. 457. — *Cephalina richardii* Palacky, Cat. Pl. Madag. 4 (1906) 50. — T y p e: Grandidier t. 457.

B. havilandiana Homolle, Bull. Soc. Bot. Fr. 84 (1937) 460. — T y p e: *Perrier de la Bâthie 3904* (P).

B. louvelii Homolle, o.c. 461. — T y p e: *Louvel 125* (P).

N o t e: This is the most widespread and variable species, a complex needing further study; possibly distinct ecological forms occur. *B. cuspidata* appears to represent a small narrow-leaved form; *B. havilandiana* a large-leaved form; and *B. louvelii* a form with juvenile leaves, this juvenile leaf form sometimes persists in adult leaves. In all cases a range of intermediates exists between these extremes and the typical leaf form. Other variations occur, particular of note is *SF (Madagascar) 12632* with long, filiform, glabrous calyx lobes.

3. **Breonia perrieri** Homolle

B. perrieri Homolle, Bull. Soc. Bot. Fr. 84 (1937) 461. — Lectotype: *Perrier de la Bâthie 3513* (P). Syntypes: *Perrier de la Bâthie 825, 17832* (P), *Grève 33* (P).

Note: Occasionally examples occur with small obovate leaves with emarginate bases.

4. **Breonia sphaerantha** (Baill.) Homolle *ex* Ridsd., *comb. nov.*

Franchetia sphaerantha Baill. (*Euphorb.*), Bull. Soc. Linn. Paris 60 (1885) 477. — [*Cephalanthus hildebrandtii* Vatke *vide* Bot. Centralbl. 22 (1885) 274, *nom. nud. in nota*]. — *B. parviflora* Havil., J. Linn. Soc. Bot. 33 (1897) 37. — Type: *Hildebrandt 3309* (K; L, P, iso).

5. **Breonia boivinii** Havil.

B. boivinii Havil., J. Linn. Soc. Bot. 33 (1897) 35. — Type: *Boivin s.n.* (K; P, iso; ? L *ex* Herb. d'Alleizette), Nossibé.

2. NEOBREONIA Ridsd., *gen. nov.*

Genus madagascariense *Breonia* valde affine, praecipue differt stipulis ellipticis usque ad obovatis, applanatis, appressis; bracteis inflorescentias circumdatis ovatis semipersistentibus pedunculo vero elongato.

Small to large trees. *Terminal vegetative buds* strongly flattened; stipules ovate to obovate, adpressed, deciduous. *Leaves* opposite, petiolate, axils of the nerves usually without domatia. *Inflorescences* lateral, axes unbranched, node with stipules which are modified into ovate bracts, these loosely adpressed, surrounding the young inflorescence, later separating, not rupturing circumscissile, semi-persistent; true peduncle elongating, sparsely to densely pubescent, the bract scars thus becoming situated more or less medianly along the flowering axis. *Flowers* 4-merous, hypanthium connate, lower parts of the calyx tubes mutually connate, upper parts free, out- and inside densely pubescent; lobes short, oblong, obtuse. *Corolla* tube hypocrateriform, lobes oblong, imbricate in the bud. *Stamens* inserted in the throat, exserted; anthers basifixed, introrse; filaments short, glabrous. *Style* exserted, stigma clavate to globose. *Ovary* 2-locular, placentas attached to the upper third of the septum, short obovoid bosses, pendulous; ovules 1 per locule, pendulous. Ovaries and *fruitlets* connate into an indehiscent syncarp; *seeds* ovoidal, bilaterally compressed, not alate.

Type: *N. decaryana* (Homolle) Ridsd.

Distribution: Madagascar.

1. **Neobreonia decaryana** (Homolle) Ridsd., *comb. nov.*

Breonia decaryana Homolle, Bull. Soc. Bot. Fr. 84 (1937) 460. — Type: *Decary 5199* (P; ? iso in L *ex* Herb. d'Alleizette).

Breonia keliravina Homolle, l.c. — Lectotype: *Thouvenot 91* (P). Syntype: *Louvel 216* (P).

3. SARCOCEPHALUS Afz. *ex* Sabine

Small to medium-sized trees. *Terminal vegetative buds* flattened, stipules deltoid, apex sometimes obtuse or slightly notched, semi-persistent. *Leaves* opposite, petiolate, axils of the nerves with or without domatia. *Inflorescences* terminal, axes unbranched, node with reduced leaves and stipules which are not modified into bracts, not surrounding the young inflorescence; true peduncle glabrous or pubescent, elongating. *Flowers* 4- or 5-merous, hypanthiums and calyx tubes mutually connate, inside densely pubescent; calyx lobes obtuse to triangular, appendiculate or not, appendages deciduous or persistent. *Corolla* tube infundibular, lobes oblong, imbricate in the bud. *Stamens* inserted

in the tube, not exserted; anthers basifixed, introrse; filaments short, glabrous. *Style* exserted, stigma spindle-shaped. *Ovary* 2-locular, placentas attached to the middle of the septum, somewhat discoidal; ovules numerous in each locule, spreading in all directions. Ovaries and *fruitlets* connate into an indehiscent syncarp; *seeds* ovoidal to ellipsoidal, not compressed, not alate.

T y p e: *S. esculentus* Afz. *ex* Sabine.

D i s t r i b u t i o n: Tropical Africa.

N o t e: See N. Hallé, Fl. Gabon 12, 1 (1966) 38—44; Petit, Bull. Jard. Bot. Brux. 28 (1958) 7—10.

1. **Sarcocephalus latifolius** (Smith) Bruce

Nauclea latifolia Smith in Rees, Cycl. 24 (1813) no. 5. — *S. latifolius* Bruce, Kew Bull. 1 (1947) 31. — T y p e: *Smeathan s.n.* (*n.v.*), Sierra Leone.

[*Nauclea sambucina* Winterbourne, Acc. Sierra Leone 2 (1803) 2, *nom. nud.*]. — *S. sambucina* K. Schum. in E. & P., Nat. Pfl. Fam., ed. 1, 4, 4 (1891) 59.

S. esculentus Afz. *ex* Sabine, Trans. Hort. Soc. Lond. 5 (1824) 442. — *Nauclea esculenta* Merr., J. Wash. Acad. Sc. 5 (1915) 535. — T y p e: *Afzelius s.n.*, in Herb. Banks (BM).

Nauclea russegeri Kotschy *ex* Schw., Rel. Kotsch. (1868) 49, t. 33. — T y p e: *Kotschy 511* (*n.v.*).

[*S. sassandrae* Chev., Expl. Bot. Afr. Occ. Fr. 1 (1920) 307, *nom. nud.*].

S. esculentus var. *amarissima* Chev., Rev. Bot. Appl. 18 (1938) 179. — T y p e: *Laffitte 50 bis* (P).

S. esculentus var. *velutina* Chev., o.c. 181. — T y p e: *Chevalier 7892* (P).

[*S. esculentus* var. *congoensis* Aubr., Fl. For. Soud.-Guin. (1950) 477, *nom. nud.*].

2. **Sarcocephalus pobeguinii** Pob. *ex* Pell.

S. pobeguinii Pob. [Ess. Fl. Guin. (1906) 313, *nom. nud.*] *ex* Pell., Bull. Soc. Bot. Fr. (1932) 222. — *Nauclea pobeguinii* Merr. [J. Wash. Acad. Sc. 5 (1915) 536, *nom. inval.*] *ex* Petit, Bull. Jard. Bot. Brux. 28 (1958) 9. — T y p e: *Pobéguin 433* (P).

4. NAUCLEA Merr. *non* L.

Medium-sized to large trees. *Terminal vegetative buds* strongly flattened; stipules ovate, elliptic, or obovate, flattened, adpressed, deciduous or semi-persistent. *Leaves* opposite, petiolate, axils of the nerves with or without domatia. *Inflorescences* terminal, or terminal and lateral, axes unbranched, node with reduced leaves and stipules which are not modified into bracts, not surrounding the young inflorescence; true peduncle glabrous or pubescent, elongating. *Flowers* 4- or 5-merous, hypanthiums and *calyx* tubes mutually connate, inside glabrous or pubescent; calyx lobes triangular, obtuse, or oblong, appendiculate or not, appendages persistent. *Corolla* tube infundibular, lobes oblong, imbricate in the bud. *Stamens* inserted in the throat, exserted; anthers basifixed, introrse; filaments short, glabrous. *Style* exserted, stigma spindle-shaped. *Ovary* 2-locular, placentas attached to the upper third of the septum, Y-shaped with 2 short ascending arms and a long descending foot; ovules numerous in each locule, mostly pendulous, some erect or horizontal but these mostly aborting. Ovaries and *fruitlets* connate into an indehiscent syncarp; *seeds* ovoidal to ellipsoidal, sometimes slightly bilaterally compressed, not alate.

L e c t o t y p e: *N. cordata* Roxb.=*N. coadunata* Roxb. *ex* J. E. Smith. [*N. orientalis* (L.) L. — *Cephalanthus orientalis* L.=*Adina orientalis* (L.) Lindman *ex* Bakh. *f.*].

D i s t r i b u t i o n: Tropical Africa, India, SE. Asia, Malesia.

N o t e: See N. Hallé, Fl. Gabon 12, 1 (1966) 38—53; Petit, Bull. Jard. Bot. Brux. 28 (1958) 7—13.

1. Nauclea diderrichii (De Wild.) Merr.

Sarcocephalus diderrichii [De Wild. & Dur. in Masui, L'Etat Indep. Expos. Brux.-Terv. (1897) 439, *nom. nud.*] De Wild., Rev. Cult. Colon. 9 (1901) 7. — *N. diderrichii* Merr., J. Wash. Acad. Sc. 5 (1915) 535. — Neotype: *Briey 189* (BR).

Sarcocephalus trillesii Pierre in De Wild., Rev. Cult. Colon. 9 (1901) 8—9; Chev., Vég. Ut. Afr. Trop. Fr. 9 (1917) 229, t. 24; Rev. Bot. Appl. 18 (1938) 185. — *N. trillesii* Merr., J. Wash. Acad. Sc. 5 (1915) 537. — Type: *Trilles s.n.* (*n.v.*), Nov. 1899, Gabon.

[*Sarcocephalus badi* Aubr., Fl. For. Soud.-Guin. (1950) 475, *nom. nud.*]

Note. Pierre forwarded a wood specimen of his *Sarcocephalus trillesii* to Bruxelles accompanied by scant notes as to the character of the tree. De Wildeman (1901) only provisionally accepted Pierre's species but, using the information supplied by Pierre, gave differential characters, viz. the varying size of the inflorescence heads, to distinguish *S. trillesii* from *S. diderrichii* and *S. gilletii*, thus affecting valid publication.

2. Nauclea vanderguchtii (De Wild.) Petit.

Sarcocephalus vanderguchtii De Wild., Pl. Bequaert. 2 (1923) 221. — *N. vanderguchtii* Petit, Bull. Jard. Bot. Brux. 28 (1958) 12. — Lectotype: *Vander Gucht 94* (BR). Syntypes: *Bequaert 2605, 6629* (BR); *Claessens 689* (BR).

Sarcocephalus nervosus Hutch. & Dalz., Fl. West Trop. Afr., ed. 1, 2 (1931) 100. — Type: *Talbot 1604* (K).

Sarcocephalus nervosus var. *cordifolia* Chev., Rev. Bot. Appl. 18 (1938) 190. — Syntypes: *Le Testu 1884* (P); *Fleury in Herb. Chev. 33620* (P).

3. Nauclea gilletii (De Wild.) Merr.

Sarcocephalus gilletii De Wild., Rev. Cult. Colon. 9 (1901) 8. — *N. gilletii* Merr., J. Wash. Acad. Sc. 5 (1915) 535. — Type: *Gillet 1069* (BR).

Sarcocephalus trillesii var. *lancifolia* Chev., Rev. Bot. Appl. 18 (1938) 188. — *N. lancifolia* Aubr., Fl. For. Côte Iv., ed. 2, 3 (1959) 264. — *N. gilletii* var. *lancifolia* N. Hallé, Fl. Gabon 12, 1 (1966) 52. — Type: *Le Testu 1912* (P).

4. Nauclea xanthoxylon (Chev.) Aubr.

Sarcocephalus xanthoxylon Chev. Rev. Bot. Appl. 18 (1938) 181. — *N. xanthoxylon* Aubr., Fl. For. Côte Iv., ed. 2, 3 (1959) 264. — Type: *Chevalier 6299* (P).

5. BURTTDAVYA Hoyle

Small to large emergent trees. *Terminal buds* strongly flattened; stipules ovate, adpressed, deciduous. *Leaves* opposite, petiolate, axils of the nerves with or without domatia. *Inflorescences* terminal, axes unbranched, node with reduced leaves and stipules which are not modified into bracts, not enclosing the young inflorescence; true peduncle glabrous or pubescent, elongating. *Flowers* 5-merous, subsessile on the receptacle, receptacle hairy, interfloral bracteoles absent. Hypanthiums and *calyx* tubes mutually free, out- and inside glabrous; calyx lobes linear-spathulate. *Corolla* tube infundibular, lobes linear-oblong, imbricate in the bud. *Stamens* inserted in the throat, partially exserted; anthers basifixed, introrse; filaments short, glabrous. *Style* exserted, stigma spindle-shaped. *Ovary* 2-locular, placentas attached to the middle of the septum, oblong to slightly bilobed; ovules numerous in each locule, spreading in all directions but predominantly ascending and descending. *Infructescence* a head of loose fruitlets, fruitlets without hard endocarp, irregularly breaking apart; *seeds* ovoidal to ellipsoidal, somewhat angular, not alate.

Monotypic.

Distribution: SE. tropical Africa.

1. Burttdavya nyassica Hoyle

B. nyassica Hoyle, Hook. Ic. Pl. V, 4 (1939) t. 3318. — T y p e: *Townsend 23* (K).

N o t e: For habit see Chapman & White, The evergreen forest of Malawi (1970), photo 57.

6. BREONADIA Ridsd., *gen. nov.*

Genus afro-madagascariense e tribus *Naucleearum*, stipulis triangularibus, foliis 3-vel 4-verticillatis, inflorescentiis lateralibus, bracteoles interfloralibus minutis, bracteatis, bracteis calyptriformibus plerumque fissura equatoriali circumdatis, stigmatibus globosis, ovariis liberis, bilocularibus, placentis apice septo affinis pendulis, ovulis 2—5. pendulis.

Small to medium-sized trees. *Terminal vegetative buds* conical; stipules narrowly triangular, deciduous. *Leaves* arranged in whorls of 3 or 4, petiolate, axils of the nerves with or without domatia. *Inflorescences* lateral, axes usually unbranched, node with stipules which are modified into calyptra-like bracts, these strongly cohering, surrounding the young inflorescence, later usually rupturing circumscissile, deciduous; true peduncle glabrous or pubescent, elongating. *Flowers* 5-merous, subsessile on the receptacle, receptacle densely pubescent, interfloral bracteoles numerous, spathulate. Hypanthiums and *calyx* tubes mutually free, outside densely hairy, inside slightly pubescent; lobes oblong. *Corolla* tube hypocrateriform, lobes oblong, imbricate in the bud. *Stamens* inserted in the throat, exserted; anthers basifixed, introrse; filaments short, glabrous. *Style* exserted, stigma clavate. *Ovary* 2-locular, placentas attached to the upper third of the septum, short obovoid bosses, ovules 2—5 per locule, pendulous. *Infructescence* a head of dehiscent fruitlets, these with a hard endocarp, splitting into 4, the apical portion and calyx remains usually attached to a central axis formed from the septum of the ovary, axis later detaching from the receptacle; *seeds* ovoidal with slightly subcordate base, bilaterally compressed, not alate.

Monotypic.

D i s t r i b u t i o n: Continental tropical Africa and Madagascar.

1. Breonadia microcephala (Del.) Ridsd., *comb. nov.*

Nauclea microcephala Del., Cent. Pl. Mér. (1826) 67. — *Adina microcephala* Hiern in Oliv., Fl. Trop. Afr. 3 (1877) 40. — T y p e: *Cilliaud 54* (*n.v.*).

Nauclea verticillata Baill., Adansonia 12 (1879) 284. [— *Cephalidium verticillatum* Boivin *ex* Baill., o.c. 314. *nom. inval.*] — L e c t o t y p e: *Boivin s.n.* (P). S y n t y p e: *Bernier 359* (P).

Cephalanthus spathelliferus Baker, J. Bot. 20 (1882) 137. — *Adina spathellifera* Oliv. in Hook. Ic. Pl. (1895) t. 2386, *nota* in text. — T y p e: *Baron 86* (K).

Adina galpinii Oliv. in Hook. Ic. Pl. (1895) t. 2386. — Type: *Galpin 1213* (K).

Adina lasiantha K. Schum. in Engl., Pfl. welt. Ost Afr. vol. C (1895) 261. — T y p e: *Buchanan 6* (*n.v.*).

7. GYROSTIPULA Leroy

Large trees. *Terminal vegetative buds* conical, volute; stipules narrowly triangular, superobvolute, deciduous. *Leaves* opposite, petiolate, axils of the nerves with domatia. *Inflorescences* lateral, axes branched or unbranched, node with stipules which are modified into bracts, these not seen, reported to enclose the young inflorescence, deciduous; true peduncle pubescent, elongating. *Flowers* 4- or 5-merous, subsessile on the receptacle, receptacle hairy, interfloral bracteoles absent. Hypanthiums and *calyx* tubes mutually free, pubescent outside and inside; calyx lobes triangular. *Corolla* tube hypocrateriform to somewhat infundibular, lobes oblong, imbricate in the bud. *Stamens* inserted in the throat,

partially exserted; anthers basifixed, introrse; filaments short, glabrous. *Style* exserted, stigma globose to clavate. *Ovary* 2-locular, placentas attached to the upper third of the septum, short obovoid bosses; ovules 5—10 per locule, pendulous. *Infructescence* a head of dehiscent fruitlets, fruitlets with a hard endocarp, splitting into 4, detaching with the apical portion and calyx remains, central axis from the septum of the ovary persisting, later detaching from the receptacle; *seeds* ellipsoidal, somewhat bilaterally compressed, bicornate, slightly alate.

T y p e: *G. foveolata* (Capuron) Leroy

D i s t r i b u t i o n: Madagascar and Comores.

1. **Gyrostipula foveolata** (Capuron) Leroy

Neonauclea foveolata Capuron [Études sur les Essences Forestières de Madagascar — Molompangady (1966) 2, plate 1, *nom. nud.*], Adansonia II, 12 (1972) 383, pl. 3. — *G. foveolata* (Capuron) Leroy, Adansonia II 14 (1975) 682. — T y p e: *Capuron SF (Madagascar) 3002* (P; L, TAN, iso).

G. comorensis Leroy, Adansonia II, 14 (1975) 683. — T y p e: *Carnaby 16* (P).

N o t e: Homolle, under a manuscript name in *Adina*, considered *G. comorensis* to be a distinct species. Leroy followed this, separating it from *G. foveolata* on vegetative characters and the branched nature of the flowering axis. However, I follow Capuron, who apparently studied more material, and include it within the range of variation of *G. foveolata*.

8. JANOTIA Leroy

Medium-sized to large trees. *Terminal vegetative buds* strongly flattened; stipules ellipti c to obovate, adpressed, semi-persistent. *Leaves* opposite, petiolate, axils of the nerves with domatia. *Inflorescences* lateral, axes unbranched, node with reduced leaves and stipules which are not modified into bracts, not enclosing the young inflorescence; true peduncle glabrous, elongating. *Flowers* 5-merous, subsessile on the receptacle, receptacle hairy, interfloral bracteoles absent. Hypanthiums and *calyx* tubes mutually free, pubescent inside and outside; calyx lobes linear-oblong, shank densely pubescent, apex slightly pubescent, brown. *Corolla* tube hypocrateriform, lobes oblong, imbricate in the bud. *Stamens* inserted in the throat, slightly exserted; anthers basifixed, introrse; filaments short, glabrous. *Style* exserted, stigma trigonal to globose. *Ovary* 2-locular, placentas attached to the upper third of the septum, short obovoidal bosses, ovules 5—15 per locule, pendulous, ovate, basally somewhat bifid. *Fruit* unknown.

Monotypic.

D i s t r i b u t i o n: Madagascar.

1. **Janotia macrostipula** (Capuron) Leroy

Neonauclea macrostipula Capuron [Études sur les Essences Forestières de Madagascar — Molompangady (1966) 4, plate 2, *nom. nud.*] Adansonia II, 12 (1972) 385. — *J. macrostipula* Leroy, Adansonia II, 14 (1975) 682. — T y p e: *SF (Madagascar) 10098* (P; L, TAN, iso).

N o t e: Haviland subdivided the *Naucleeae* into subtribes, of which the *Mitragyninae* Havil. *emend.* Ridsd. (tribes '*Mitragyneae*' + '*Uncariae*' of Haviland) and '*Cephalanthidae*' are here excluded. Thus, two of Haviland's subtribes remain, one containing the type genus *Nauclea* and the other, with the removal of *Cephalanthus*, may be considered to be based on *Adina s.l.* Clearly, if recognized these subtribes need renaming but purposely this is here avoided. Current investigations on Malesian taxa strongly suggest that these divisions are artificial.

Janotia provides some further evidence in this direction. The node on the flowering axis bears highly reduced leaves and small stipules that are not modified into bracts surrounding the young inflorescence, a situation also found in *Burtdavvya*, *Nauclea*, and *Sarcocephalus*. In the genera in the sphere of affinity of *Adina s.l.*, the stipules of the flowering axis, where known, are modified into bracts surrounding the young inflorescence. The long non-appendiculate calyx lobes approach those found in some taxa of *Nauclea s.l.* Although *Janotia* shows some affinity with the genera allied to *Nauclea* the placentation is quite different, the placentas being apically attached to the septum and bearing pendulous ovules. It is unfortunate that fruiting material of this genus is not available as this taxon is one of the most interesting discoveries in the *Naucleeae* since *Burtdavvya*.

DUBIOUS SPECIES

1. **Breonia longipetiolata** Havil., J. Linn. Soc. Bot. 33 (1897) 36. — T y p e: *Leprieur* (P, *n.v.*).

   Species requires critical re-investigation which will be reported on by J. F. Leroy.

2. **Cephalina esculenta** Thonn. in Schum., Beskr. Guin. Pl. 1 (1827) 125. — Type: *Schum. & Thonn. s.n.* (*n.v.*).

   Generally assumed to be conspecific with *Sarcocephalus esculentus* Afz. *ex* Sabine. No material seen, no recent interpretation available.

EXCLUDED FROM ADINA

1. *Adina inermis* (Willd.) Roberty=**Mitragyna inermis** (Willd.) O.K.
2. *A. ledermannii* Krause=**Mitragyna** *sp.*? **M. rubrostipulata** (K. Schum.) Havil.
3. *A. rubrostipulata* K. Schum.=**Mitragyna rubrostipulata** (K. Schum.) Havil.
4. *A. stipulosa* (DC.) Roberty=**Mitragyna stipulosa** (DC.) O.K.

EXCLUDED FROM BREONIA

5. *Breonia chinensis* (Lamk.) Capuron, Adansonia II, 13 (1973) 472. — *Cephalanthus chinensis* Lamk., Enc. Méthod. Bot. 1 (1785) 678. — *Anthocephalus chinensis* A. Rich. *ex* Walp., Repert. 2 (1785) 678. — L e c t o t y p e: *Sonnerat s.n.* (not traced). Not? *Commerson s.n.*, in Herb. Lamarck (P-LA).

Bakhuizen van den Brink Jr. (1970) has published an extensive review of the nomenclature of the *Naucleeae* in which he clearly indicates that the basionym of *Anthocephalus indicus* A. Rich. is *Cephalanthus chinensis* Lamk. Richard himself states that the genus is based upon *C. chinensis* Lamk. Lamarck indicates that the type of the plant is *Sonnerat s.n.* from Asia, and makes no mention of the occurrence of the plant in Madagascar. The publication of Bakhuizen van den Brink Jr. seems to have been overlooked as the combination *Breonia chinensis* (Lamk.) Capuron has been published. This effectively reduces the widespread Asiatic genus to synonymy of *Breonia*, which clearly was not the intent of the author. The problem, as outlined by Bakhuizen van den Brink Jr., is that it is certain that the plant now included in the Herbarium Lamarck under the name *Cephalanthus chinensis* is not the plant which Richard saw and upon which he based his genus *Anthocephalus*. Bakhuizen van den Brink Jr. postulated that this element is now missing.

It is agreed by all that the plant remaining in Herbarium Lamarck is a *Breonia*, the provenance of which is given as Île de France (Mauritius) and it is almost certain that it was collected by Commerson. Other duplicates of this plants exist in the Paris Herbarium;

a full account of these is given by Capuron (1972). A Commerson collection, possibly one of these duplicates, is the type of *Breonia mauritiana* Havil. of which Haviland (1897, p. 5) writes: 'A specimen of *Breonia* in the Paris Herbarium still has attached to its sheet sections of the fruiting heads of *Anthocephalus indicus*, a label on the left '*Cephalanthus chinensis* Lmk., fide herb.' and on the right '*Nauclea purpurea*, Roxb., Pl. Corom. i 41 tab. 54; Fl. Ind. ii p. 123; DC., Prod. iv. 346. *Cephalanthus chinensis*, Lamk. Dict. i. 678. Inde? Île de France? Herb. de Commerson."

It would seem that this originally was the situation with the specimen in the Lamarck herbarium. Lamarck's description does not closely correspond to the Asiatic genus *Anthocephalus* and clearly includes reference to elements of *Breonia* especially regarding the axillary inflorescences and possibly also the stipules. It would seem that Lamarck based his *Cephalanthus chinensis* on mixed elements, the *Breonia* collection of? Commerson and an *Anthocephalus* collection of Sonnerat. Subsequently A. Richard typified his *Anthocephalus indicus* by the *Anthocephalus* element included by Lamarck on the sheet named *Cephalanthus chinensis*. Richard may be considered to automatically have chosen this element as the lectotype of *Cephalanthus chinensis*. In any case Bakhuizen van den Brink Jr. typified the name by an *Anthocephalus* element excluding the *Breonia* element, in effect following the typification of Richard. The *Anthocephalus* element can no longer be traced but clearly the name *Cephalanthus chinensis* Lamarck cannot again be re-typified by the remaining *Breonia* element. The species represented by the *Breonia* element was later described by Richard as *Cephalidium citrifolium*, based upon *Nauclea citrifolia* Poir., but here it is to be noted that Poiret does not include *Cephalanthus chinensis* Lamk. in the synonymy of *N. citrifolia* but disposes of the name elsewhere.

The Sonnerat collection cannot at the moment be traced. It is possible that the *Anthocephalus* element mentioned by Haviland as being mounted on the type sheet of *Breonia mauritiana* represents an isotype fragment of this collection; however, this requires further investigation and will be difficult to establish with certainty.

EXCLUDED FROM CEPHALANTHUS

6. *Cephalanthus africanus* Reich.=**Mitragyna inermis** (Willd.) O.K.

EXCLUDED FROM NAUCLEA

7. *Nauclea africana* Walp.=**Uncaria africana** G. Don
8. *N. africana* Willd.=**Mitragyna inermis** (Willd.) O.K.
9. *N. bracteosa* Welw.=**Mitragyna stipulosa** (DC.) O.K.
10. *N. inermis* (Willd.) Baill.=**Mitragyna inermis** (Willd.) O.K.
11. *N. macrophylla* Perr. & Lepr. *ex* DC.=**Mitragyna stipulosa** (DC.) O.K.
12. *N. stipulosa* DC. ('*N. stipulata*' Benth. & Hook.)=**Mitragyna stipulosa** (DC.) O.K.

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INDEX OF SCIENTIFIC NAMES

Accepted names are in plain type, synonyms in *italics*, new names in **bold type.** Numbers refer to the number of the accepted genus and species: dub., excl., dubious and excluded species respectively.