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A REVISION OF NEONAUCLEA (RUBIACEAE)

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SUMMARY

An illustrated revision of the 65 species of the genus *Neonauclea* (Rubiaceae–Naucleeae) with a key to all species. The 61 Malesian species are treated in full, 28 new species are described and 5 new combinations are made.

INTRODUCTION

In an earlier paper (Ridsdale, 1979) I have considered the taxonomic position and relationships of the genera accepted in the tribe Naucleeae; the African and Madagascan species were treated separately (Ridsdale, 1975). Genera which were formerly placed in the Naucleeae have also been treated separately, *Cephalanthus* (Ridsdale, 1976) and *Mitragyna* and *Uncaria* (Ridsdale, 1978). Subsequently, in collaboration with the School of Pharmacy, London, the distribution of alkaloids in the tribe has been examined (Phillipson et al., 1982).

The present paper deals with the large genus *Neonauclea*. The genus is predominantly Malesian, the extra-Malesian species from continental Asia have already been considered (Ridsdale, 1979: 338–341). Before his retirement Dr. R.C. Bakhuizen van den Brink Jr † had made a start at studying the genus and had identified some new species which are described here under the authorship Bakh.f. & Ridsd., in acknowledgement of his initial studies.

The genus *Neonauclea* is easily recognized by the presence of highly ornate deciduous calyx lobes and fruiting heads with free fruitlets. The calyx lobes are highly characteristic for many species but unfortunately are usually lacking on mature fruiting material. Complete material with young flowering heads and material with mature corollas together with a vegetative bud is required to be able to identify the species with certainty. This is all too frequently lacking. Fruiting material is difficult or impossible to identify with certainty.

Our knowledge of some species, particularly those found in Celebes and the Moluccas, remains scanty, many species being known only from the type collection or from a few collections.

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TAXONOMIC CHARACTERS

The flowering heads occur terminally on the side branches, and, when young, are surrounded by a pair of modified stipules. In some species myrmedomes are present on the twigs. The form of the stipules is relatively constant for some groups of species. The majority of the characters used to separate the species are to be found in the calyx.

Myrmedomes

In some species the internodes of the ultimate branches are swollen and the hollow chambers are inhabited by ants (fig. 1). Surprisingly, the presence or absence of myrmedomes seems to be a constant character with different species. It should be noted that often collectors fail to observe and collect these structures so that they may be found to occur in some other little collected species. So far they have been recorded in the following species:

Neonauclea

artocarpoides
butonensis
borneensis
calcarea
celebica
cyrtopoda
excelsioides
formicaria
gigantea
havilandii
longipedunculata
paracyrtopoda
pseudocalycina
rupestris
superba
unicapitulifera
ventricosa

Fig. 1. Myrmedome of *Neonauclea havilandii* Ridsd. Photograph from *van Balgooy 3507*.

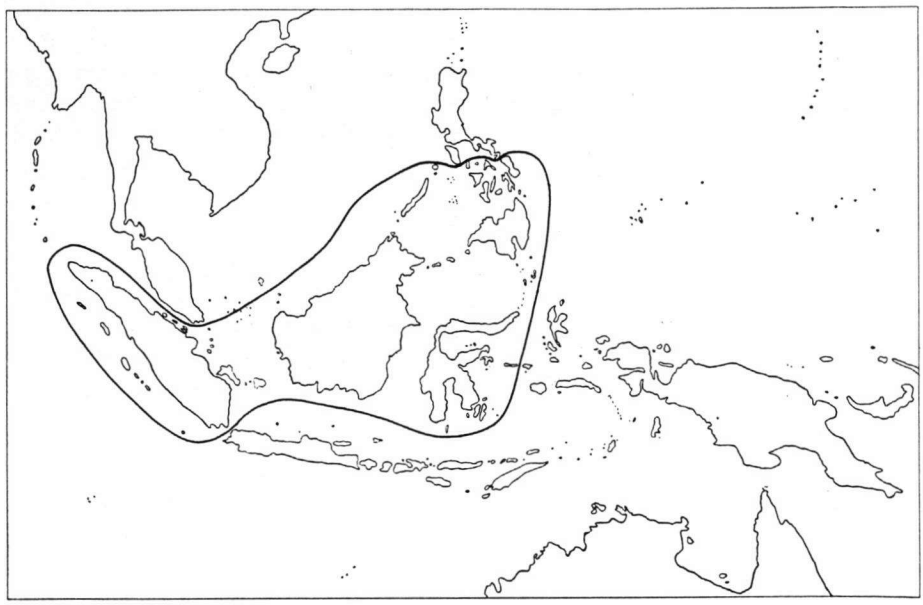

Fig. 2. Area of *Neonauclea* species with myrmedomes.

Myrmedomous species have as yet not been recorded from the Malay Peninsula, Java, the Lesser Sunda Islands and New Guinea (fig. 2). It is, therefore, interesting to note that *Neonauclea celebica,* cultivated at Bogor, still has the typical myrmedomes, hence in an area outside its natural distribution, and where the local species do not have myrmedomes.

Terminal vegetative buds and stipules

The form of the stipules is characteristic for broad groups of species, but rarely a help in distinguishing closely related species. Unfortunately, vegetative buds are frequently not collected and hence the range of variation that can be expected is uncertain.

In some species the stipules are unknown.

Usually the stipules are flattened and adpressed, exceptions occurring in the Moluccas and New Guinea where some species have conical vegetative buds comparable to *Ludekia.* The pubescence of the stipules is sometimes characteristic, e.g. *Neonauclea obversifolia.*

Flowering heads

The immature flowering heads are first surrounded by a pair of modified stipules. Each head bears numerous flowers on a spherical receptacle. Between the flowers there may be groups of interfloral hairs and in certain taxa interfloral bracteoles may be found. These are usually cigar-shaped and easily distinguished from the hairs of

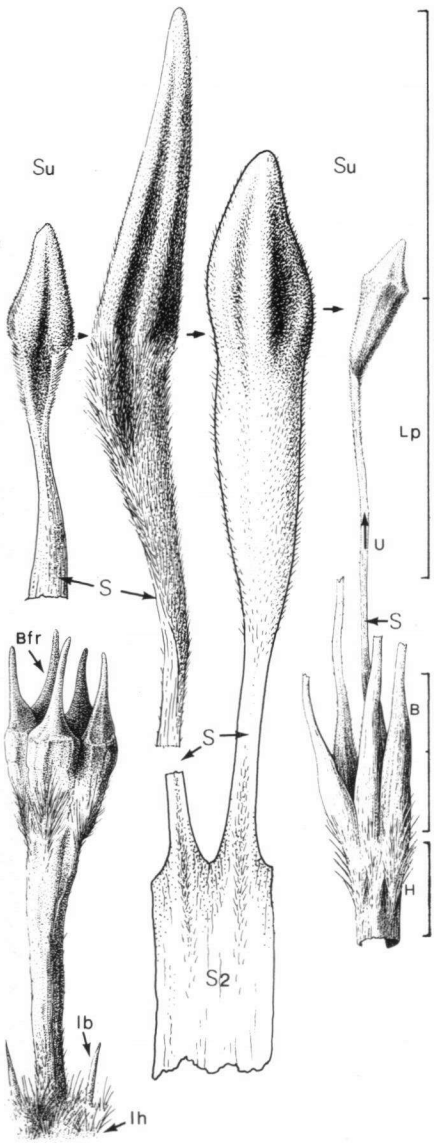

Fig. 3. Structure form of calyx and other parts of the flowering heads. Bfr = basal part of fruit; B = basal part; H = hypanthium; Ib = interfloral bracteoles; Ih = interfloral hairs; Lp = lower part; S2 = shafts mutually connate at base; S = shaft; Su = summit; U = upper apical portion.

the receptacle but in some species, e.g. the widespread *Neonauclea calycina,* they are sometimes filiform and not always easy to see; furthermore in some collections of this species the frequency of interfloral bracteoles in the heads is very low. In the keys these species are also keyed out in the group with interfloral bracteoles absent, as a search for such structures means that half the flowering head needs to be pulled apart to check the character. Usually it is sufficient to remove but a few hypanthia to observe the interfloral bracteoles.

The calyx (fig. 3)

The structure and form of the calyx is highly characteristic, particularly the apical part of the calyx lobes is needed for identification. In old flowering and fruiting heads remnants of the calyx may often be found near the stalk of the receptacle.

As the components of the calyx are so characteristic considerable attention has been given to these components in the descriptions. The calyx has been divided into three parts. The upper apical portion has further been subdivided into the summit and the lower part. The upper apical portion is connected to the basal part by a thin shaft. The basal part is generally persistent and is usually found as a dried remnant on the fruitlets.

The overall form of the upper apical portion may loosely be subdivided into two types:

1) Summit papillate, strikingly orange-ochre coloured when dry; predominantly West Malesian.
2) Summit not papillate, dark, usually covered with pallid hairs (unfortunately the hairs are sometimes tinged with an ochre colour). Predominantly East Malesian.

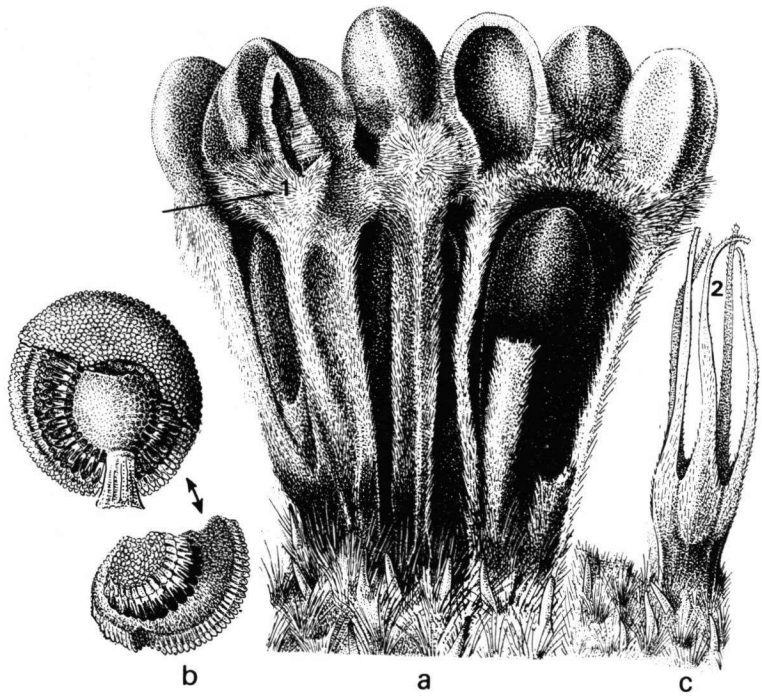

Fig. 4. Species with accrescent calyx lobes. a 1: note stiff hairs; b: calyx lobes detaching in a mass; c 2: persistent shafts.

The expansion of the corolla has repercussions on the calyx. The commonest situation is that the apical portions of the calyx lobes are pushed aside or pushed upwards, ultimately breaking the thin shaft. The remnants of the upper part of the calyx lobes are frequently found between the corollas. In some other species the upper apical portions of the calyx lobes are mutually accrescent to those of the surrounding flowers, this caused by the presence of stiff hairs (fig. 4a). As the corolla expands, the upper apical portions of the calyx lobes are pushed off in a mass (fig. 4b), usually breaking at the top of the shaft, and the shaft is semi-persistent (fig. 4c). In such cases the calyx lobes are rarely seen between the mature corollas, a situation commonly seen in *Neonauclea excelsa*. In both of these cases the basal part of the calyx and part of the shaft remain attached to the hypanthium and remnants persist to the fruiting stage.

In a few species, predominantly found in the Philippines, the calyx detaches as a whole leaving a regular circumscissile scar on the hypanthium, which may also be seen on the fruitlets (fig. 5a–d).

At the end of this article calyces of almost all *Neonauclea* species treated here are pictured in Plates 1–15.

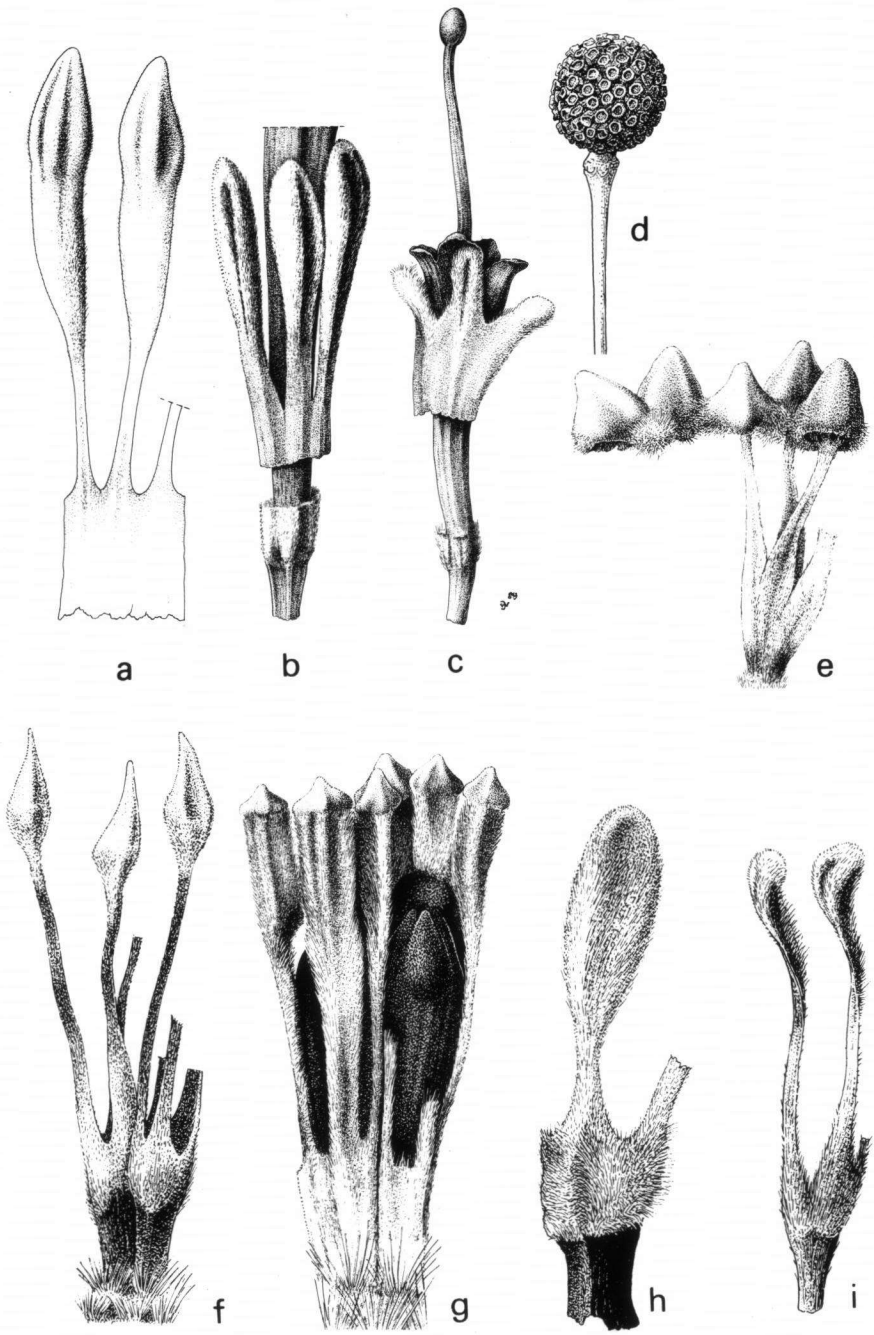

Fig. 5. Types of calyx used in the key. a–d: circumscissile; e: detaching in a mass; f, g: ochre coloured, papillate; h: apex hairy, pallid, not papillate.

Flower biology

In the young closed flower the anthers are closely adpressed around the stigma. The upper part of the style and the globose stigma are grooved. The anthers are protandrous, releasing the pollen in the closed bud (fig. 5e) and this forms a mass over and around the stigma. The corolla opens and the style increases in length so that the stigma, covered with pollen, plays a role in pollen presentation. It is assumed that the period of pollen presentation is relatively short, hence it has not been observed in all species. The style increases to its maximum length, the stigma swells and becomes globose, traces of the grooves disappear and the stigma then becomes receptive. The mechanism seems comparable to that described in *Canthium* (Vanguerieae) by Skottsberg (1945).

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Nauclea auct. non L.: Roxb., Fl. Ind. 1, 2 (1824) 117; Blume, Bijdr. (1826) 1008; DC., Prod. 4 (1830) 343; Roxb., Fl. Ind. ed. 2, 1 (1832) 508; G.Don, Gen. Hist. 3 (1834) 466; Endl., Gen. Pl. (1838) 557; Korth., Obs. Naucl. Ind. (1839) 17; Dietr., Syn. Pl. 1 (1839) 789; Miq., Fl. Ind. Bat. 2 (1856) 136; Benth. & Hook.f., Gen. Pl. 2 (1873) 31; Kurz, For. Fl. Burma 2 (1877) 64; Hook.f., Fl. Brit. India 3 (1880) 26; Schum. in E. & P., Nat. Pflanzenfam. 4, 4 (1891) 57; Havil., J. Linn. Soc. Bot. 33 (1897) 48; King, J. As. Soc. Beng. 72, 2 (1903) 9; Pitard, Fl. Gén. Indo-Chine 3 (1922) 34; Ridley, Fl. Mal. Pen. 2 (1923) 9; Lemée, Dict. 4 (1932) 184.
Bancalus Rumph. ex O.Ktze, Rev. Gen. Pl. 1 (1891) 276, 289, 297, nom. superfl.
Neonauclea Merr., J. Wash. Acad. Sc. 5 (1915) 538; Backer & Bakh.f., Fl. Java 2 (1965) 302; Bakh.f., Taxon 19 (1970) 476; Ridsd., Gard. Bull. Sing. 25 (1970) 253; Blumea 24 (1979) 337; Darwin, Allertonia 2 (1979) 12; A.C. Smith, Fl. Vit. Nova 4 (1988) 160. — Lectotype species: *Neonauclea obtusa* (Blume) Merr. (Bakhuizen van den Brink, 1970).

Trees or shrubs; twigs sometimes with somewhat fusiform myrmedomous swellings. Terminal vegetative bud strongly flattened, rarely conical. Stipules ovate, elliptic to obovate, usually with a rounded apex, or less frequently linear-oblong or narrowly triangular and then sometimes acute at apex, strongly adpressed or less frequently cohering into a cylindrical cone, deciduous or (semi-)persistent. *Leaves* opposite, pinnately nerved. *Flowering heads* terminal, generally 1–3, rarely 5–7. *Flowering axes* 1 or 3, unbranched, solitary or arranged like a simple dichasium, or rarely branched and each axis branched like a simple thyrse; the uppermost node(s) with stipules modified into involucre-like bracts which surround the young flowering heads and later separating, deciduous; the node below the flowering axes often bearing smaller leaves. *Flowers* 5-merous (or 6-merous in *N. wenzelii*), subsessile on the receptacle; receptacle usually hairy, interfloral bracteoles present or absent, if present then conical, glabrous, shiny. *Hypanthia* mutually free. *Calyx* tube short; lobes with a deciduous apical portion, lobes distinct and then attenuate into a filiform shaft, or short and abruptly forming a filiform shaft; apical portion obtrigonal to spathuloid or somewhat clavate, orange or grey coloured, in the young flowering heads longer than the immature corolla, later breaking from the shaft at the apex, about the middle, or at the base. *Corolla* hypocrateriform to narrowly infundibular;

lobes imbricate in the bud. *Stamens* inserted in the upper part of the tube, filaments short, glabrous, anthers basifixed, introrse, partially or conspicuously protruding from the throat. *Style* exserted, stigma globose to obovoid. *Ovary* 2-locular; placentas attached to the upper third of the septum, ovules numerous, pendulous. *Infructescence* a head of loose dehiscent *fruitlets*; these with a hard endocarp, splitting septicidally and loculicidally into 4 from base to apex and detaching with apical portion and calyx remnants; central axis, formed from septum of ovary, persisting, later detaching from the receptacle. *Seeds* ellipsoidal, somewhat bilaterally compressed, shortly winged at both ends.

KEY TO THE SPECIES

Note: in some characters, particularly presence or absence of interfloral bracteoles, the character cannot always be clearly seen without destroying material; of other characters such as presence or absence of myrmedomes, the material is not always collected. Here and in a few other couplets safeguards have been built in the key. So in case of doubt, make a choice.

1a. Upper apical portion of the calyx lobes orange brown to ochre coloured, papillate. Predominantly *W Malesian* 2
b. Upper apical portion of calyx lobes hairy, pallid, less frequently brown or even ochre tinted (rarely pallidly papillate at summit). Predominantly *E Malesian*, few *S and SE Asia* 64
[S and SE Asia: *N. gageana, N. griffithii, N. purpurea, N. sessilifolia** – Malaysia: *N. gigantea, N. lanceolata, N. montana, ?N. rupestris*.]
2a. Shafts of calyx mutually connate, often only for a short distance, detaching as a whole in a ring and leaving an even scar on the hypanthium. Receptacle usually glabrous or with a few scattered hairs, rarely hairy. *Philippines, Celebes, Borneo* 3
[Note: other species with mutually connate shafts which key out via 1b are: New Guinea: *N. colla, N. coronata*; Philippines: *N. kentii*; Borneo: *N. gigantea*.]
b. Shafts of calyx mutually free (or appearing so), breaking in various ways and usually leaving irregular remnants on the hypanthium. Receptacle usually sparsely to densely hairy, rarely glabrous 21
3a. Myrmedomes present 4
b. Myrmedomes absent, or not observed on the material 13
4a. Leaves subsessile, broadly obovate to broadly elliptic or orbicular, 12–23 × 8–15 cm, base subcordate. *Celebes* (incompletely known species)
37. N. rupestris
b. Leaves petiolate 5
5a. Diameter of flowering heads across calyces up to 25 mm, and/or across corollas less than 35 mm; across fruiting heads generally less than 35 mm . . . 6
b. Diameter of flowering heads across calyces 25 mm or more, and/or across corollas 35 mm or more; across fruiting heads usually 35 mm or more 7

* See Blumea 24 (1979) 337–341.

6a. Leaves up to 20 × 12 cm. *Celebes* ..... **20. N. butonensis**
b. Leaves 25–45 × 12–23 cm. *Borneo* ..... **15. N. calcarea**
7a. Calyx lobes with distinctly long conical or subulate apex 8
b. Calyx lobes with a short conical apex 10
8a. Leaves pubescent below, at least on the nerves. *Philippines*, so far as is known *Luzon* (presence of myrmedomes unconfirmed) **18. N. reticulata**
b. Leaves glabrous below 9
9a. Basal part of upper conical portion (1.5–)2–4 mm, summit long conical 2.5–3.5 mm. *Philippines: Luzon* ..... **19. N. circumscissa**
b. Basal part of upper apical portion 0–0.5 mm, summit ventricose to obclavate. *Celebes* **11. N. ventricosa**
10a. Distribution *Philippines* 11
b. Distribution *Celebes* or *Borneo* (insufficiently known species) 12
11a. Diameter of mature flowering heads across corollas (45–)50–70 mm. Leaves over 5 cm wide ..... **17. N. formicaria**
b. Diameter of mature flowering heads across corollas 35–40 mm. Leaves less than 5 cm wide ..... **22. N. jagorii**
12a. Leaves up to 20 × 12 cm. Shaft filamentous, lower part of apical portion hardly developed, upper ochre-coloured part and summit 2 mm. Diameter of mature flowering heads across corollas 50–60 mm. *Celebes* .. **20. N. butonensis**
b. Leaves 25–45 × 12–23 cm. Shaft thick, lower part of apical portion well developed, 1–1.7 mm, densely pallidly hairy, upper ochre-coloured part and summit 0.7–1 mm. Mature flowering stages not seen. *Borneo* **15. N. calcarea**
13a. Diameter of mature flowering heads across calyces less than 25 mm, and/or across corollas less than 35 mm; across fruiting heads generally less than 35 mm 14
b. Diameter of mature flowering heads across calyces 25 mm or more, and/or across corollas 35 mm or more; diameter across fruiting heads generally over 35 mm 20
14a. Leaves distinctly pubescent below. *Philippines* ..... **21. N. bartlingii** [New Guinea, with pallid calyx lobes: *N. colla, N. coronata.*]
b. Leaves more or less glabrous below 15
15a. Leaves narrowly elliptic, up to 2.5 cm wide. Rheophyte. *Philippines* **22. N. jagorii**
b. Leaves over 2.5 cm wide. Not rheophytic 16
16a. Free part of calyx shafts over 3 mm long, upper apical part over 1.5 mm long. *Celebes* ..... **20. N. butonensis**
b. Free part of calyx shafts up to 3 mm long, upper apical part up to 1.5 mm long. *Taiwan, Borneo, Philippines* 17
17a. Interfloral bracteoles present 18
b. Interfloral bracteoles absent, or sparse and not observed. *Philippines, Taiwan* 19
18a. Leaves petiolate. *Borneo* ..... **4. N. endertii**
b. Leaves subsessile. *Taiwan; Philippines: Bataan Is.* ..... **16. N. truncata**

19a. Diameter of mature flowering heads across calyces 15–20 mm. Leaves (ovate-) elliptic to lanceolate. *Philippines* ..... **21. N. bartlingii**
b. Diameter of mature flowering heads across calyces 20–25 mm. Leaves broadly elliptic to orbicular. *Taiwan; Philippines: Bataan Is.*..... **16. N. truncata**
20a. Leaves subsessile. *Taiwan; Philippines: Bataan Is.* ..... **16. N. truncata**
[Note: Celebes: *N. rupestris*, flowering stages unknown.]
b. Leaves petiolate 7
21a. Diameter of mature flowering heads across calyces 25 mm or more and/or across corollas 35 mm or more; across fruiting heads usually 35 mm or more 22
b. Diameter of mature flowering heads across calyces less than 25 mm and/or across corollas less than 35(–40) mm; across fruiting heads generally less than 35 mm 33
22a. Calyx lobes subulate or elongately conical 23
b. Calyx lobes shortly obclavate or shortly conical 27
23a. Apical portion of the calyx lobes detaching at the upper portion of the calyx shafts. Shafts persistent on the fruiting stage 24
b. Apical portion of the calyx lobes detaching together with the shaft. Shafts not persistent to fruiting stages 26
24a. Interfloral bracteoles present ..... **8. N. longipedunculata**
b. Interfloral bracteoles absent or sparse and not observed 25
25a. Hypanthium densely and finely pubescent. *Borneo*, predominantly *Sabah* **10. N. artocarpoides**
b. Hypanthium glabrous. *Sumatra* ..... **12. N. cyrtopoda**
[Note: Philippines, *N. reticulata, N. circumscissa*, see couplet 8.]
26a. Hypanthium densely pubescent. *Borneo* ..... **9. N. paracyrtopoda**
b. Hypanthium glabrous below, slightly pubescent in upper 1/3. *Celebes* **11. N. ventricosa**
27a. Interfloral bracteoles present 28
b. Interfloral bracteoles absent or sparse and not observed 29
28a. Apical portion of the calyx lobes elongate-clavate; shaft detaching at the base, not persistent to the fruiting stage ..... **6. N. pseudocalycina**
b. Apical portion of the calyx lobes turbinate; shaft persistent to the fruiting stage **14. N. borneensis**
29a. Upper portion of the calyx lobes detaching at the apex of the shaft; shaft semi-persistent to fruiting stages. *Sumatra* ..... **13. N. superba**
b. Upper portion of calyx lobes detaching together with the shaft 30
30a. Hypanthium and calyx densely pubescent. Receptacle densely hairy. *Borneo; Philippines: Sulu Arch.* ..... **6. N. pseudocalycina**
b. Hypanthium glabrous below, sometimes slightly pubescent in the upper 1/3. Receptacle glabrous or sparsely hairy 31
31a. Distribution *Borneo* ..... **15. N. calcarea**
b. Distribution *Philippines, Celebes* 32
32a. Diameter of mature flowering heads across corollas (45–)50–70 mm. *Philippines* ..... **17. N. formicaria**

b. Diameter of mature flowering heads across corollas 35–45 mm. *Celebes* **20. N. butonensis**

33a. Myrmedomes present 34
b. Myrmedomes absent, or not observed on material 41

34a. Apical portion of calyx lobes mutually accrescent, detaching as a mass, breaking at the top of the shaft; shafts persistent to the fruiting stage 35
b. Apical portion of calyx lobes mutually free, shafts not persistent to the fruiting stage. Corolla glabrous 37

35a. Corolla pubescent. *Borneo* . . . . . **5. N. excelsioides**
b. Corolla glabrous. *Sumatra* 36

36a. Upper apical portion of calyx lobes long subulate . . . . . **12. N. cyrtopoda**
b. Apical portion of calyx lobes shortly conical . . . . . **13. N. superba**

37a. Hypanthium densely pubescent. *Borneo; Philippines: Sulu Arch.* **6. N. pseudocalycina**
b. Hypanthium glabrous 38

38a. Upper apical portion of the calyx lobes 1–1.5 mm, summit clearly ochre coloured, papillate. *Celebes* . . . . . **23. N. havilandii**
b. Upper apical portion of calyx lobes 2 mm or more 39

39a. Distribution *Borneo*. Upper apical portion of the calyx lobes distinctly orange brown, papillate . . . . . **15. N. calcarea**
b. Distribution *Celebes, Moluccas*. Summit indistinctly ochre coloured, exceptionally marginally considered to be papillate 40

40a. Distribution *Celebes*. Stipules large, generally 20–35 × 12–20 mm. Myrmedomes so far unknown . . . . . **24. N. pseudopeduncularis**
b. Distribution *Moluccas*. Stipules smaller, generally 8–10(–20) × 4–6(–10) mm **40. N. glandulifera**

41a. Interfloral bracteoles present 42
b. Interfloral bracteoles absent, or sparse and not observed 47

42a. Apical portion of calyx lobes mutually accrescent and detaching as a mass from the tops of the shafts, or mutually free and detaching at the top of the shaft. Shafts semi-persistent to the fruiting stage 43
b. Apical portion of the calyx lobes not mutually accrescent, detaching separately together with the shafts. Shafts not semi-persistent 46

43a. Stipules semi-persistent on at least 2 nodes. Rheophyte . . . . . **2. N. pallida**
b. Stipules not persistent at the nodes, or absent from material 44

44a. Corolla pubescent. *Borneo*. – Diameter of the mature flowering heads across calyces 12–15 mm . . . . . **5. N. excelsioides**
b. Corolla glabrous. 45

45a. Diameter of mature flowering heads across calyces 15–20 mm. *Thailand, Malay Peninsula* . . . . . **2. N. pallida**
b. Diameter of mature flowering heads across calyces 7–10 mm. *Borneo*; mostly on limestone . . . . . **4. N. endertii**

46a. Hypanthium glabrous or sparsely pubescent but then strikingly less pubescent than the lower part of the calyx . . . . . **3. N. calycina**

b. Hypanthium and lower part of calyx both densely soft hairy **6. N. pseudocalycina**

47a. Stipules semi-persistent on at least 2 nodes 48
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48a. Upper apical portion of calyx lobes 2–2.8 mm. Not rheophytic. *New Guinea* **57. N. maluensis**
b. Upper apical portion of calyx lobes 0.4–0.9(–1.5) mm. Rheophyte. *Sumatra, Java* . . . . . **2. N. pallida**

49a. Stipules obovoid to obovate 50
b. Stipules lingulate or ovoid, or narrowly oblong (unknown in *N. calcarea*, Borneo) 54

50a. Upper part of calyx lobes obturbinate, mutually accrescent and detaching in a mass from the tops of the shafts. Shafts semi-persistent to fruiting stages **1. N. excelsa**
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57a. Apical portion of the calyx lobes mutually accrescent and detaching in a mass, breaking from the top of the shafts, or mutually free en detaching from the top of the shaft. Shafts semi-persistent to fruiting stages 58
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b. Leaves petiolate 69
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* See Blumea 24 (1979) 338–339.
** See Blumea 24 (1979) 334–337.

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* See Blumea 24 (1979) 345–347.
** See Blumea 24 (1979) 337–341.

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1. Neonauclea excelsa (Blume) Merr.

Nauclea excelsa Blume, Bijdr. (1826) 1009. — *Neonauclea excelsa* Merr., J. Wash. Acad. Sci. 5 (1915) 539. — T y p e: *Blume s.n.* (L sh. 908.219-827-9), Seriba Parang.

Nauclea cordata Blume, Bijdr. (1826) 1011, nom. illeg., non *Nauclea cordata* Roxb. 1824. — T y p e: *Blume s.n.* (L sh. 908.219-818), Java, Salak.

Nauclea mollis Blume, Bijdr. (1826) 1010. — *Bancalus mollis* O. Ktze, Rev. Gen. Pl. 1 (1891) 277. — *Neonauclea mollis* Merr., J. Wash. Acad. Sci. 5 (1915) 541. — T y p e: *Blume s.n.* (L sh. 908.219-105/110), Java, Salak.

Nauclea morindaefolia Blume, Bijdr. (1826) 1011. — *Neonauclea morindaefolia* Merr., J. Wash. Acad. Sci. 5 (1915) 541. — T y p e: *Blume s.n.*, Java, Salak.

Nauclea obtusa Blume, Bijdr. (1826) 1009. — *Bancalus obtusa* O. Ktze, Rev. Gen. Pl. 1 (1891) 277. — *Neonauclea obtusa* Merr., J. Wash. Acad. Sci. 5 (1915) 541. — T y p e: *Blume s.n.* (L sh. 908.219-117), Java, Tjerimai.

Nauclea purpurea auct. non Roxb.: Blume [Cat. Gewas. Buitenz. (1823) 52, nom. nudum;] Bijdr. (1826) 1008, p.p.

Nauclea synkorynes Korth., Verh. Nat. Gesch. Ned., Bot. (1842) 148. — *Bancalus synkorynes* O. Ktze, Rev. Gen. Pl. 1 (1891) 277. — *Neonauclea synkorynes* Merr., J. Wash. Acad. Sci. 5 (1915) 542. — T y p e: *Korthals s.n.* (L sh. 908.218-1032, 1050), Borneo, Doesson.

Nauclea obtusa Blume var. *major* Havil., J. Linn. Soc. Bot. 33 (1897) 61. — T y p e: not indicated.

Nauclea obtusa Blume var. *minor* Havil., J. Linn. Soc. Bot. 33 (1897) 61. — T y p e: not indicated.

Nauclea nicobarica Havil., J. Linn. Soc. Bot. 33 (1897) 59. — *Neonauclea nicobarica* Merr., J. Wash. Acad. Sci. 5 (1915) 541. — T y p e: Soc. Unit Frat. (BM).

Nauclea obtusa Blume var. *pubescens* Koord. & Valeton, Bijdr. Booms. Java 8 (1902) 32. — T y p e: not indicated.

Nauclea purpurascens auct. non Korth.: Ridley, Fl. Mal. Pen. 2 (1923) 9. — *Neonauclea purpurascens* Ridley, Fl. Mal. Pen. 5 (1925) 314, p.p., Malay Peninsula.

Tree to 28 m, dbh up to 40(–75) cm. Bark scaly, grey to chocolate-brown, inner bark brownish yellow. Ultimate branchlets without myrmedomes. Terminal vegetative bud ellipsoidal to obovoidal to lingulate, flattened. Stipules not persistent, elliptic to slightly obovate, (5–)8–16(–25) × (1–)2–6 mm, in Java often obovate, rhomboidal to orbicular (? watershoots), 10–30 × 5–25 mm and often slightly keeled, glabrous, rarely pubescent. *Leaves* (broadly) elliptic, (5.5–)8–20(–22) × (2–)3–5(–7) cm, coriaceous, above and below glabrous, very rarely pubescent, apex acute, base acute to cuneate or obtuse, lateral nerves 6–12 pairs. Petiole up to 2 cm. *Inflorescence* terminal, flowering heads usually in triads, axis 3–11 cm. Diameter of mature flowering heads across calyces (8–)10–20 mm, across corollas (20–)25–30 mm. *Receptacle* very sparsely hairy, interfloral bracteoles absent. *Hypanthium* 0.7–1(–1.5) mm, glabrous. *Calyx:* persistent part (1–)1.5–2 mm, sparsely finely pubescent, shaft filiform, 2.5–3(–4) mm, broad at the base, breaking at the top or middle; upper apical portion obturbinate, (0.7–)1–1.5 mm, ochre coloured, papillate, lower part ill defined with stiff hairs by which mutual elements stick together and detach in a mass. *Corolla* (5–)6–8 mm, infundibular, lobes 1 mm, outside pubescent; anthers 1.2 mm. *Style* exserted for 8–10 mm. Diameter across fruiting heads (12–)15–20 (–30) mm, fruitlets 6–8 mm, crowned by calyx remnants. — Plate 1.

D i s t r i b u t i o n. Andaman Islands, Sumatra, Java, Borneo, Lesser Sunda Islands, Celebes. Fig. 6.

N o t e s. There has been continuous confusion as to the identity and number of species of *Neonauclea* with flowering heads of small diameter. *Neonauclea excelsa* seems to be the most variable species in terms of leaf size and degree of pubescence. Recent collections of this species from Borneo all have lingulate stipules comparable to those of *Neonauclea calycina*. The collections from Java vary from lingulate (rare, e.g. *Backer 30615, Koorders 13115, 14666*) to obovate and strongly keeled with a range of intermediates. The majority of the stipules are to be found in the early collections of Koorders. After examining a larger range of material than previous authors, I can only confirm Koorders' observations that there are no differences at all to be found in the fertile material; his scant notes do not indicate any obvious ecological differences in Java.

Neonauclea excelsa has been confused with two other species, *Neonauclea pallida* and *N. calycina*. In *Neonauclea excelsa* and *N. pallida* the lower part of the upper

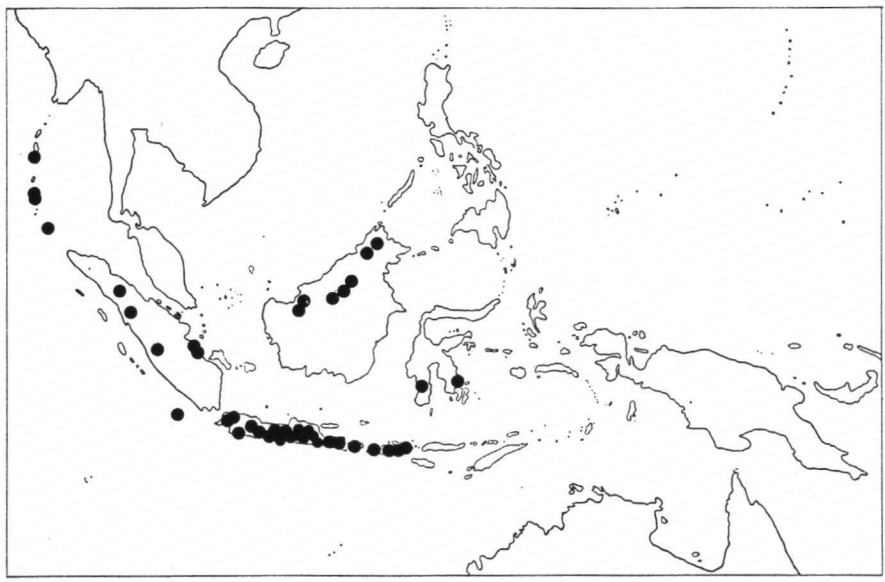


Fig. 6. Known localities of *Neonauclea excelsa* (Blume) Merr.

apical portion of the calyx appendages is hardly developed. In *Neonauclea excelsa* the lower parts of the apical portion of the calyx appendages are usually mutually accrescent by stiff erect hairs. Hence, as the corollas expand they are pushed off in a mass and are rarely found on material with mature corollas. In *Neonauclea pallida* the calyx appendages lack the stiff hairs and on expansion of the corolla simply separate and are usually present between the mature corollas. *Neonauclea calycina* has calyx appendages with a well developed lower part of the upper apical portion.

2. Neonauclea pallida (Reinw. ex Havil.) Bakh. f.

Nauclea pallida Reinw. ex Havil. (1897). — *Nauclea malaccensis* Gand. (1918).
For full synonymy, see under the subspecies.

KEY TO THE SUBSPECIES

1a. Interfloral bracteoles absent ..... **a.** subsp. **pallida**
b. Interfloral bracteoles present ..... **b.** subsp. **malaccensis**

a. subsp. pallida.

Nauclea pallida Reinw. [ex Blume, Cat. Gewas. Buitenz. (1823) 52, nom. nud.] ex Havil., J. Linn. Soc. Bot. 33 (1897) 58. — *Neonauclea pallida* [Merr., J. Wash. Acad. Sci. 5 (1915) 541, nom. invalid.] Bakh. f., Blumea 12 (1963) 63. — T y p e: *Reinwardt s.n.* (L sh. 908.218-930).

Nauclea orientalis auct. non L.: Blume, Bijdr. (1826) 1008.
Nauclea purpurea auct. non Roxb.: Blume, Bijdr. (1826) 1008, p.p.; Zoll. & Mor., Syst. Verz. (1864) 61.
Nauclea lanceolata Blume var. *longifolia* Miq., Fl. Ind. Bat. 2 (1856) 136. — S y n t y p e s : *Zollinger 334* (L); *Junghuhn s.n.* (L sh. 908.219-409).
Nauclea purpurascens auct. non Korth.: Miq., Ann. Bot. Mus. Lugd.-Bat. 4 (1869) 182.
Nauclea sumatrana Gand., Bull. Soc. Bot. Fr. 65 (1918) 34. — T y p e: *Korthals s.n.* (U, iso).

Rheophytic, much branched shrub or small tree usually up to 5 m, rarely attaining 12 m. Ultimate branches without myrmedomes. Terminal vegetative bud ovoidal, flattened. Stipules mostly persistent on the first 3 nodes, ovate to ovate-oblong, (5–)15–20(–25) × (2–)4–8(–12) mm, keeled, sparsely pubescent at base, veins prominent. *Leaves* on juvenile specimens linear-lanceolate, on mature specimens elliptic to elliptic-oblong, less frequently obovate-oblong, (6–)8–15(–25) × (1.5–)3–6(–7) cm, chartaceous to subcoriaceous, above and below glabrous, apex acute to acuminate, base rounded to acute, lateral nerves 6–10 pairs, axils often with sparsely pubescent domatia. Petiole up to 2.5 cm. *Inflorescence* terminal, flowering heads usually solitary, axis up to 8 cm. Mature flowering heads with diameter across calyces (12–)15–20 mm, across corollas 30–40 mm. *Receptacle* hairy, interfloral bracteoles absent. *Hypanthium* 1 mm, glabrous or with a few scattered hairs. *Calyx* divided almost to the base, persistent part ovate, 1–1.5 mm, slightly hairy, shaft 4–5 mm, breaking about the middle or top, semi-persistent; upper apical portion pyriform, summit conical, orange to ochre coloured, papillate, (0.4–)0.6–0.9(–1.5) mm, lower part usually ill defined. *Corolla* (7–)9–11 m, hypocrateriform, lobes ovate, 1 mm, glabrous. *Style* exserted for 6–12 mm. Diameter across fruiting heads 20–25 mm, fruitlets 8–10 mm long, crowned by calyx remnants. — Plate 1.

D i s t r i b u t i o n. Sumatra, Java.

b. subsp. **malaccensis** (Gand.) Ridsd., *stat. nov.*

Nauclea purpurascens auct. non Korth.: King & Gamble, J. As. Soc. Beng. 75, II (1903) 124; Ridley, Fl. Mal. Pen. 2 (1923) 9. — *Neonauclea purpurascens* Ridley, Fl. Mal. Pen. 5 (1925) 314, p.p.
Nauclea malaccensis Gand., Bull. Soc. Bot. Fr. 65 (1918) 34. — T y p e: *King 8603* (BO, iso).

Rheophyte, at least when young, becoming a small tree up to 12 m, bark grey-brown, smooth. Ultimate branches without myrmedomes. Terminal vegetative bud ovoidal, strongly flattened. Stipules usually persistent on the first 3 nodes, ovate to ellipsoidal, rarely obovate, (8–)15–25 × 6–10(–12) mm, keeled, pubescent at base. *Leaves* lanceolate to (elliptic-)oblong, rarely obovate, (5–)12–22(–30) × (2–)3–6(–8) cm, above and below glabrous, apex acute to acuminate, base acute to cuneate, less frequently rounded, lateral nerves 6–10 pairs. Petiole glabrous, up to 2.5 cm. Flowering heads solitary, axis up to 12 cm. Mature flowering heads with diameter across calyces 15–20 mm, across corollas 25–35(–40) mm. *Receptacle* hairy, interfloral bracteoles present, conical. Flowering parts as for subsp. *pallida*.

D i s t r i b u t i o n. Peninsular Thailand, Malay Peninsula.

3. Neonauclea calycina (DC.) Merr.

Nauclea calycina Bartling ex DC., Prod. 4 (1830) 346. – *Neonauclea calycina* Merr., J. Wash. Acad. Sci. 5 (1915) 539. — T y p e: *Haenke s.n.* (L, photo).

Nauclea peduncularis Wall. [Cat. (1831/32) 6091] ex G. Don, Gen. Hist. 3 (1834) 469. — *Bancalus peduncularis* O. Ktze, Rev. Gen. Pl. 1 (1891) 277. — *Neonauclea peduncularis* Merr., J. Wash. Acad. Sci. 5 (1915) 544. — T y p e: *Wallich Cat. 6091* (K).

Nauclea purpurascens Korth., Verh. Nat. Gesch. Ned., Bot. (1842) 157. — *Neonauclea purpurascens* Ridley, Fl. Mal. Pen. 5 (1925) 314, p.p. typus. — S y n t y p e s: *Korthals s.n.*, Java (L sh. 908.219-401, 405), Sumatra (L sh. 908.214-440).

Nauclea blancoi Vidal, Phan. Cuming. Philipp. (1885) 175. — T y p e: *Cuming 890* (n.v.).

Nauclea monocephala Merr., Philipp. J. Sci. 8 (1913) Bot. 44. — *Neonauclea monocephala* Merr., J. Wash. Acad. Sci. 5 (1915) 431. — T y p e: *Merrill 2980* (L).

Tree up to 25 m, dbh 25–35 cm. Bark flaky, inner bark yellow-brown. Ultimate branches without myrmedomes. Terminal vegetative buds lingulate to spathulate. Stipules not persistent, lingulate to spathulate, (6–)8–20(–25) × (2–)4–6(–12) mm, glabrous, not keeled. *Leaves* (broadly) elliptic, (5–)12–20(–30) × (3–)4–9 (–10) cm, above and below glabrous, apex acute to acuminate, base obtuse, rarely acute, lateral nerves 6–10 pairs. Petiole up to 3 cm. *Inflorescences* terminal, flowering heads usually in triads, axis up to 12 cm. Diameter of mature flowering heads across calyces (10–)15–20 mm, across corollas (20–)25–35 mm. *Receptacle* hairy, interfloral bracteoles present, conical or sometimes sparse and filiform. *Hypanthium* 0.7–1 mm, glabrous or sparsely pubescent but strikingly less pubescent than lower part of calyx. *Calyx:* persistent part (1–)1.5–2 mm, sparsely finely pubescent, shaft

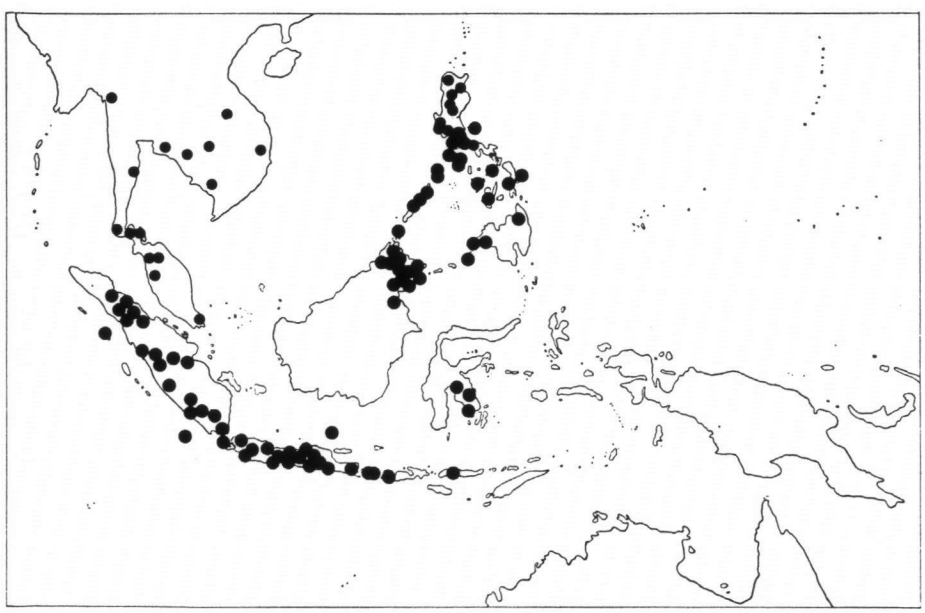


Fig. 7. Known localities of *Neonauclea calycina* (Bartling) Merr.

1.5–2.5 mm, usually breaking at the base; upper apical portion clavate, 1.5–2 mm, summit shortly conical, ochre coloured, papillate, 0.4–1.3 mm, lower part well defined, pallidly pubescent, 0.7–1.5 mm. *Corolla* infundibular, 6–8 mm, lobes ovate, 1.5 mm, glabrous; anthers 1.7 mm. *Style* exserted for 6–12 mm. Diameter across fruiting heads (20–)25–35(–40) mm, fruitlets 6–10 mm, crowned by calyx remnants. — Plate 1.

Distribution. Burma, Indochina, Peninsular Thailand, Malay Peninsula, Sumatra, Java, Lesser Sunda Islands, (Northern) Borneo, Celebes, Philippines. Fig. 7.

Ecology. Common regrowth tree, also recorded from ultrabasic soils.

Note. The distribution pattern of this species is most interesting, suggesting a preference for a feeble dry season and absence from a large part of the everwet Sundaland. Compare figures 8 and 13 in C.G.G.J. van Steenis, Plant-geography of East Malesia, Bot. J. Linn. Soc. 79 (1979) 97–178.

4. **Neonauclea endertii** Ridsd., *spec. nov.* – **Fig. 8.**

Arbores usque ad 15 m altae. Gemmae terminales vegetativae complanatae, ellipsoideae. Stipulae lingulatae vel ellipticae, 10–15 mm longae et 3–6 mm latae. Folia (anguste-)elliptica usque leviter obovata, (5–)8–16 cm longa et (2–)3–5 cm lata, utrinque glabra, apice acuta usque acuminata, basi acuta usque cuneata, nervis lateralibus 6–8-paribus, petiolo glabro 1–1,5 cm longo. Capitula florifera terminalia, solitaria vel tricephala, axe florifero 2–4(–6) cm longo. Capitula florifera subplana, per anthesim super calyces 7–10 mm, super corollas 16–25 mm diametro. Flores 5-meri, receptaculo glabro, bracteolis interfloralibus conicis, numerosis. Hypanthia glabra 0,5–0,7 mm longa, calyx usque ad basim divisus, caule 1,2–1,5 mm longo, verticibus conicis ochraceis. Corolla anguste cylindrica, glabra. Stylus 5–7 mm exsertus. Capitula fructifera 14–20 mm diam., fructibus 5–7 mm longis. — Typus: *Endert 5400* (L).

Tree up to 15 m, dbh 20 cm. Bark fissured, sometimes flaky, yellowish brown, inner bark yellow to pale brown, wood orange- to yellow-brown. Ultimate branchlets without myrmedomes. Terminal vegetative bud ellipsoidal, flattened. Stipules not persistent, lingulate to elliptic, 10–15 × 3–6 mm, apex obtuse, glabrous, slightly keeled. *Leaves* (narrowly) elliptic, rarely slightly obovate, (5–)8–16 × (2–)3–5 cm, those below the flowering heads smaller in the range, 3–5 × 1.5–2 cm, above and below glabrous, apex acute to acuminate, base acute to cuneate, lateral nerves 6–8 pairs. Petioles slender, 1–1.5 cm, glabrous. *Inflorescences* terminal, solitary or in triads, axes 2–4(–6) cm. Mature flowering heads with diameter across calyces 7–10 mm, across corollas 16–25 mm. *Receptacle* glabrous or rarely with a few scattered hairs, interfloral bracteoles numerous, conical. *Hypanthium* 0.5–0.7 mm, glabrous. *Calyx* divided almost to the base, shafts persistent, being outside and inside pubescent, shaft 1.5–2.2 mm, breaking at the top; upper apical portion 1.2–1.5 mm, summit conical, creamish brown to ochre, papillate, lower part 0.2–0.5 mm with stiff pallid hairs, these causing the lobes to be accrescent and detaching in a mass. *Corolla* narrowly cylindrical, 5–7 mm, lobes 0.5 mm long, glabrous; anthers 0.7 mm, included. *Style* exserted for 5–7 mm. Diameter across fruiting heads 14–20 mm, fruits 5–7 mm, finely pubescent, crowned by persistent calyx shafts. — Plate 1.

Distribution. Borneo (Kutei). Fig. 9a.

Ecology. Apparently restricted to limestone.

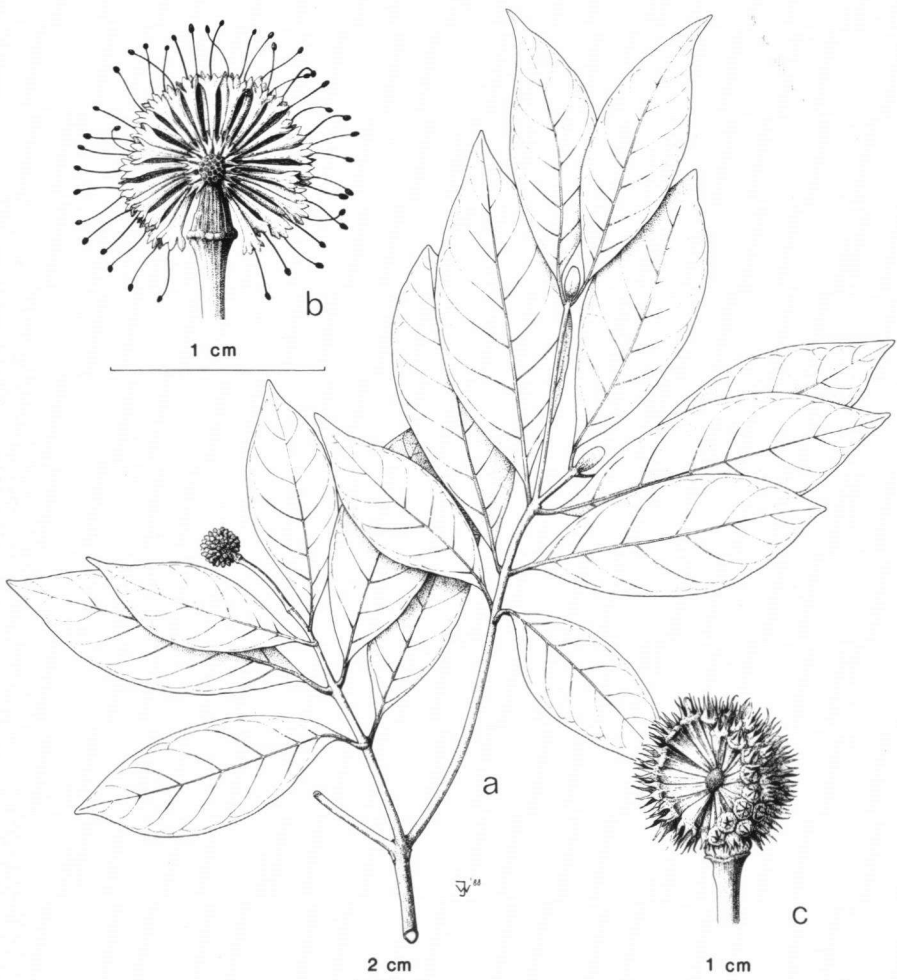


Fig. 8. *Neonauclea endertii* Ridsd. a. Habit; b. flowering head; c. fruiting head (a *Endert 5400*, b *Kostermans 5954*; c *Kostermans 13833*).

5. Neonauclea excelsioides Ridsd., *spec. nov.*

Arbores usque ad 30 m altae, ramunculis myrmecophylis. Gemmae terminales vegetativae complanatae, lingulatae. Stipulae lingulatae, (5–)18–35 mm longae et (1–)2–5 mm latae, glabrae. Folia (late) elliptica, (12–)14–24 cm longa et (8–)10–14 cm lata, coriacea, utrinque glabra, apice leviter acuta, basi plerumque obtusa, nervis lateralibus 12–16-paribus, petiolo glabro, 1,2–2 cm

longo. Capitula florifera terminalia, solitaria vel tricephala; axe florifero usque ad 8 cm longo. Capitula florifera subplana, per anthesim super calyces 12–15 mm, super corollas 20–30(–35) mm diametro. Flores 5-meri, receptaculo hirsuto, bracteolis interfloralibus conicis, numerosis. Hypanthia glabra, 0,6–1 mm longa; calyx usque ad basim divisus, caule 1,5–2,5 mm longo, hirsuto; pars apicalis dilatata conica, verticibus conicis ochraceis. Corolla infundibularis, 4–6 mm longa. Stylus 6–8 mm exsertus. Capitula fructifera 15–20 mm diam., fructibus 3 mm longis; calycis residua persistentia. — T y p u s: *SAN 66973* (L, holo; K).

Tree up to 30 m, dbh 60 cm, sometimes buttressed. Bark greyish pale brown, scaling off in small pieces, inner bark fibrous, yellowish brown, sapwood white, heartwood orange-brown. Ultimate branchlets with myrmedomes. Terminal vegetative bud lingulate, flattened. Stipules not persistent, lingulate, (5–)18–35 × (1–)2–5 mm, glabrous, not keeled. *Leaves* (broadly) elliptic, (12–)14–24 × (8–)10–14 cm, coriaceous, above and below glabrous; apex slightly acute, base obtuse, rarely acute, sometimes decurrent; lateral nerves 12–16 pairs. Petiole 12–20 mm, glabrous. *Inflorescence* terminal, 1–3, usually solitary, axis up to 8 cm long. Diameter of mature flowering heads across calyces 12–15 mm, across corollas 20–30(–35) mm. *Receptacle* hairy, interfloral bracteoles present, cigar-shaped, numerous. *Hypanthium* 0.6–1 mm, glabrous. *Calyx* divided almost to the base, shaft 1.5–2.5 mm, densely adpressed short hairy, breaking at the top and persistent in fruit; upper apical portion conical, 1 mm, summit shortly conical, papillate, orange-brown to ochre, lower part with numerous stiff hairs concrescent and detaching in a mass. *Corolla* infundibular, 4–6 mm, lobes ovoid, 0.7–1 mm, hairy outside; anthers included, 1 mm long. *Style* exserted for 6–8 mm. Diameter across fruiting heads 15–20 mm, fruitlets 3 mm long, crowned by persistent calyx shafts. — Plate 2.

D i s t r i b u t i o n. Borneo (Sabah, Kalimantan). Fig. 9b.

E c o l o g y. Frequently recorded from limestone and possibly restricted to this habitat.

N o t e. *SAN 40685* has been tested for veneer.

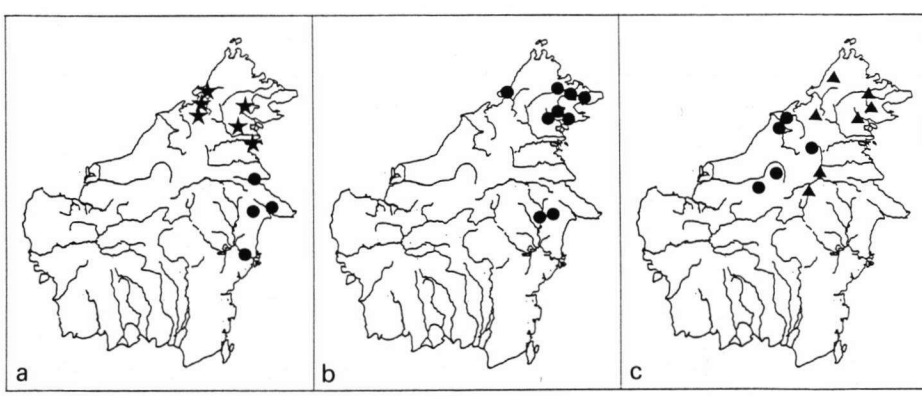


Fig. 9. Known localities of **a:** *Neonauclea endertii* Ridsd. (●); *N. longipedunculata* Merr. (★); **b:** *N. excelsioides* Ridsd. (●); **c:** *N. paracyrtopoda* Bakh.f. & Ridsd. (●); *N. artocarpoides* Ridsd. (▲).

6. Neonauclea pseudocalycina Ridsd., *spec. nov.*

Arbores usque ad 15 m altae, ramunculis myrmecophylis. Gemmae terminales vegetativae complanatae, oblongo-lingulatae. Stipulae oblongo-lingulatae, 25–30 mm longae et 4–8 mm latae, glabrae. Folia (late) elliptica, (19–)25–50 cm longa et (7–)10–15 cm lata, utrinque glabra, apice acuta, basi acuta vel obtusa, nervis lateralibus 9–12-paribus, petiolo usque ad 3 cm longo. Capitula florifera terminalia plerumque tricephala; axe florifero usque ad 8 cm longo. Capitula florifera subplana, per anthesim super calyces 20–25 mm, super corollas 35–40(–45) mm diametro. Flores 5-meri, receptaculo hirsuto, bracteolis interfloralibus filiformis, paucis. Hypanthia dense hirsuta. Calycis pars persistens 1,5–2 mm longa, caule 1,8–2,3 mm longo; pars apicalis dilatata, elongato-clavata 2,5–3,5 mm longa, verticibus conicis, 0,5–0,7 mm longis, ochraceis, papillatis. Corolla infundibularis 11–13 mm longa. Stylus 10–12 mm exsertus. Capitula fructifera 15–25 mm diam., fructibus 6–10 mm longis. — T y p u s: *Endert 3291* (L).

Tree up to 15 m. Ultimate branchlets with myrmedomes. Terminal vegetative bud oblong-lingulate, flattened. Stipules not persistent, oblong-lingulate, 25–30 × 4–8 mm, glabrous, not keeled. *Leaves* (broadly) elliptic, (19–)25–50 × (7–)10–15 cm, above and below glabrous, apex acute, base acute to obtuse, lateral nerves 9–12 pairs. Petiole up to 3 cm. *Inflorescence* terminal, usually in triads; axis up to 8 cm. Mature flowering heads with diameter across calyces 20–25 mm, across corollas 35–40(–45) mm. *Receptacle* densely hairy, interfloral bracteoles sparse, thread-like. *Hypanthium* 1–1.5 mm, densely hairy. *Calyx:* persistent part 1.5–2 mm, outside and inside densely hairy, shaft 1.8–2.3 mm, sparsely to densely pubescent, breaking near the base; upper apical portion elongate-clavate, 2.5–3.5 mm, summit short and sharply conical, 0.5–0.7 mm, orange-brown, papillate, lower part densely pallidly pubescent. *Corolla* infundibular, 11–13 mm, glabrous, lobes 2 mm; anthers 1.5–2 mm. *Style* exserted for 10–12 mm. Diameter across fruiting heads 15–25 mm, fruitlets 6–10 mm. — Plate 2.

D i s t r i b u t i o n. Borneo (Sabah, Kalimantan), Philippines (Tawi Tawi). Fig. 10.

7. Neonauclea parviflora (Koord. & Valeton) Ridsd., *comb. & stat. nov.*

Nauclea purpurascens Korth. var. *parviflora* Koord. & Valeton, Bijdr. Booms. Java 8 (1902) 26. — L e c t o t y p e: *Koorders 30126* (BO); s y n t y p e s: *Koorders 6723, 6724, 12882* (all BO).

Tree 13–20(–35) m tall. Outer bark 5 mm thick, somewhat finely fissured, greyish; underbark and inner bark yellowish with bitter taste. Ultimate branchlets without myrmedomes. Terminal vegetative buds spathulate to lingulate, flattened. Stipules not persistent, lingulate to spathulate, somewhat parabolical in upper part, (6–)8–15 × 2–4 mm, keeled, glabrous. *Leaves* (broadly) elliptic to obovate, (5–)13–18(–24) × (2–) 4.5–9(–12) cm, those below the flowering heads often smaller, chartaceous, above and below glabrous, apex acute, base acute to cuneate, rarely obtuse, lateral nerves 7–9 pairs, above and below glabrous. Petiole 10–20 mm, glabrous. *Inflorescences* terminal, flowering heads solitary or in threes or fives, axis 2–5 cm. Mature flowering heads with diameter across calyces (8–)9–12 mm, across corollas 15–20 mm. *Receptacle* hairy, interfloral bracteoles absent. *Hypanthium* glabrous

or with a few scattered hairs, 0.7–1 mm long. *Calyx:* persistent part 0.7–1 mm, outside finely sparsely pubescent, shaft 1–2 mm, sparsely pubescent, breaking at the base; upper apical portion somewhat obovoidal to clavate, 0.6–0.9(–1) mm, ochre coloured, papillate, summit ± obtuse to flattened, lower part pallidly hairy. *Corolla* hypocrateriform, 4–5.5 mm, yellowish white, tube 3–3.5 mm, lobes ovate, 1 mm; anthers 1 mm, somewhat protruding from the throat. *Style* exserted for 4–6 mm. Diameter across mature fruiting heads 10–15(–18) mm, fruitlets 3–4 mm long, crowned by hairy calyx remnants. — Plate 2.

Distribution. Java, Lesser Sunda Islands (Lombok, Sumba, Flores, Timor), Moluccas (Buru, ?Tenimbar Is.). Fig. 10.

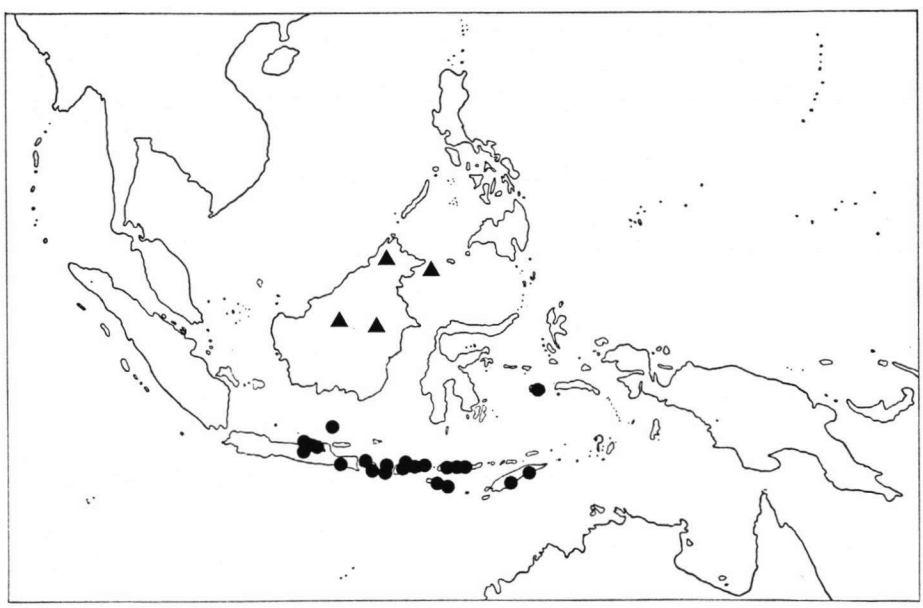


Fig. 10. Known localities of *Neonauclea pseudocalycina* Ridsd. (▲) and *N. parviflora* (Koord. & Valeton) Ridsd. (●).

8. Neonauclea longipedunculata Merr.

Neonauclea longipedunculata Merr., J. Mal. Br. Roy. As. Soc. 1 (1923) 37. — Type: *Agama 1034* (K).

Tree up to 30 m tall, bole up to 15 m, dbh 30 cm. Outer bark brownish to greyish black, sometimes scaly, inner bark yellowish brown. Ultimate branchlets with myrmedomes. Terminal vegetative bud oblong. Stipules not persistent, linear-oblong, (15–)20–30 × (4–)8–10 mm, glabrous, slightly keeled. *Leaves* broadly elliptic,

20–45 × 10–25 cm, those above myrmedomes and below flowering heads smaller, c. 15–18 × 6–10 cm, coriaceous, above and below glabrous, apex acute, base obtuse, rarely somewhat acute, lateral nerves 10–15 pairs. Petiole short, (1–)3–6 cm, glabrous. *Inflorescence* terminal, heads solitary or in triads, axis (4–)7–12 cm. Mature flowering heads with diameter across calyces 30–40 mm, across corollas (70–)80–90 mm. *Receptacle* hairy, interfloral bracteoles present, conspicuous, conical, sometimes with a filiform apex. *Hypanthium* 1.5–2 mm, slightly hairy. *Calyx* divided to the base, persistent basal part of shafts ovate-oblong, 2–3(–3.5) mm with thickened bands of sclerenchyma becoming totally sclerified and pallid at base with age, outside glabrous, rarely slightly pubescent on midline, inside with tufts of hairs opposite each lobe, shaft (1.5–)2–2.5(–4) mm, glabrous or slightly pubescent, breaking at the top; upper apical portion clavate-ventricose with a long subulate apex, summit 3.5–4 mm, ochre orange, papillate, lower part (1.5–)3–4 mm, densely pallidly hairy. *Corolla* dirty white, infundibular, 15–18 mm; anthers 2 mm, included. *Styles* exserted for 14–18 mm. Diameter across fruiting heads 35–40 mm, fruitlets 8–12 mm long, crowned by persistent calyx remnants. — Plate 3.

Distribution. Borneo. Fig. 9a.

9. Neonauclea paracyrtopoda Bakh. f. & Ridsd., *spec. nov.*

Arbores usque ad 15 m altae, ramunculis myrmecophylis. Gemmas terminales vegetativas stipulasque non vidi. Folia late elliptica, 25–45 cm longa et 14–25 cm lata, coriacea, utrinque glabra, apice acuta, basi obtusa vel truncata, nervis lateralibus 10–14-paribus, petiolo usque ad 5 cm longo. Capitula florifera terminalia; axe florifero usque ad 20 cm longo. Capitula florifera subplana, per anthesim super calyces 30–40 mm, super corollas 60–65 mm diametro. Flores 5-meri, receptaculo hirsuto; bracteolae interflorales deficientes. Hypanthia dense pubescentia, 2 mm longa; calyx usque ad basim divisus, caule 4–6 mm longo, pubescenti; pars apicalis clavata ventricosa, verticibus subulatis, ochraceis. Corolla infundibularis 12–15 mm longa. Stylus 11–15 mm exsertus. Capitula fructifera non vidi. — Typus: *S 34764* (L, holo).

Small tree, rarely attaining 15 m. Ultimate branches sometimes with myrmedomes. Terminal vegetative buds and stipules not seen. *Leaves* broadly elliptic, 25–45 × 14–25 cm, those below the flowering heads and myrmedomes often smaller, generally 10–20 × 3–10 cm, coriaceous, above and below glabrous, apex acute, base obtuse to truncate, rarely acute, lateral nerves 10–14 pairs. Petiole up to 5 cm long. *Inflorescence* terminal, solitary or in triads, axis up to 20 cm long. Mature flowering heads with diameter across calyces 30–40 mm, across corollas 60–65 mm. *Receptacle* densely hairy, interfloral bracteoles absent. *Hypanthium* 2 mm, densely pubescent. *Calyx* divided to the base, shaft 4–6 mm, slightly broadened at the base, breaking at the base, outside moderately to densely pubescent, inside with tuft of hairs at base, upper apical portion clavate-ventricose with a long subulate apex, summit pale yellow-brown to ochre, 3–4 mm long, papillate, lower part densely pallidly pubescent, (2–)2.5–3 mm. *Corolla* infundibular, 12–15 mm, dirty white tinged with violet, lobes 3 × 1 mm; anthers 2 mm, included. *Style* exserted for 11–15 mm. Fruiting heads unknown. — Plate 4.

Distribution. Borneo (Sarawak). Fig. 9c.

10. Neonauclea artocarpoides Ridsd., *spec. nov.*

Arbores usque ad 25 m altae, ramunculis myrmecophylis. Gemmas terminales vegetativas stipulasque non vidi. Folia late elliptica vel leviter obovata, 24–41 cm longa et 11–22 cm lata, chartacea vel coriacea, utrinque glabra, apice et basi acuta, nervis lateralibus 8–16-paribus, petiolo crasso, usque ad 5 cm longo. Capitula florifera terminalia solitaria vel tricephala, axe florifero usque ad 15 cm longo. Capitula florifera subplana, per anthesim super calyces 25–35 mm, super corollas 50 mm diametro. Flores 5-meri, receptaculo pubescenti; bracteolae interflorales deficientes. Hypanthia pubescentia 1–2 mm longa; calycis pars persistens 2–4 mm longa, caule 3–4 mm longo, pars apicalis dilatata clavata vel ventricosa, verticibus subulatis, ochraceis. Corolla infundibularis 14 mm longa. Stylus 10 mm exsertus. Capitula fructifera 35 mm diam., fructibus 7–10 mm longis. — Typus: *BRUN 762* (L, holo; BO, K, iso).

Tree up to 25 m tall, bole up to 15 m, bark ochre to brownish black, smooth; inner bark ochre to orange brown, sapwood pinkish yellowish. Ultimate branchlets sometimes with myrmedomes. Terminal vegetative buds and stipules not seen. *Leaves* (broadly) elliptic, rarely slightly obovate, 24–41 × 11–22 cm, those below the flowering heads and above the myrmedomes smaller, 13–22 × 5–9 cm, chartaceous to coriaceous, above and below glabrous, apex and base acute, lateral nerves 8–16 pairs. Petiole stout, up to 5 cm. *Inflorescence* terminal, solitary or in triads, axis up to 15 cm. Mature flowering head with diameter across calyces 25–35 mm, across corollas 50 mm. *Receptacle* hairy, interfloral bracteoles absent. *Hypanthium* 1–2 mm, densely finely pubescent. *Calyx:* persistent part 2–4 mm, outside and inside finely pubescent, free part of shaft 3–4 mm, somewhat broadening at the base and connate for c. 0.5 mm; upper apical portion clavate to ventricose, summit conical to shortly subulate, 2–3 mm, orange to orange-brown, papillate, lower part 2–3 mm with dense stiff hairs and thus mutually cohering and breaking as a mass at the top of the shaft. *Corolla* infundibular, 14 mm, glabrous, lobes ovate, 1.5 mm long, apiculate; anthers 2 mm, included. *Style* exserted for c. 10 mm. Diameter across fruiting heads 35 mm, fruitlets 7–10 mm long, crowned by calyx remnants and shafts. — Plate 4.

Distribution. Borneo (Brunei, Sabah, Kalimantan). Fig. 9c.

11. Neonauclea ventricosa Ridsd., *spec. nov.* – Fig. 11.

Arbores usque ad 25 m altae, ramunculis myrmecophylis. Gemmae terminales vegetativae complanatae, ovoideae. Stipulae late ellipticae, 20–30 mm longae et 8–12 mm latae, glabrae. Folia (late) elliptica vel obovate, 15–28 cm longa et 12–18 cm lata, coriacea, utrinque glabra, apice et basi obtusa, nervis lateralibus, 7–9-paribus, petiolo crasso usque ad 3 cm longo. Capitula florifera terminalia solitaria vel tricephala; axe florifero usque ad 12 cm longo. Capitula florifera subplana, per anthesim super calyces (20–)25–35 mm, super corollas 60–65 mm diametro. Flores 5-meri, receptaculo glabro, bracteolae interflorales deficientes. Hypanthia glabra 1,5–2 mm longa; calycis pars persistens 1,5–2 mm longa, caule pubescenti 3,5–4 mm longo, pars apicalis dilatata, ventri-cosa vel clavata, verticibus subulatis, ochraceis, papillatis. Corolla infundibularis, 14–16 mm longa, lobis ovatis extus farinoso-pubescentibus. Stylus 10 mm exsertus. Capitula fructifera (25–)35–40 mm diam., fructibus 9–12 mm longis; calycis residua persistentia. — Typus: *de Vogel 6080* (L, holo).

Tree up to 25 m, 30 cm dbh. Ultimate branchlets with myrmedomes. Terminal vegetative bud flattened, ovoidal. Stipules not persistent, broadly elliptic, 20–30 ×

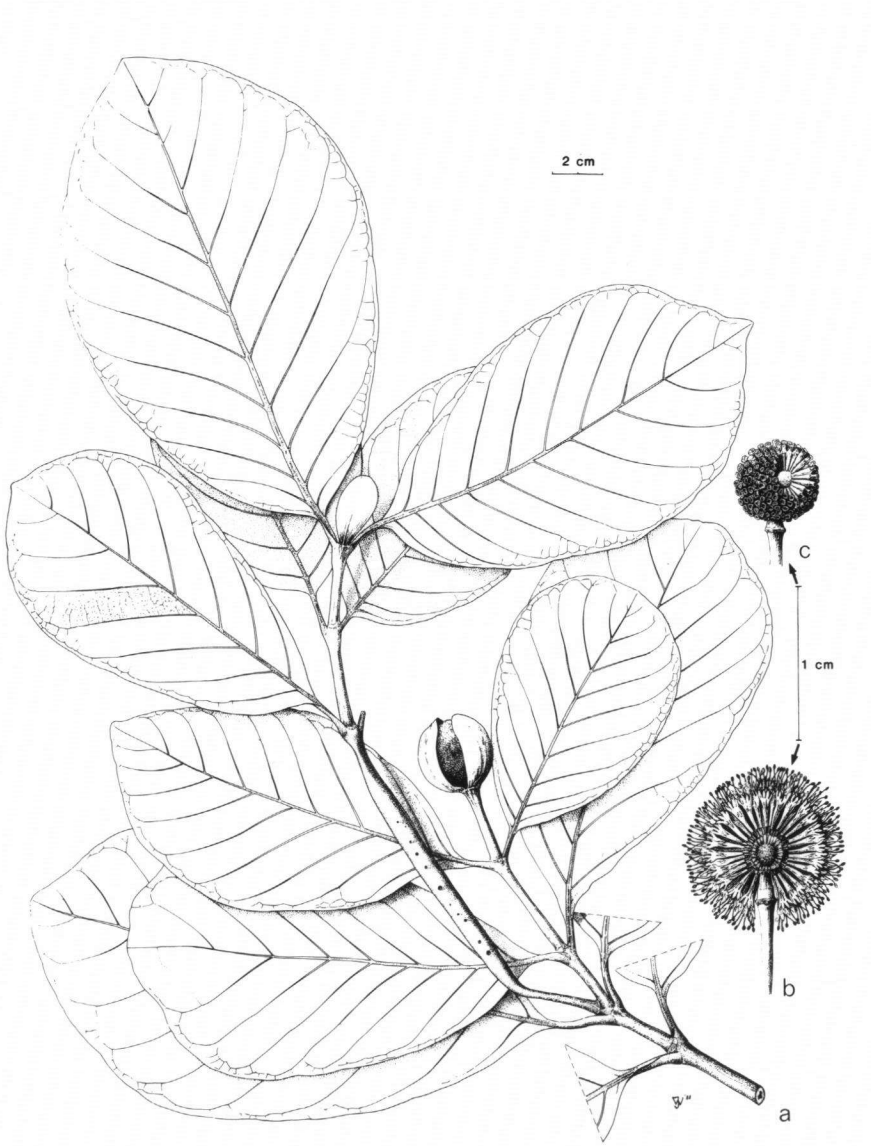


Fig. 11. *Neonauclea ventricosa* Ridsd. a. Habit; b. flowering head; c. fruiting head (all *Meijer 10210*).

8–12 mm, glabrous, slightly keeled. *Leaves* (broadly) elliptic to obovate, 15–28 × 12–18 cm, those above myrmedomes and below the flowering heads usually smaller, up to 10 × 7 cm, coriaceous, above and below glabrous, apex obtuse, base obtuse, sometimes slightly unequal, lateral nerves 7–9 pairs. Petiole stout, up to 3 cm, glabrous. *Inflorescence* terminal, solitary or in triads, axis up to 12 cm. Mature

flowering heads with diameter across calyces (20–)25–35 mm, across corollas 60–65 mm. *Receptacle* glabrous, interfloral bracteoles absent. *Hypanthium* 1.5–2 mm, glabrous. *Calyx:* persistent part 1.5–2 mm, outside below glabrous with lines of sclerenchyma, above finely densely pubescent, inside densely sericeous, shaft filamentous, 3.5–4 mm, sparsely to densely pubescent, probably connate at ultimate base and breaking into separate elements at the base, upper apical portion ventricose to obclavate, summit (1.5–)2–2.5(–3) mm, ochre to orange-brown, distinctly shortly subulate, papillate, lower part 0–0.5 mm, pallidly hairy. *Corolla* infundibular, 14–16 mm long, lilac, tube glabrous except near lobes, lobes 1.5–2.5 mm, outside farinose-pubescent; anthers 2 mm, included. *Style* exserted for c. 10 mm. Diameter across mature fruiting heads (25–)35–40 mm, fruitlets 9–12 mm long, strongly cohering with each other. — Plate 5.

Distribution. Celebes.

12. Neonauclea cyrtopoda (Miq.) Merr.

Nauclea cyrtopoda Miq., Fl. Ind. Bat. 2 (1856) 342. — *Neonauclea cyrtopoda* Merr., J. Wash. Acad. Sci. 5 (1915) 539. — Type: *Diepenhorst s.n.* (U), Sumatra, Priaman.

Usually a small tree, 8–10(–15–?30) m, dbh 30(–?60) cm. Ultimate branchlets with myrmedomes. Terminal vegetative bud narrowly ovoidal. Stipules not persistent, ovate lanceolate, (7–)10–25(–30) × 5–10 mm, slightly keeled or not, glabrous. *Leaves* (broadly) elliptic to oblong, less frequently obovate, (15–)18–30 × (7.5–) 10–15 cm, those below the flowering heads and above the myrmedomes usually smaller and in the range 8–15 × 2.5–7 cm, coriaceous, above and below glabrous, apex acute, base obtuse to acute, sometimes decurrent, midrib stout, lateral

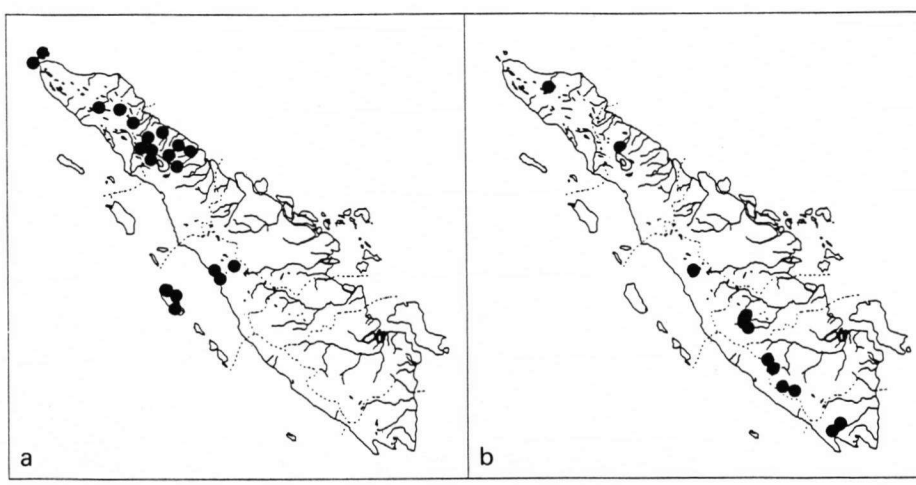


Fig. 12. Known localities of **a:** *Neonauclea cyrtopoda* (Miq.) Merr.; **b:** *N. superba* S. Moore.

nerves 9–14 pairs. Petiole stout, glabrous, 2–3.5 cm long. *Inflorescence* solitary or in triads, axis up to 10 cm long. Mature flowering heads with diameter across calyces (20–)25–30 mm, across corollas (40–)45–80 mm. *Receptacle* hairy, interfloral bracteoles absent. *Hypanthium* glabrous, 1–2 mm. *Calyx:* persistent part 1–2 mm,

Fig. 13. *Neonauclea superba* S. Moore. a. Habit; b. myrmedome (a *Forbes 2605A*; b Cult. Bog. IV.E. 19, L sh. 926.134-464).

outside glabrous below, finely greyish pubescent above, inside sericeous below, pubescent above, shaft filamentous, 3–5 mm, pallidly greyish pubescent, persistent; upper apical portion obpyramidal with long subulate apex, 2.5–4.5 mm, summit 2.5–3.5 mm, pale yellow to ochre orange-brown, papillate, lower part 0.5–1 mm, pallidly hairy; the whole apical portion accrescent and breaking at top of shafts and detaching in an irregular mass. *Corolla* infundibular, widened above, 15–18 mm long, glabrous, lobes 1–2 mm long; anthers 2 mm, included in throat. *Style* exserted for 10–12 mm. Diameter across fruiting heads 35 mm, fruitlets 8–12 mm, glabrous, crowned by calyx remnants. — Plate 5.

Distribution. Sumatra. Fig. 12a.

Ecology. Usually primary forest. There are several sterile collections from limestone rocks (see Jochems, Trop. Natuur 18, 1929, 28) which have been previously retained under this species. However, *Jochems 5070* from Lau Debok[2] is *Neonauclea superba.*

Note. A sterile collection, *van Steenis 5733,* is recorded as being a large tree, up to 35 m, dbh 60 cm.

13. Neonauclea superba S. Moore – Fig. 13.

[*Nauclea grandifolia* auct. non Spreng. nec Roxb.: Miq., Fl. Ind. Bat., Suppl. 1, Sum. (1861) 538.] — *Nauclea purpurascens* Korth. f. *latifolia* Korth. ex Miq., Ann. Mus. Bot. Lugd.-Bat. 4 (1869) 182. — Type: *Teijsmann 8865* (BO), Sumatra, Palembang, Moera Doera.

[*Nauclea grashoffii* Valeton ex Heyne, Nutt. Pl. Ned. Ind. (1917) 191, nom. nud.]

Nauclea superba S. Moore, J. Bot. 62 (1924) Suppl. 47. — *Neonauclea superba* S. Moore, J. Bot. 64 (1926) Suppl. 146. — Types: *Forbes 1473* (BM, L, lecto), *1474* (L).

Tree attaining 18 m, crown broad. Outer bark grey-brown fissured. Ultimate branchlets usually with myrmedomes. Terminal vegetative bud oblong, flattened. Stipules not persistent, (narrowly) oblong, (12–)20–30(–40) × 5–10 mm, glabrous, keeled. *Leaves* elliptic to broadly elliptic, (14–)18–27 × (6–)8–17 cm, those below the flowering heads and above myrmedomes usually smaller, up to 14 × 5 cm, coriaceous, above and below glabrous; apex acute to acuminate, base acute to cuneate, sometimes decurrent; lateral nerves 9–12 pairs. Petiole stout, 2–3 cm long, glabrous. *Inflorescences* terminal, solitary or in triads, axis up to 2 cm long. Mature flowering heads with diameter across calyces 20–30 mm, across corollas 35–55 mm. *Receptacle* hairy, interfloral bracteoles absent. *Hypanthium* glabrous, 1.5–2 mm. *Calyx:* persistent part 2.5–3 mm, the basal 1 mm outside pubescent, shaft filamentous, 2–3.5 mm; upper apical portion ovoidal, 2–3.5 mm long, summit shortly conical, orange coloured, papillate, lower part ill defined from shaft; the apical portions mutually accrescent and detaching in an irregular mass. *Corolla* hypocrateriform, purplish, glabrous, tube 9–12 mm, upper part 2–2.5 mm, lobes ovate, 1.5–2 mm; anthers 2–2.5 mm, included. *Style* exserted for 9–10 mm. Diameter across fruiting heads 30–35 mm, fruitlets 8–10 mm long, crowned by calyx remnants. — Plate 6.

Distribution. Sumatra. Fig. 12b.

14. Neonauclea borneensis Ridsd., *spec. nov.*

Arbores parvae vel mediocres usque ad 12 m altae, ramunculis myrmecophylis. Gemmae terminales vegetativae oblongae, complanatae. Stipulae anguste oblongae, 20–25 mm longae et 5–7 mm latae, glabrae, carinatae. Folia late elliptica, (12–)20–35(–50) cm longa et (10–)15–20(–30) cm lata, utrinque glabra, apice acuta, basi truncata vel subcordata, nervis lateralibus, (8–)11–15-paribus, petiolo 1,5–3(–6) cm longo, glabro. Capitula florifera terminalia solitaria vel tricephala; axe florifero usque ad 4,5 cm longo. Capitula florifera subplana per anthesim super calyces 25–30(–35) mm, super corollas 60–70 mm diametro. Flores 5-meri, receptaculo hirsuto, bracteolis interfloralibus filiformis. Hypanthia 1,5–2 mm longa, hirsuta; calyx cartilagineus usque ad basim divisus, caule 3–4 mm longo; pars apicalis dilatata turbinata 2–3 mm longa, verticibus obclavatis ochraceis papillatis. Corolla infundibularis 13–16 mm longa. Stylus 15–18 mm exsertus. Capitula fructifera 35–40 mm diam., fructibus 8 mm longis; calycis residua persistentia. — T y p u s: *Purseglove 5400* (L, holo; K).

Small shrub or slender tree up to 12 m high. Bark greyish brown, mottled. Ultimate branchlets stout, usually with myrmedomes. Terminal vegetative bud oblong, flattened. Stipules not persistent, narrowly oblong, 20–25 × 5–7 mm, keeled, glabrous, apex acute. *Leaves* broadly elliptic, (12–)20–35(–50) × (10–)15–20(–31) cm, those below the flowering heads and above the myrmedomes usually smaller, up to 17 × 10 cm, above and below glabrous; apex acute, base truncate to subcordate, rarely obtuse, frequently asymmetrical, lateral nerves (8–)11–15 pairs. Petiole stout, 1.5–3(–6) cm, glabrous. *Inflorescence* terminal, flowering heads solitary or in triads, axis up to 4.5 cm. Mature flowering heads with diameter across calyces 25–30(–35) mm, across corollas 60–70 mm. *Receptacle* hairy, interfloral bracteoles present, long, filamentous. *Hypanthium* 1.5–2 mm long, sparsely to densely hairy. *Calyx* divided to the base, thick and cartilaginous, drying dark blackish brown, broadened basal part (2.5–)3–3.5 mm, attenuate into the shaft, shaft 3–4 mm long, glabrous or with a few scattered hairs, breaking first at the top and then just above the broadened basal part; upper apical portion 2–3 mm long, turbinate, summit shortly obclavate, pallid ochre coloured, papillate, 0.7–1.2 mm, not accrescent, lower part 1–1.7 mm long, with long dense soft hairs. *Corolla* infundibular, purplish, 13–16 mm long, glabrous, lobes ovate, 1–2 mm long; anthers 2 mm, included. *Style* exserted for 15–18 mm. Diameter across fruiting heads 36–40 mm, fruitlets 8 mm long, crowned by calyx remnants. — Plate 7.

D i s t r i b u t i o n. Borneo (Brunei, Kalimantan, Sarawak). Fig. 14a.

15. Neonauclea calcarea Ridsd., *spec. nov.*

Frutices vel arbores usque ad 7 m altae, ramunculis myrmecophylis. Gemmas terminales vegetativas stipulasque non vidi. Folia (late) elliptica, 25–45 cm longa et 12–23 cm lata, utrinque glabra, apice leviter acuta, basi plerumque obtusa vel truncata, nervis lateralibus 10–15-paribus, petiolo crasso glabro 2–5 cm longo. Capitula florifera terminalia solitaria vel tricephala; axe florifero usque ad 9 cm longo. Capitula florifera subplana, per anthesim super calyces 20–25 mm diametro. Flores 5-meri receptaculo dense hirsuto; calycis pars persistens 1,5–2 mm longa, caulibus (2,5–) 3–4 mm longis basi connatis circumscissilibus deciduis; pars apicalis dilatata obturbinato-clavata, verticibus leviter conicis, ochraceis, papillatis. Capitula fructifera 30–35 mm diam., fructibus 9–12 mm longis. — T y p u s: *S 22837* (L, holo; K, S, SING).

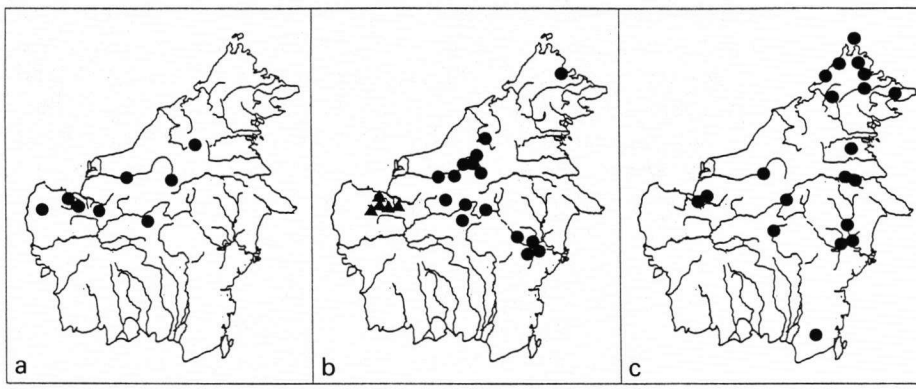


Fig. 14. Known localities of **a:** *Neonauclea borneensis* Ridsd. (●); **b:** *N. calcarea* Ridsd. (▲); *N. angustifolia* (Havil.) Merr. (●); **c:** *N. gigantea* (Valeton) Merr. (●).

Shrub or small tree up to 7 m. Bark grey-brown, fissured. Ultimate branchlets with myrmedomes. Terminal vegetative buds and stipules not seen. *Leaves* (broadly) elliptic, 25–45 × 12–23 cm, those above the myrmedomes and below the flowering heads smaller, usually in the range 10–23 × 6–11 cm, coriaceous, above and below glabrous, apex acute, base obtuse to truncate, less frequently acute, sometimes unequal, lateral nerves 10–15 pairs. Petiole stout, 2–5 cm long, glabrous. *Inflorescence* terminal, solitary or in triads, axis up to 9 cm. Mature flowering heads with diameter across calyces 20–25 mm, across corollas not known. *Receptacle* densely hairy, interfloral bracteoles absent. *Hypanthium* 2 mm, glabrous or with a few scattered hairs. *Calyx:* persistent part 1.5–2 mm, outside densely finely pubescent, free part of shaft (2.5–)3–4 mm, finely pubescent, often ultimately breaking completely to the base, shortly connate at base for 1–1.2 mm; upper apical portion obturbinate-clavate, 2–3 mm, summit shortly conical, 0.7–1 mm, clearly ventricose at the apex, orange-brown, papillate, lower part 1–1.7 mm, densely pallidly hairy. *Corolla* immature, glabrous, lobes tinged purple. Diameter across mature fruiting heads 30–35 mm, fruitlets 9–12 mm long. — Plate 7.

Distribution. Borneo (Sarawak). Fig. 14b.

Ecology. Apparently restricted to forest on limestone.

16. Neonauclea truncata (Hayata) Yamamoto

Nauclea truncata Hayata, J. Coll. Sci. Tokyo 30 (1911) 140. — *Neonauclea truncata* Yamamoto, J. Soc. Trop. Agric. Taiwan 7 (1935) 149. — Type: *Kawakami 1660* (n.v.).

Tree. Terminal vegetative bud ovoidal, flattened. Myrmedomes not observed. Stipules not persistent, ovate, 12–16(–25) × (8–)10–15 mm, glabrous, slightly keeled. *Leaves* broadly elliptic to orbicular or broadly obovate, (6–)9–18 × (4–)6–18 cm, coriaceous, above and below glabrous, apex obtuse to slightly acute, base

subcordate, decurrent, lateral nerves 7–9 pairs. Petiole 0(–5) mm, glabrous. *Inflorescence* terminal, mostly solitary. Mature flowering heads with diameter across calyces 20–25 mm, across corollas 35–45 mm. *Receptacle* glabrous, interfloral bracteoles present, sparse. *Hypanthium* 0.75–1.5 mm, glabrous. *Calyx:* persistent part 1–1.5 mm, outside glabrous but with stiff hairs above, inside sericeous, basal part of shaft mutually connate into a ring for 0.3–0.8 mm, probably breaking in a ring at the base, free part of shaft (1–)1.5–2.5 mm, sparsely pubescent; upper apical portion 2–2.5 mm, clavate to turbinate, summit shortly conical, 1–1.5 mm, orange to ochre coloured, papillate, lower part 0.75–1 mm, pallidly hairy. *Corolla* infundibular, white, 12–14 mm long, glabrous, tube c. 10 mm, lobes 2–3 mm, ovate, outside farinose pubescent; anthers 2 mm, included. *Style* exserted for 8–10 mm. Diameter across mature fruiting heads 30–35 mm, fruitlets c. 10 mm long, often appearing as a pseudosyncarp, crowned by calyx remnants. — Plate 8.

Distribution. Taiwan, Philippines (Batan Is.).

17. Neonauclea formicaria (Elmer) Merr.

Nauclea formicaria Elmer, Leafl. Philipp. Bot. 3 (1911) 989. — *Neonauclea formicaria* Merr., Enum. Philipp. 3 (1923) 512. — Type: *Elmer 11034* (WRSL, iso).

Small tree, 5–15 m, dbh up to 25–50(–60) cm, bole up to 10 m, often crooked, branches spreading. Outer bark cracked, scaling in plates, yellowish grey; underbark red, wood dirty yellowish white with a bitter taste. Ultimate branchlets with myrmedomes. Terminal vegetative bud ovoidal, flattened. Stipules not persistent, ovate, 30–40 × 15–25 mm, glabrous, slightly keeled. *Leaves* (broadly) elliptic, 15–33 × 9–24 cm, those below the flowering heads and above the myrmedomes usually smaller, generally in the range 7–12 × 4–8 cm, above glabrous, below glabrous or less frequently finely pubescent particularly on the nerves, apex acute, base obtuse to subcordate, rarely acute, lateral nerves 7–9 pairs. Petioles stout, 2–9 cm, usually glabrous. *Inflorescences* mostly terminal, rarely also lateral from second node, flowering heads 1–3(–7), axes 5–13 cm long. Mature flowering heads with diameter across the calyces 25–30 mm, across the corollas (45–)50–70 mm. *Receptacle* ± glabrous, interfloral bracteoles absent. *Hypanthium* 0.75–2 mm, glabrous or with a few stiff minute hairs in the upper part. *Calyx:* persistent part 1.5–2.5 mm, outside glabrous below, usually with vertical sclerenchyma thickening, above finely pubescent, inside densely sericeous, shaft 3–4.5 mm, breaking at the base, sometimes the shafts mutually connate for 0.5 mm but rapidly breaking apart; upper apical portion 3–4.5 mm, clavate to turbinate or napiform, summit shortly conical to napiform, (0.75–)1–2 mm, orange to ochre coloured, papillate, lower part 1.5–2.5 (–3) mm, pallidly hairy. *Corolla* infundibular, 12–14 mm, white, slightly pubescent below lobes, lobes ovate, 2–3 mm, outside pubescent; anthers 2–3 mm, included. *Style* exserted for 8–9 mm. Diameter across fruiting heads (30–)35–45 mm, fruitlets 8–14 mm long, at the top with minute hairs which often cling together with the surrounding fruitlets and appearing as a pseudosyncarp, crowned with calyx remnants. — Plate 8.

Distribution. Philippines (Viscayas, Mindanao). Fig. 15a.

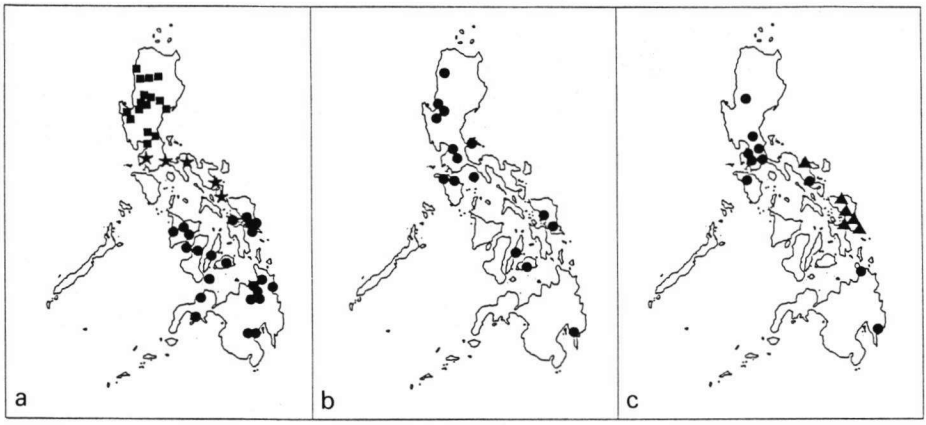


Fig. 15. Known localities of **a:** *Neonauclea formicaris* (Elmer) Merr. (●); *N. reticulata* (Havil.) Merr. (■); *N. circumscissa* Ridsd. (★); **b:** *N. bartlingii* (DC.) Merr. var. *cumingiana* (Vidal) Ridsd. (●); **c:** *N. bartlingii* var. *bartlingii* (●); *N. jagorii* Merr. (▲).

18. Neonauclea reticulata (Havil.) Merr.

Nauclea reticulata Havil., J. Linn. Soc. Bot. 33 (1897) 62. – *Neonauclea reticulata* Merr., J. Wash. Acad. Sci. 5 (1915) 542. — T y p e: *Vidal 2955* (K, holo).

Tree up to 15 m. Terminal vegetative buds obovoidal, flattened. Myrmedomes thought to be absent from ultimate branchlets. Stipules not persistent, obovate, 25–40 × 15–20 mm, pubescent, slightly keeled. *Leaves* broadly elliptic to obovate, 15–45 × 10–30 cm, coriaceous, above glabrous, below pubescent, apex obtuse, base subcordate, lateral nerves 8–10 pairs. Petioles stout, 5–15 mm, pubescent. *Inflorescence* terminal, flowering heads solitary or in triads, axes up to 8 cm. Mature flowering heads with diameter across calyces (25–)30–40 mm, across corollas (50–)60–80 mm. *Receptacle* glabrous, interfloral bracteoles absent. *Hypanthium* 0.8–2 mm, glabrous. *Calyx:* persistent part 2–3 mm, outside glabrous below, finely pubescent above with distinct sclerenchyma bands on lobes, inside densely sericeous, shaft 5–6 mm, slightly pubescent, breaking at the base; upper apical portion 5–6 mm, clavate, summit long conical, (2–)3–3.5 mm, orange-ochre coloured, papillate, lower part 2.5–3(–4) mm, pallidly hairy. *Corolla* infundibular, 14–18 mm, white but purplish above, below glabrous, above slightly farinose pubescent, lobes ovate, 2–3 mm, outside farinose pubescent; anthers 2–3 mm, included. *Style* exserted for 10–15 mm. Diameter across fruiting heads 40–50 mm, fruitlets 10–15 mm long, at the top with minute hairs and often adhering together and appearing as a pseudosyncarp. — Plate 8.

D i s t r i b u t i o n. Philippines (Luzon). Fig. 15a (southern limit uncertain).

N o t e. There are many problems surrounding the holotype specimen *Vidal 2955*; the branch and the leaf correspond to the description of *Neonauclea reticulata*

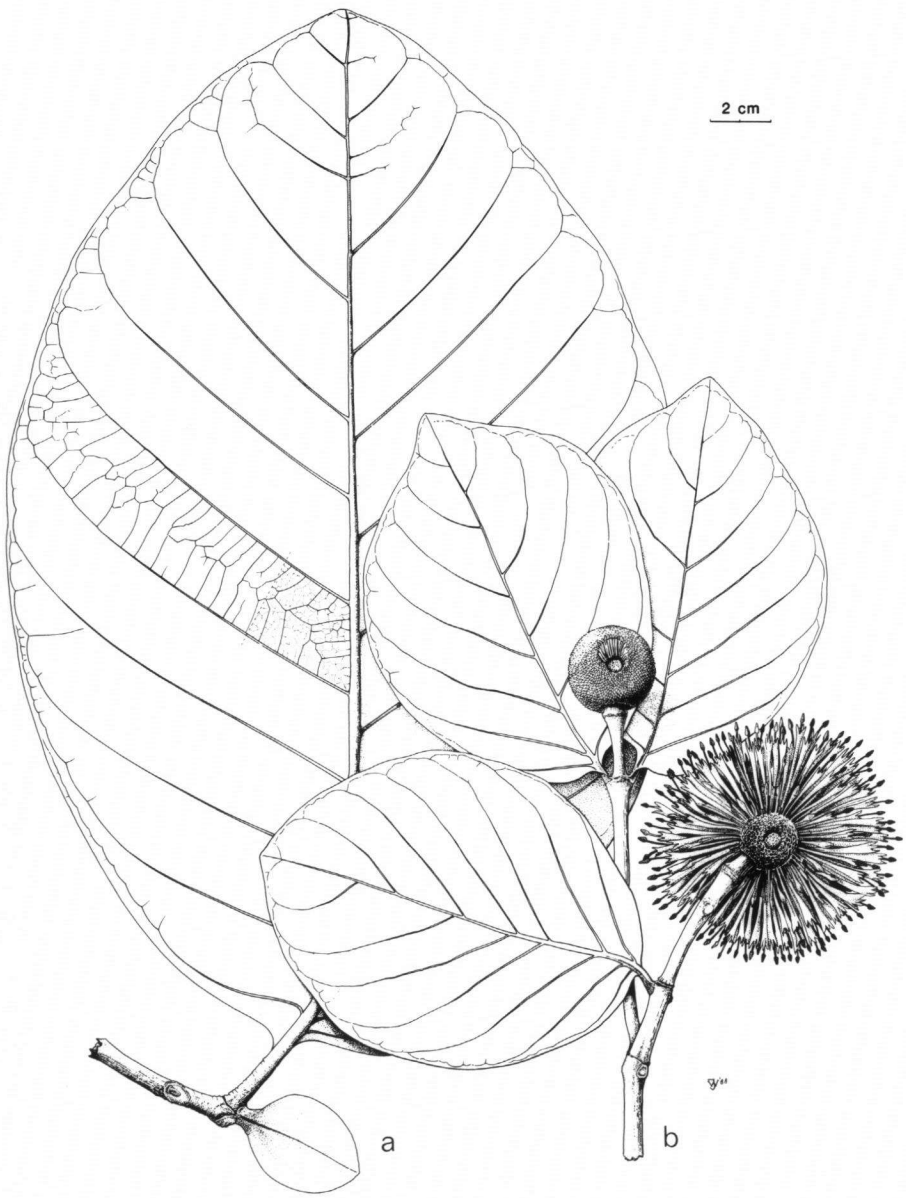


Fig. 16. *Neonauclea circumscissa* Ridsd. a. Stipule and leaf; b. flowering branchlet (a *FB 26045*; b *PNH 18407*).

but the flowering head mounted on the same sheet is *N. formicaria,* confirmed by the presence of one or two calyx appendages. The other cited specimens, *Vidal 364 & 1473,* are free from confusion. I have not observed myrmedomes to be present on the material examined nor on the few living specimens I have seen. However, the size of the leaves usually means that most collectors only collect the terminal node, hence they may have been overlooked.

19. Neonauclea circumscissa Ridsd., *spec. nov.* – Fig. 16.

Arbores parvae 5–7 m altae. Gemmae terminales vegetativae complanatae ovoideae. Stipulae ovatae, 40 mm longae et 30 mm latae, glabrae. Folia late elliptica vel leviter obovata, 13–42 cm longa et 9–28 cm lata, coriacea utrinque glabra, apice obtusa vel leviter acuta, basi subcordata, nervis lateralibus 7–9-paribus, petiolo crasso, 0,5–4 cm longo, glabro. Capitula florifera terminalia solitaria, axe florifero usque ad 6 cm longo. Capitula florifera subplana per anthesim super calyces 20–30 mm, super corollas 55–80 mm diametro. Flores 5-meri, receptaculo glabro, bracteolae interflorales deficientes. Hypanthia glabra 0,7–2 mm longa; calycis pars persistens 1–1,25 mm longa, caulibus (2–)3–4,5 mm longis, basi 2–2,5 mm connatis, circumscissilibus deciduis; pars apicalis dilatata clavata (3,5–)5–7 mm longa, verticis conicis (2–)2,5–3,5 mm longis ochraceis. Corolla infundibularis extus farinosa. Stylus 14–16 mm exsertus. Capitula fructifera 40 mm diam., fructibus 8–14 mm longis. — T y p u s: *PNH 18407* (L).

Tree 5–7 m tall. Terminal vegetative bud ovoidal, flattened. Myrmedomes thought to be absent from ultimate branchlets. Stipules not persistent, ovate, 40 × 30 mm, glabrous, slightly keeled. *Leaves* broadly elliptic to slightly obovate, 13–42 × 9–28 cm, coriaceous, above and below glabrous, apex obtuse to slightly acute, base subcordate, sometimes slightly unequal, lateral nerves 7–9 pairs. Petiole stout, 0.5–4 cm, glabrous. Flowering heads terminal, solitary, axis 0.5–6 cm. Mature flowering heads with diameter across calyces 20–30 mm, across corollas 55–80 mm. *Receptacle* glabrous, interfloral bracteoles absent. *Hypanthium* 0.7–2 mm, glabrous, later with stiff minute hairs above. *Calyx:* persistent part 1–1.25 mm, outside below glabrous with thickened lines of sclerenchyma, above finely pubescent, inside densely sericeous; free part of shaft (2–)3–4.5 mm, sparsely pubescent, lower part mutually connate for 2–2.5 mm, breaking in a ring at the base; upper apical portion (3.5–)5–7 mm long, clavate, summit long conical, (2–)2.5–3.5 mm, orange-ochre coloured, papillate, lower part (1.5–)2–4 mm, pallidly hairy. *Corolla* infundibular, 15–18 mm long, glabrous, lobes ovate, 2–3 mm long, farinose-pubescent outside; anthers included, 2–3 mm long. *Style* exserted for 14–16 mm. Diameter across fruiting heads 40 mm, fruitlets 8–14 mm, at the top clinging mutually together and appearing as a pseudosyncarp, crowned by persistent calyx remnants. — Plate 8.

D i s t r i b u t i o n. Philippines (Luzon). Fig. 15a.

20. Neonauclea butonensis Ridsd., *spec. nov.*

Arbores parvae 3–4 m altae, ramunculis myrmecophylis. Gemmae terminales vegetativae ellipsoideae complanatae. Stipulae anguste ellipticae, 12–15 mm longae et 5–6 mm latae, glabrae. Folia late elliptica, 13–18 cm longa et 7–11 cm lata, coriacea, utrinque glabra, apice leviter acuta, basi obtusa, nervis lateralibus 7–9-paribus, petiolo glabro 5–15 mm longo. Capitula florifera terminalia

solitaria, axe florifero usque ad 2 cm longo. Capitula florifera subplana per anthesim super calyces 20 mm, super corollas 50–60 mm diametro. Flores 5-meri, receptaculo glabro; bracteolae interflorales deficientes. Hypanthia 1,5–2 mm longa, glabra; calycis pars persistens 2 mm longa, caulis pars libra 3–3,5 mm longa ceterum basi 1–1,2 mm connato circumscissile deciduo; pars apicalis conica ochracea, verticibus 2 mm longis. Corolla infundibularis, glabra. Stylus 12 mm exsertus. Capitula fructifera non vidi. — T y p u s: *Kjellberg 273* (BO, holo; L, iso).

Small tree, 3–4 m. Ultimate branchlets with myrmedomes. Terminal vegetative bud ellipsoidal, flattened. Stipules not persistent, narrowly elliptic, 12–15 × 5–6 mm, glabrous, slightly keeled. *Leaves* broadly elliptic, 13–18 × 7–11 cm, coriaceous, above and below glabrous, apex slightly acute, base obtuse, somewhat unequal, lateral nerves 7–9 pairs. Petiole 5–15 mm, glabrous. *Inflorescence* terminal, solitary, axis up to 2 cm. Mature flowering heads with diameter across calyces 20 mm, across corollas 50–60 mm. *Receptacle* glabrous, interfloral bracteoles absent. *Hypanthium* 1.5–2 mm, glabrous. *Calyx:* persistent part 2 mm, below with thickened lines of sclerenchyma, above finely densely pubescent, inside sericeous, shaft at the base mutually connate for 1–1.2 mm, detaching as a unit at the base, free part of shaft filamentous, 3–3.5 mm, slightly pubescent; upper apical portion conical, ochre to orange-brown, papillate, summit shortly conical, 2 mm, lower part more or less absent, with a few long hairs. *Corolla* infundibular, 12–14 mm, glabrous, lobes ovate, 1.5 mm long, outside pubescent-farinose; anthers 1.5 mm, included. *Style* exserted for 12 mm. Fruiting heads unknown. — Plate 8.

D i s t r i b u t i o n. Celebes (Buton).

21. Neonauclea bartlingii (DC.) Merr.

Nauclea bartlingii DC. (1830). — *Nauclea cumingiana* Vidal (1885). — *Nauclea vidalii* Elmer (1906). — *Nauclea ategii* Elmer (1913). — *Nauclea cordatula* Merr. (1913). — *Neonauclea auriculata* Quis. & Merr. (1928).
For full synonymy, see under the varieties.

KEY TO THE VARIETIES

1a. Stipules and nerves densely pubescent, apical portion of the calyx lobes usually, but not exclusively 1–1.5 mm long . . . . . **a.** var. **bartlingii**
b. Stipules and nerves glabrous, rarely with a few scattered hairs, apical portion of the calyx lobes usually, but not exclusively 1.5–3 mm . . . **b.** var. **cumingiana**

a. var. bartlingii.

Nauclea bartlingii DC., Prod. 4 (1830) 344. — *Sarcocephalus bartlingii* Miq., Fl. Ind. Bat. 2 (1856) 133. — *Bancalus bartlingii* O. Ktze, Rev. Gen. Pl. 1 (1891) 276. — *Neonauclea bartlingii* Merr., J. Wash. Acad. Sci. 5 (1915) 539. — T y p e: *Haenke s.n.* (L, photo), Philippines, Luzon, near Sorzogon.

Nauclea ategii Elmer, Leafl. Philipp. Bot. 5 (1913) 1877. — *Neonauclea ategii* Merr., J. Wash. Acad. Sci. 5 (1915) 539. — T y p e: *Elmer 13910* (BO, L).

Neonauclea auriculata Quis. & Merr., Philipp. J. Sci. 37 (1928) 205. — T y p e: *BS 49281 (Ramos & Edaño)* (BO).

Tree up to 12 m. Ultimate branchlets without myrmedomes. Terminal vegetative bud ellipsoidal, flattened. Stipules not persistent, elliptic, 12–25(–35) × 5–10(–15) mm, densely pubescent, not prominently keeled. *Leaves* (ovate-)elliptic, rarely lanceolate, (5–)10–20(–30) × (3–)5–10(–12) cm, coriaceous, above pubescent on midrib, below densely pubescent, particularly on the nerves, apex acute, base (sub)-cordate to truncate, sometimes slightly unequal, lateral nerves 6–10 pairs. Petiole up to 1 cm, pubescent. *Inflorescences* usually in triads, flowering axis up to 12 cm. Mature flowering heads with diameter across calyces 15–20 mm, across corollas 30–35(–40) mm. *Receptacle* glabrous, interfloral bracteoles absent. *Hypanthium* 0.5–1 mm, glabrous. *Calyx:* persistent part 0.7–1.3 mm, usually densely pubescent, shafts mutually connate at base for 0.8–1.3 mm, detaching in a ring, free part of shafts 1–2 mm, slightly hairy; upper apical portion 1–1.5(–2) mm, summit shortly conical, 0.7–1 mm, orange-brown, papillate, lower part 0.3–0.8 mm, pallidly hairy. *Corolla* infundibular to hypocrateriform, 6–11 mm, lobes 1–1.5 mm, glabrous. *Style* exserted for 6–12 mm. Diameter across fruiting heads 20–25 mm, fruitlets 5–7 mm long. — Plate 9.

Distribution. Philippines. Fig. 15c.

Notes. Merrill suggested that *'Neonauclea vidalii'* might only be a glabrous form of *'Neonauclea bartlingii'*. Generally the apical portion of the calyx lobes of the latter is small and shortly conical and those of *'Neonauclea cumingiana'* tend to be more elongate and have a tapering summit. Unfortunately there are one or two specimens with an overlap in these characters. I have observed both varieties growing in the wild on Mindoro and sterile material can easily be separated by degree of pubescence, the pubescent var. *bartlingii* being only encountered in open regrowth and disturbed riverine forest, the glabrous var. *cumingiana* only in closed forest. A greater number of collections with calyx lobes is required and I maintain the two entities at varietal rank.

b. var. **cumingiana** (Vidal) Ridsd., *comb. & stat. nov.*

Nauclea cumingiana Vidal, Phan. Cuming. Philipp. (1885) 176. — Lectotype: *Cuming 833* (L); syntypes: *Cuming 1522* (n.v.), *Vidal 365, 367* (L).

Nauclea vidalii Elmer, Leafl. Philipp. Bot. 1 (1906) 16. — *Neonauclea vidalii* (Elmer) Merr., J. Wash. Acad. Sci. 5 (1915) 542. — Type: *Elmer 6138* (BO).

Nauclea cordatula Merr., Philipp. J. Sci. 8 (1913) Bot. 40. — *Neonauclea cordatula* Merr., J. Wash. Acad. Sci. 5 (1915) 539. — Type: *FB 22239* (K, L).

Tree 8–10 m, dbh 40–60 cm. Bark coarse and deeply fissured. Ultimate branchlets without myrmedomes. Terminal vegetative bud ellipsoid, flattened. Stipules not persistent, elliptic to rhombic, 10–25(–40) × 5–10(–15) mm, glabrous or with a few scattered hairs at the base, not keeled. *Leaves* (ovate-)elliptic, rarely lanceolate, (5–)8–20(–28) × (2–)4–8(–13) cm, coriaceous, above and below glabrous, rarely with a few scattered hairs on the nerves, apex acute, base (sub)cordate to truncate, sometimes slightly unequal, lateral nerves 7–10 pairs. Petiole up to 1 cm, glabrous or slightly pubescent. *Inflorescence* terminal, flowering heads usually in triads, axis up to 10 cm. Mature flowering heads with diameter across calyces 15–20 mm, across

Fig. 17. *Neonauclea jagorii* Merr. a. Branchlet with immature flowering heads; b. flowering head and fruiting head (a *FB 30301*; b *FB 10635*).

corollas 30–35(–40) mm. *Receptacle* glabrous, interfloral bracteoles absent. *Hypanthium* 0.5–1 mm, glabrous. *Calyx:* persistent part 0.7–1.3 mm, sparsely to densely pubescent, particularly above, shafts mutually connate at the base for 0.8–1.3 mm, detaching circumscissile, free part of shafts 1–3 mm, slightly hairy; upper apical portion 1–3 mm, summit shortly conical, 0.7–1.5 mm, orange brown, papillate, lower part 0.3–1.2 mm, pallidly hairy. *Corolla* infundibular, 6–11 mm, glabrous, lobes ovate, 1–1.5 mm long, outside sometimes slightly farinose pubescent. *Style* exserted for 6–12 mm. Diameter across mature fruiting heads 20–25 mm, fruitlets 5–7 mm. — Plate 9.

Distribution. Philippines. Fig. 15b.

Note. The majority of the collections cited by Vidal, Rev. Vasc. Pl. Filip. (1886) 149, clearly represent the variety until present known as *'Neonauclea vidalii'* and not *'Neonauclea bartlingii'*.

22. Neonauclea jagorii Merr. – Fig. 17.

Nauclea jagorii Merr., Philipp. J. Sci. 4 (1909) Bot. 326. — *Neonauclea jagorii* Merr., J. Wash. Acad. Sci. 5 (1915) 540. — Type: *Jagor 987* (B, lost); neotype: *FB 31136 Fontanoza* (NY).

Trees or shrubs, rheophytic. Ultimate branchlets without myrmedomes. Terminal vegetative bud lingulate-oblong, flattened. Stipules not persistent, linear to oblong, (12–)15–35 × 3–7 mm, hirsute, particularly at base, slightly keeled. *Leaves* lanceolate, (5.5–)8–20 × 0.7–2.5 cm, coriaceous, above and below glabrous, apex acute, base cuneate, lateral nerves 9–15 pairs. Petiole 3–7 mm long, glabrous. *Inflorescence* terminal and solitary, axis up to 4.5 cm long. Mature flowering heads with diameter across calyces 15 mm, across corollas (30–)35–40 mm. *Receptacle* more or less glabrous, interfloral bracteoles absent. *Hypanthium* 1–1.5 mm, glabrous. *Calyx:* persistent part 1.2–1.5 mm long, outside glabrous with conspicuous cartilaginous streaks, shafts connate at the base for (0.2–)0.8–1.2 mm, detaching in a ring, free part of shaft c. 2 mm long, sparsely pubescent; upper apical portion obturbinate, ochre-orange, papillate, summit shortly conical, lower part poorly developed with pallid hairs. *Corolla* somewhat infundibular, 8–10 mm long, glabrous, lobes 1 mm, sometimes slightly pubescent; anthers 1.2 mm, included. *Style* exserted for 8–10 mm. Diameter across fruiting heads 20–25 mm, fruitlets 4–5 mm, crowned by calyx remnant. — Plate 9.

Distribution. Philippines (Luzon, Camarines Sur, Samar). Fig. 15c.

23. Neonauclea havilandii Koord. ex Ridsd., *spec. nov.*

[*Nauclea havilandii* Koord., Meded. 's Lands Plant. Buitenz. 13 (1898) 498, nom. nud. — *Neonauclea havilandii* Merr., J. Wash. Acad. Sci. 5 (1915) 540, nom. nud.]

Arbores usque ad 14 m altae, ramunculis myrmecophylis. Gemmae terminales vegetativae obovoideae vel lingulatae complanatae. Stipulae obovato-spathulatae vel lingulatae, 10–20(–25) mm longae et (4–)5–6 mm latae, glabrae. Folia (late) elliptica vel oblanceolata in eadem arbor variabilia (8–)20–30 cm longa et (4–)9–15 cm lata, coriacea, utrinque glabra, apice acuta, basi obtusa vel

attenuata, nervis lateralibus 6–10-paribus, petiolo crasso usque ad 5 cm longo. Capitula florifera praecipue terminalia solitaria vel 3–5(–9)-cephala, axe florifero usque ad 6 cm longo. Capitula florifera subplana per anthesim super calyces (7–)10–15 mm, super corollas (20–)25–30 mm diametro. Flores 5-meri, receptaculo sparsim hirsuto; bracteolae interflorales deficientes. Hypanthium glabrum 0,7 mm longum; calycis pars persistens 1–3 mm longa, utrinque pubescens, caule 1,5–2 mm longo; pars apicalis clavata vel turbinata, ochracea, verticibus breve conicis. Corolla infundibularis, 7–8 mm longa. Stylus 8–9 mm exsertus. Capitula fructifera (15–)20–25 mm diam., fructibus 5–7 mm longis. — T y p u s: *Koorders 18630* (BO, holo).

Tree up to 14 m, dbh. 15 cm. Ultimate branchlets with myrmedomes. Terminal vegetative bud obovoid to lingulate, flattened. Stipules not persistent, obovate-spathulate to lingulate, 10–20(–25) × (4–)5–6 mm, glabrous, not or only slightly keeled. *Leaves* (broadly) elliptic to oblanceolate, rather variable on different twigs from same tree, (8–)20–30 × (4–)9–15 cm, those below the flowering heads and above the myrmedomes usually smaller in range, 8–20 × 4–8 cm, coriaceous, above and below glabrous, apex acute, base obtuse to attenuate, lateral nerves 6–10 pairs. Petiole stout, 1–5 cm long, glabrous. *Inflorescence* mainly terminal, sometimes also from second node, flowering heads 1 or 3–5, rarely 7–9, axis up to 6 cm long. Mature flowering head with diameter across calyces (7–)10–15 mm, across corollas (20–)25–30 mm. *Receptacle* sparsely hairy, interfloral bracteoles absent. *Hypanthium* 0.7 mm, glabrous. *Calyx:* persistent part 1–3 mm, outside and inside densely pallidly pubescent, divided to the middle by the bases of the shafts, shaft 1.5–2 mm, pubescent, breaking about 0.5 mm above the base so that the persistent part of the calyx appears shaggy; upper apical portion 1–1.5 mm, clavate to turbinate, dirty orange to ochre coloured, summit shortly conical and papillate, lower part brownish hairy. *Corolla* glabrous, cream, infundibular, 7–8 mm long, lobes 1 mm long; anthers 1 mm, slightly protruding. *Style* exserted for 8–9 mm. Diameter across fruiting heads (15–)20–25 mm, fruitlets 5–7 mm long, slightly hairy at the top, crowned by calyx remnants, these rather strongly stellate. — Plate 9.

D i s t r i b u t i o n. Celebes. Fig. 18a.

24. Neonauclea pseudopeduncularis Ridsd., *spec. nov.*

Arbores usque ad 30 m altae. Gemmae terminales vegetativae complanatae. Stipulae obovatae, 15–25(–30) mm longae et 8–20 mm latae, glabrae. Folia obovata, (11–)13–24(–30) cm longa et (7–)9–16(–20) cm lata, coriacea utrinque glabra, apice obtusa, basi obtusa interdum leviter acuta vel inaequilatera, nervis lateralibus 7–15-paribus; petiolo usque ad 5 cm longo. Capitula florifera terminalia solitaria vel tricephala, axe florifero usque ad 8 cm longo. Capitula florifera subplana per anthesim super calyces (12–)15–20 mm diametro. Flores 5-meri, receptaculo sparsim hirsuto; bracteolae interflorales deficientes. Hypanthium glabrum c. 1 mm longum; calycis pars apicalis elongato-clavata 2,5 mm longa, verticibus breve conicis, ochraceis; pars inferior fusca. Corollam non vidi. Capitula fructifera 25 mm diam., fructibus 4–6 mm longis. — T y p u s: *de Vogel 6509* (L, holo).

Tree attaining 30 m, bole 15 m, dbh 45 cm. Outer bark grey-brown, not fissured or peeling, warty, inner bark yellowish mottled ochre, cream coloured near cambium. Sapwood ochre, heartwood dirty orange. Myrmedomes apparently absent from ultimate branchlets. Terminal vegetative bud flattened. Stipules not persistent, obovate, 15–25(–30) × 8–20 mm, glabrous, not keeled. *Leaves* obovate, (11–)13–

24(–30) × (7–)9–16(–20) cm, coriaceous, above and below glabrous, apex obtuse, base obtuse or rarely slightly acute, sometimes unequal, lateral nerves 7–15 pairs. Petiole up to 5 cm long. *Inflorescence* terminal, heads solitary or in triads, axis up to 8 cm long. Diameter of mature flowering heads across calyces (12–)15–20 mm, across corollas not known. *Receptacle* sparsely hairy, interfloral bracteoles absent. *Hypanthium* (immature) c. 1 mm, glabrous. *Calyx* shaft ill defined, c. 1 mm long, densely brown pubescent, probably breaking at the top; upper apical portion elongate-clavate, 2.5 mm long, upper part 1–1.3 mm, dark brown, sparsely pubescent, summit shortly conical, c. 0.2 mm, papillate, pallid to pale ochre tinged, lower part densely brown pubescent. *Corolla* not known. Diameter across mature fruiting heads 25 mm, fruitlets 4–6 mm, crowned by calyx remnants. — Plate 9.

Distribution. Celebes. Fig. 18b.

Note. This species is very similar to *Neonauclea havilandii* but differs in the large stipules, and apparent absence of myrmedomes on limited material known.

25. Neonauclea gigantea (Valeton) Merr.

Nauclea gigantea Valeton, Bot. Jahrb. 44 (1910) 549. — *Neonauclea gigantea* Merr., J. Wash. Acad. Sci. 5 (1915) 540. — Type: *Winkler 2533* (n.v.), *2924* (WRSL).

Nauclea cyrtopodioides Wernh. in Gibbs, J. Linn. Soc. Bot. 42 (1914) 87. — *Neonauclea cyrtopodioides* Merr., Enum. Born. (1921) 554. — Type: *Gibbs 2758* (BM).

Trees attaining 30 m, bole 18 m. Outer bark rough and deeply fissured, sometimes flaking; inner bark pink to reddish brown. Sapwood yellowish. Ultimate branchlets often with myrmedomes. Terminal vegetative bud ellipsoidal, flattened. Stipules elliptic, 30–40 × 12–15 mm, glabrous or pubescent, slightly keeled. *Leaves* broadly elliptic to orbicular, 20–38 × 12–26 cm, above glabrous, below glabrous to

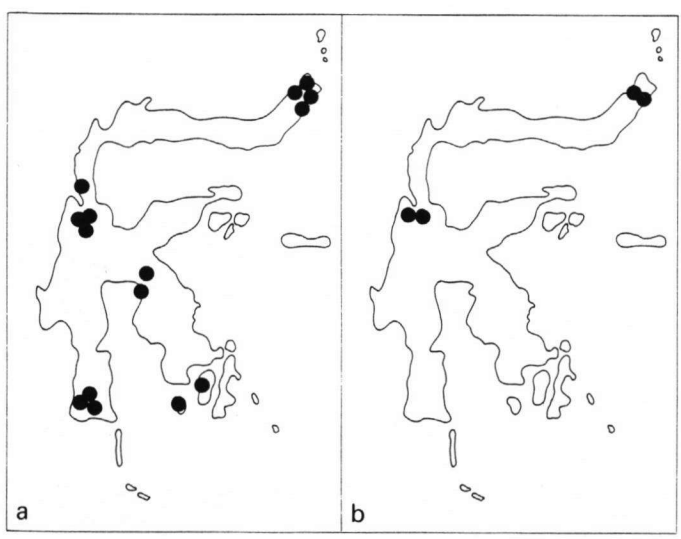


Fig. 18. Known localities of **a:** *Neonauclea havilandii* Koord. ex Ridsd.; **b:** *N. pseudopeduncularis* Ridsd.

pubescent, particularly on the nerves, apex acute, base obtuse to cordate, sometimes unequal, lateral nerves 9–14 pairs. Petiole up to 5 cm, glabrous or pubescent. *Inflorescence* terminal, flowering heads solitary or in triads, axis up to 15 cm. Mature flowering heads with diameter across calyces 25–35(–40) mm, across corollas (50–)55–65 mm. *Receptacle* very sparsely hairy, interfloral bracteoles absent. *Hypanthium* 1.5–2 mm, glabrous. *Calyx:* persistent part 2 mm, outside and inside densely pallidly pubescent, lower part mutually connate for 1.5–2 mm, breaking in a ring at the base, free part of shaft (2.5–)3–4 mm, mediumly to densely pubescent; upper apical portion 2.5–3.5 mm, summit 0.2–0.7 mm, short, conical, dirty brown to slightly ochre tinted, not papillate, lower part 2–3 mm, densely pallidly pubescent. *Corolla* infundibular, 13–15 mm, below glabrous, upper part and outside of lobes glabrous or slightly (farinose) pubescent; anthers 2 mm, included. *Style* exserted for 9–14 mm. Diameter across mature fruiting head 35–40 mm, fruitlets 9–14 mm long, crowned by calyx remnants. — Plate 9.

Distribution. Borneo (Kalimantan, Sabah, Sarawak). Fig. 14c.

26. Neonauclea angustifolia (Havil.) Merr.

Nauclea angustifolia Havil., J. Linn. Soc. Bot. 33 (1897) 55, t. 3, f. 1–7. — *Neonauclea angustifolia* Merr., J. Wash. Acad. Sci. 5 (1915) 539. — Type: *Haviland 2150* (K).

Rheophytic shrub up to 5 m, sometimes with branches spreading to 2 m. Ultimate branchlets without myrmedomes. Terminal vegetative bud lingulate. Stipules not persistent, lingulate-ovate, 12–20(–25) × 2–4 mm, slightly or not keeled, slightly pubescent, especially the keel and mid-line. *Leaves* narrowly elliptic, (4–)10–18(–22) × 0.5–2(–2.8) cm, those below the flowering heads often smaller, c. 4 × 0.5 cm, coriaceous, above and below glabrous, apex acute to long acuminate, base acute to cuneate, decurrent into petiole, lateral nerves 7–10 pairs. Petiole 0–1 cm. *Inflorescence* terminal, flowering heads solitary, axes up to 3 cm long. Mature flowering heads with diameter across calyces 10–12 mm, across corollas 20–25 mm. *Receptacle* glabrous, interfloral bracteoles absent. *Hypanthium* 0.5–1 mm, glabrous. *Calyx:* persistent part 1–1.25 mm, outside and inside sparsely pubescent on lobes which have thickened bands of sclerenchyma, shaft 2 mm, glabrous or with a few scattered hairs, breaking at base; upper apical portion obturbinate, 1–1.3 mm, pallid or brownish hairy, summit short, short hairy, not papillate, lower part not defined. *Corolla* infundibular, 6–7 mm long, tube glabrous, lobes ovate, 1–1.5 mm long, outside slightly pubescent; anthers 1 mm, slightly protruding. *Style* exserted for 5–6 mm. Diameter across fruiting heads 15–20 mm, fruitlets slightly accrescent at apex, 5 mm long, glabrous. — Plate 9.

Distribution. Borneo (Kalimantan, Sabah, Sarawak). Fig. 14b.

27. Neonauclea lanceolata (Blume) Merr.

Nauclea lanceolata Blume (1826). — *Nauclea affinis* Miq. (1856). — *Nauclea gracilis* Vidal (1885). — *Adina philippinensis* Vidal (1886). — *Nauclea tenuis* Havil. (1897). — *Neonauclea oligophlebia* Merr. (1917). — *Nauclea schlechteri* Valeton (1925).
For full synonymy, see under the subspecies.

KEY TO THE SUBSPECIES

1a. Interfloral bracteoles absent ..... **a.** subsp. **lanceolata**
b. Interfloral bracteoles present ..... **b.** subsp. **gracilis**

a. subsp. lanceolata.

[*Cephalanthus orientalis* auct. non L. (1753): Blume, Cat. Gewas. Buitenz. (1823) 38, nom. nud.] — *Nauclea lanceolata* Blume, Bijdr. (1826) 1009. — *Neonauclea lanceolata* Merr., J. Wash. Acad. Sci. 5 (1915) 504. — T y p e: *'Cephalanthus orientalis'* Blume (L sh. 908-219.275), Java, Salak, Sept. 1822.

Nauclea affinis Miq., Fl. Ind. Bat. 2 (1856) 137. — *Bancalus affinis* O. Ktze, Rev. Gen. Pl. 1 (1891) 276. — T y p e: *Horsfield s.n.* (n.v.), Java; *Zollinger s.n.* (n.v.), Java.

Tree attaining 30 m, bole straight, 15–25 m, dbh up to 75 cm. Bark grey, flaking in large pieces, underbark orange-brown, inner bark dirty white turning orange-brown. Ultimate branchlets without myrmedomes. Terminal vegetative bud ovoidal, flattened. Stipules not persistent, ovate, (3–)5–10(–20) × (2–)3–7(–10) mm, glabrous, sometimes slightly keeled. *Leaves* elliptic, (3.5–)6–10(–17) × (1.5–)2–4.5 (–6) cm, above and below glabrous, apex acute to caudate-acuminate, base acute to cuneate, sometimes unequal or decurrent; lateral nerves 4–7 pairs. Petiole up to 2 cm. *Inflorescence* terminal, solitary, axis up to 4 cm. Diameter of mature flowering heads across calyces 5–8 mm, across corollas 10–15(–20) mm.*Receptacle* hairy, interfloral bracteoles absent. *Hypanthium* 0.6–0.8 mm. *Calyx:* persistent part 0.3–0.5 mm, densely pallidly pubescent, shaft 1.2–1.5 mm; upper apical portion 0.5–0.7 mm, clavate to spathuloid, hairy; summit rounded, dark pubescent, lower part ill defined. *Corolla* broadly infundibular, 3.5–5 mm, tube glabrous at base, above densely hairy. Stamens 1 mm. *Style* exserted for 4–5 mm. Diameter across fruiting heads (7–)10–12(–15) mm, fruitlets 3–5 mm long. — Plate 9.

D i s t r i b u t i o n. Sumatra, Java, Lesser Sunda Islands. Fig. 19.

b. subsp. gracilis (Vidal) Ridsd., *stat. nov.*

Nauclea gracilis Vidal, Phan. Cuming. Philip. (1885) 176. — *Sarcocephalus gracilis* K.Schum. ex Havil., J. Linn. Soc. Bot. 33 (1897) 33, nom. prov. — *Bancalus gracilis* O. Ktze, Rev. Gen. Pl. 1 (1891) 277. — *Neonauclea gracilis* Merr., J. Wash. Acad. Sci. 5 (1915) 540. — T y p e: *Cuming 835* (K, L).

Adina philippinensis Vidal, Rev. Pl. Vasc. Filip. (1886) 148. — *Nauclea philippinensis* Havil., J. Linn. Soc. Bot. 33 (1897) 52. — *Neonauclea philippinensis* Merr., J. Wash. Acad. Sci. 5 (1915) 542. — T y p e: *Vidal 371* (K), San Matao.

Adina polycephala auct. non Benth. (1861): Vidal, Sinopsis Atlas (1883) 28, t. 56, f. 2.

Nauclea tenuis Havil., J. Linn. Soc. Bot. 33 (1897) 55. — *Neonauclea tenuis* Merr., J. Wash. Acad. Sci. 5 (1915) 542. — T y p e: *Forbes 535* (K, holo; BM, L).

Neonauclea oligophlebia Merr., Philipp. J. Sci. 12 (1917) Bot. 159. — T y p e: *Wenzel 1608* (BM).

Nauclea schlechteri Valeton, Bot. Jahrb. 60 (1925) 50. — *Neonauclea schlechteri* Merr. & Perry, J. Arnold Arbor. 25 (1944) 187. — T y p e s: *Ledermann 7475* (B, lost), *Schlechter 16925* (K).

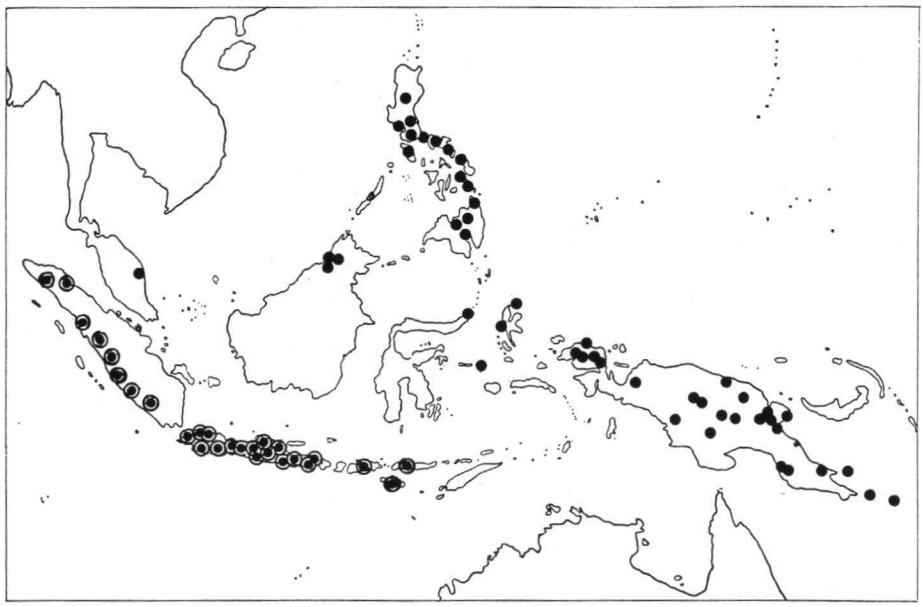


Fig. 19. Known localities of *Neonauclea lanceolata* (Blume) Merr. var. *lanceolata* (◉) and var. *gracilis* (Vidal) Ridsd. (●).

Tree attaining 25 m, frequently 12–19 m, crown large. Outer bark grey-brown, flaky with vertical cracking,underbark pink, inner bark pink to pinkish white; sapwood cream turning pink to orange-brown at heartwood. Ultimate branchlets without myrmedomes. Terminal vegetative bud ovoidal, flattened. Stipules not persistent, ovate, (3–)4–8(–10) × (1.5–)3–5(–7) mm, faintly keeled, minutely pubescent. *Leaves* (narrowly) elliptic, rarely obovate, (3–)7–12(–20) × (2–)4–7(–8) cm, above and below glabrous, apex caudate-acuminate, up to 2 cm long, base acute to attenuate; lateral nerves 4–7 pairs. Petiole up to 2 cm long. *Inflorescence* usually solitary, rarely in triads, axis up to 2 cm. Diameter of mature flowering heads across calyces (4–)6–9 mm, across corollas 10–15(–17) mm. *Receptacle* hairy, interfloral bracteoles present, conspicuous, numerous, cigar-shaped. Flowering parts as for subsp. *lanceolata.*

Distribution. Malay Peninsula (1 coll.), Borneo (rare), Moluccas, Celebes, Philippines, New Guinea. Fig. 19.

28. Neonauclea montana Ridsd., *spec. nov.*

Frutices vel arbores parvae usqua ad 4 m altae. Gemmae terminales vegetativae complanatae. Stipulae lingulatae, 12–18 mm longae et 4–6 mm latae, glabrae, carinatae. Folia obovata, (2–)4–6,5 cm longa et (1–)2–4 cm lata, coriacea, utrinque glabra, apice obtusa, basi acuta, nervis lateralibus 5–6-paribus, petiolo usque ad 1 cm longo. Capitula florifera terminalia solitaria, axe florifero usque ad 2 cm longo. Flores non vidi, receptaculo hirsuto, bracteolis interfloralibus conicis. Corol-

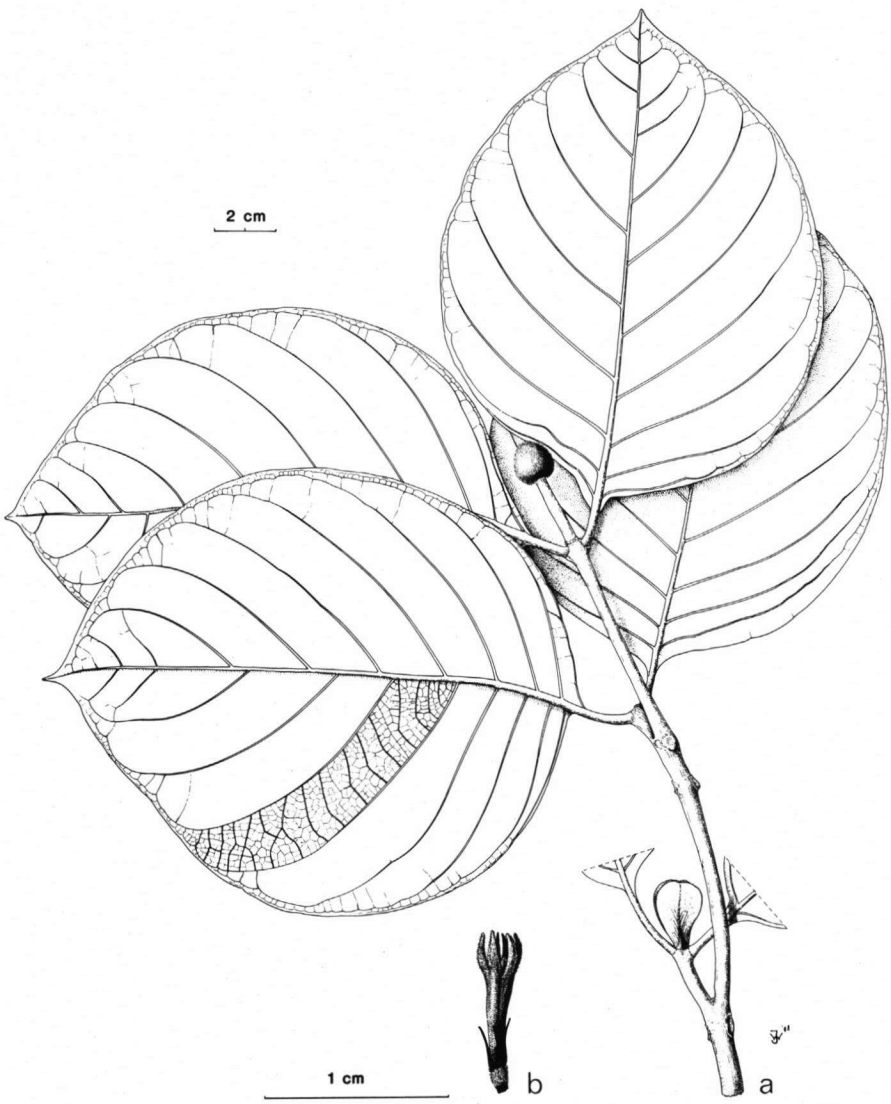


Fig. 20. *Neonauclea wenzelii* Merr. a. Habit; b. flower (a *PNH 14363*; b *Wenzel 348*).

larum et calycum tantum fragmenta cognita. Capitula fructifera 12–18 mm diametro, fructibus 3–4 mm longis. — T y p u s: *S 30432* (L).

Small shrubby tree up to 4 m. Ultimate branchlets without myrmedomes. Terminal vegetative bud flattened. Stipules not persistent, lingulate, 12–18 × 4–6 mm, glabrous, keeled. *Leaves* obovate, (2–)4–6.5 × (1–)2–4 cm, coriaceous, above and below glabrous, apex obtuse, base acute, lateral nerves 5–6 pairs. Petiole up to 1

cm long. *Inflorescence* terminal, solitary, axis up to 2 cm long. Young and mature flowering heads unknown. *Receptacle* hairy, interfloral bracteoles present, scattered, conical to cigar-shaped. *Hypanthium* unknown. *Calyx* (remnants on fruit): persistent part 0.5–0.8 mm, pubescent, shaft 1.5–2 mm with a few scattered hairs, breaking near the middle or in upper 1/3, upper apical portion 0.5–0.7 mm, turbinate, summit 0.2 mm, shortly conical, dirty brown, not conspicuously papillate, lower part ill defined, with pallid hairs. *Corolla* (only one fragment seen) hypocrateriform, 5.5 mm, glabrous, tube 3 mm, lobes not seen; anthers included. *Style* (broken) at least exserted for 4 mm. Diameter across mature fruiting heads 12–18 mm, fruitlets 3–4 mm, crowned by calyx remnants. — Plate 9.

Distribution. Borneo (Sarawak).

Ecology. Known only from 2 collections from 'mossy' forest on limestone (G. Api, Sarawak).

29. Neonauclea wenzelii Merr. – Fig. 20.

Nauclea wenzelii Merr., Philipp. J. Sci. 9 (1914) 386. — *Neonauclea wenzelii* Merr., J. Wash. Acad. Sci. 5 (1915) 542. — Type: *Wenzel 348* (BM).

Small tree up to 7 m, ultimate internodes of branchlets sometimes hollow and ant-infested. Terminal vegetative bud flattened. Stipules not persistent, obovate, 20–15 mm, narrowing to 5 mm at base, glabrous, not keeled. *Leaves* broadly elliptic, 13–23 × 8–16 cm, above glabrous, below with erect hairs on the nerves, apex bluntly acute, base rounded, slightly attenuate, lateral nerves 7–8 pairs. Petiole 1.5–2 cm. *Inflorescence* solitary, axis up to 4 cm. Mature flowering heads with diameter across calyces 15 mm, across corollas 30–35 mm. *Receptacle* hairy, interfloral bracteoles present, elongate. Flowers 6-merous. *Hypanthium* 1–1.3 mm, pubescent. *Calyx:* persistent part 1 mm, glabrous, shaft 2.5–3 mm, broadened at base, glabrous, upper apical portion 2.5–3 mm, minutely brown pubescent with sparse pallid hairs, particularly at the base, summit conical, lower part ill defined. *Corolla* 6-merous, 10–11 mm, tube 8 mm, glabrous, lobes 2–3 mm, outside densely hairy; anthers 1.5 mm long, slightly protruding. *Style* exserted for 10 mm. Diameter across mature fruiting heads c. 30 mm, fruitlets 6 mm long, capped with pubescent calyx remnants. — Plate 10.

Distribution. Philippines (Leyte, Samar). Fig. 21a.

30. Neonauclea kentii Merr.

Nauclea kentii Merr., Philipp. J. Sci. 8 (1913) Bot. 43. — *Neonauclea kentii* Merr., J. Wash. Acad. Sci. 5 (1915) 540. — Type: *BS 15440* (L).

Nauclea mindanaensis Merr., Philipp. J. Sci. 8 (1913) Bot. 44. — *Neonauclea mindanaensis* Merr., J. Wash. Acad. Sci. 5 (1915) 541. — Type: *Copeland 1630* (n.v.).

Neonauclea media auct. non (Havil.) Merr.: Seeber, Weidelt & Banaag, Dendr. Charact. Imp. For. Tr. E. Mindanao (1979) 360, f. 218.

Tree attaining 15 m or more, dbh 30 cm (to 70 cm), trunk often fluted. Bark smooth, ochre-grey, inner bark red, stringy, sapwood yellowish darkening on expo-

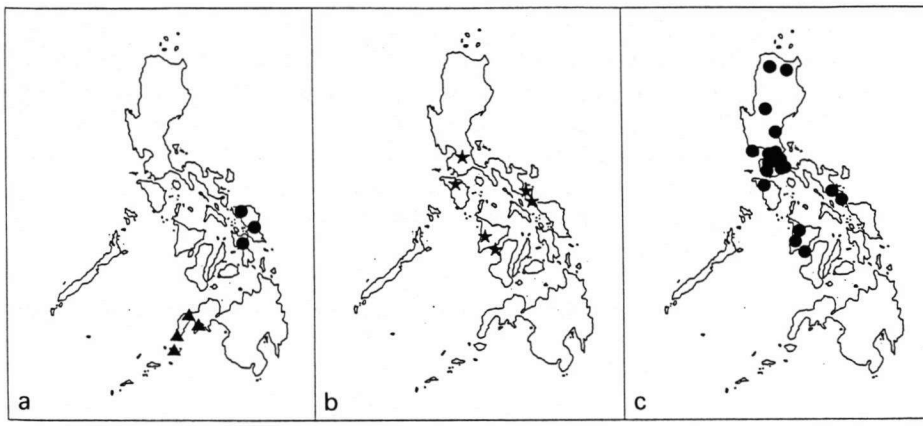


Fig. 21. Known localities of **a:** *Neonauclea wenzelii* Merr. (●); *N. kentii* Merr. (▲); **b:** *N. puberula* Merr. (★); **c:** *N. media* (Havil.) Merr. (●).

sure. Myrmedomes present vide Merrill but these not seen. Terminal vegetative bud ellipsoidal, flattened. Stipules lanceolate, 20–30 × 4–6 mm, glabrous, semi-persistent for at least 2 nodes. *Leaves* elliptic to obovate, (10–)18–28(–35) × (4–)7–12 (–15) cm, above and below glabrous, apex acuminate, base obtuse to subcordate for 0.7–2 mm, sometimes slightly unequal, lateral nerves 7–10(–14) pairs. Petiole up to 2 cm long. *Inflorescences* terminal, usually solitary, axis up to 6 cm. Diameter of mature flowering heads across calyces 20–25 mm, across corollas 50–60 mm. Receptacle glabrous, interfloral bracteoles absent. *Hypanthium* 1.5 mm, glabrous. *Calyx:* persistent part 1.3–1.5 mm, outside and inside pubescent, shafts mutually connate for 1–1.5 mm, usually detaching in a ring, free part of shafts 3–4 mm with a few scattered hairs; upper apical portion obtrigonal, 1.5–2 mm, summit pyramidal, pallid brown hairy, lower part densely pallidly hairy. *Corolla* hypocrateriform, 12 mm, tube 7–9 mm, lobes ovate, 1–1.5 mm long, outside faintly pubescent, rarely glabrous; anthers 1 mm, included. *Style* exserted for 9–12 mm. Diameter across mature fruiting heads 25–30 mm, fruitlets 9–12 mm long, glabrous. — Plate 10.

Distribution. Philippines (Basilan; Mindanao, Zamboanga, also E Mindanao, vide Seeber c.s., without locality). Fig. 21a.

31. Neonauclea puberula Merr.

Nauclea forsteri auct. non Seem.: Havil., J. Linn. Soc. Bot. 33 (1897) 56, p.p. — *Neonauclea forsteri* auct. non (Seem.) Merr.: Merr., Enum. Philipp. 3 (1923) 512.

Nauclea puberula Merr., Philipp. J. Sci. 8 (1913) Bot. 41. — *Neonauclea puberula* Merr., J. Wash. Acad. Sci. 5 (1915) 542. — Type: *Elmer 7319* (BO, iso).

Tree. Ultimate branchlets without myrmedomes. Terminal vegetative bud ellipsoidal to obovoidal, flattened. Stipules not persistent, elliptic to obovate, 10–20 ×

5–10 mm, keeled, with scattered hairs. *Leaves* elliptic to obovate, (8–)10–23 × (4–)7–11 cm, those below the flowering heads smaller, 5–8 × 2–4 cm, chartaceous, above glabrous, below slightly pubescent to glabrous, apex obtuse, sometimes slightly acute, base cuneate; lateral nerves 6–10 pairs. Petiole 1–3 cm long. *Inflorescence* terminal, flowering heads 1 to 3, axis up to 5 cm long. Mature flowering heads with diameter across calyces 15–20 mm, across corollas 30 mm. *Receptacle* hairy, interfloral bracteoles absent. *Hypanthium* 1.5 mm long, slightly hairy. *Calyx:* persistent part 1.5 mm, densely pallidly hairy, shaft ill defined breaking at the base; upper apical portion (including ill defined shaft) 4–4.5 mm, summit short conical, 0.7–1 mm, short brown hairy, lower part densely pallidly hairy. *Corolla* infundibular, 7–8 mm long, glabrous. *Style* exserted for 4 mm. Fruiting heads not seen. — Plate 10.

Distribution. Philippines (Luzon, Mindoro, Panay, Guimaras I., ?Mindanao). The record from Mindanao is tentatively based on *Ahern 3624* with no further locality. Fig. 21b.

32. Neonauclea media (Havil.) Merr.

Nauclea media Havil., J. Linn. Soc. Bot. 33 (1897) 56. — *Neonauclea media* Merr., J. Wash. Acad. Sci. 5 (1915) 541. — Type: *Calléry s.n.* (P).

Tree up to 15 m. Ultimate branchlets without myrmedomes. Terminal vegetative bud spathulate, flattened. Stipules not persistent, spathulate, 12–18 × 5–10 mm, glabrous, not keeled. *Leaves* elliptic to obovate, 15–30(–35) × 8–14(–18) cm, those below the flowering heads sometimes smaller, 8–12 × 3.5–6 cm, coriaceous, above and below glabrous, apex acute to acuminate, base acute to cuneate, sometimes slightly decurrent, lateral nerves 8–12 pairs. Petiole (0.5–)2–4 cm, glabrous. *Inflorescence* terminal, solitary, axis up to 5 cm. Mature flowering heads with diameter across the calyces 20–25 mm, across the corollas 30–40 mm. *Receptacle* hairy, interfloral bracteoles absent. *Hypanthium* 1.2–1.5 mm, glabrous or with a few scattered hairs below. *Calyx:* persistent part 2.2–2.5 mm, divided to the base, outside and inside finely pubescent, shaft (1–)1.5–3 mm, broad below and grading into apical portion, sometimes ill defined in young flowering heads, upper apical portion long and tapering, 4.5–6 mm, pallid, summit 2.5–4 mm, finely hairy with short stiff hairs, lower part 1.5–2 mm, pallidly long hairy. *Corolla* infundibular, 8–12 mm long, glabrous, lobes ovate, 2 mm long, outside glabrous; anthers 1.5–2 mm. *Style* exserted for 10–15 mm. Diameter across mature fruiting head 25–35 mm, fruitlets 6–8 mm long, crowned by calyx remnants and base of shafts. — Plate 10.

Distribution. Philippines (Luzon, Mindoro, Panay, Guimaras I.). Fig. 21c.

33. Neonauclea sericea Ridsd., *spec. nov.*

Arbores usque ad 35 m altae. Gemmae terminales vegetativae conicae. Stipulae involutae, (4–)6–12(–15) mm longae et 1–3 mm latae, dense pubescentes vel sericeae. Folia (late) elliptica, (5–)9–15(–18) cm longa et (2–)3–6(–9) cm lata, utrinque glabra, apice acuta, basi acuta vel obtusa,

nervis lateralibus 7–9-paribus, petiolo usque ad 2 cm longo. Capitula florifera terminalia solitaria vel tricephala, axe florifero usque ad 3 cm longo. Flores non vidi, receptaculo hirsuto; bracteolae interflorales deficientes. Hypanthium 0,7 mm longum, glabrum vel sparse pilosum. Calycis pars persistens 1 mm longa, extus dense pubescens, caule 1–1,5 mm longo leviter pubescenti; pars apicalis clavata vel turbinata, verticibus breve conicis pallidis, papillosis. Corollam non vidi. Capitula fructifera 10–15 mm diam., fructibus 2–3 mm longis. — T y p u s: *bb 33808* (L).

Tree up to 35 m high, dbh 65 cm. Ultimate branchlets without myrmedomes. Terminal vegetative bud conical. Stipules not persistent, involute, (4–)6–12(–15) × 1–3 mm, densely pubescent to sericeous. *Leaves* (broadly) elliptic, (5–)9–15(–18) × (2–)3–6(–9) cm, above and below glabrous, apex acute, base acute to obtuse, lateral nerves 7–9 pairs. Petiole up to 2 cm long, sometimes hairy or sericeous at the base. *Inflorescence* terminal, flowering heads solitary or in triads, axis up to 3 cm long. Diameter of mature flowering heads across calyces and corollas unknown. *Receptacle* hairy, interfloral bracteoles absent. *Hypanthium* 0.7 mm, glabrous or with a few scattered hairs. *Calyx:* persistent part 1 mm, outside densely pubescent, shaft 1–1.5 mm, sparsely pubescent, breaking near the base; upper apical portion clavate to turbinate, pallidly hairy, summit shortly conical, pallidly papillose. *Corolla* unknown. Diameter across fruiting heads 10–15 mm, fruitlets 2–3 mm long, crowned by calyx remnants. — Plate 11.

D i s t r i b u t i o n. Moluccas (Morotai, Halmahera). Fig. 22.

34. Neonauclea hagenii (Laut. & K. Schum.) Merr.

Nauclea hagenii Laut. & K. Schum. (1900). — *Nauclea papuana* Valeton (1911) — *Nauclea dahlii* Valeton (1925).
For full synonymy, see under the subspecies.

KEY TO THE SUBSPECIES

1a. Corolla glabrous. . . . . **a.** subsp. **hagenii**
b. Corolla pubescent . . . . . **b.** subsp. **papuana**

a. subsp. hagenii.

Nauclea hagenii Laut. & K. Schum., Fl. Schutzgeb. (1900) 557. — *Neonauclea hagenii* Merr., J. Wash. Acad. Sci. 5 (1915) 540. — T y p e: *Lauterbach 2175* (K).
Nauclea dahlii Valeton, Bot. Jahrb. 60 (1925) 51. — *Neonauclea dahlii* Merr. & Perry, J. Arnold Arbor. 25 (1944) 188. — T y p e: *Dahl 9* (B, lost). — Note: there seems to be an error in the locality of the type collection indicated by Valeton as New Ireland. Dahl is not known to have collected there and neighbouring numbers were collected in New Britain.

Tree up to 30 m, usually 10–20 m, bole up to 12 m, rarely shallowly buttressed. Outer bark greyish brown, usually fissured, sometimes flaky, often with vertical lines of raised lenticels, underbark creamy pink to yellowish brown, fibrous. Wood cream to straw. Ultimate branchlets without myrmedomes. Terminal vegetative bud conical. Stipules not persistent, involute, (6–)10–16(–20) × 2–4 mm, minutely finely pubescent, rarely with a few minute scattered hairs. *Leaves* (broadly) elliptic,

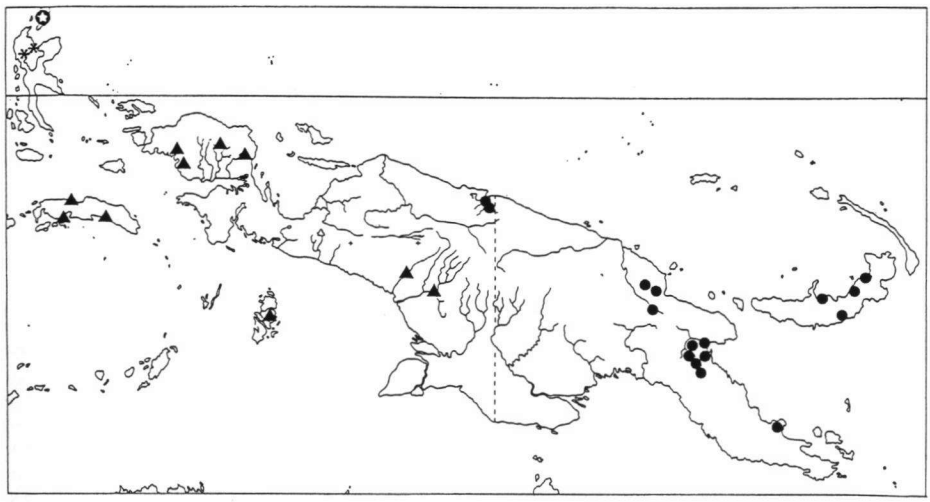


Fig. 22. Known localities of *Neonauclea sericea* Ridsd. (✱); *N. hagenii* (Laut. & K.Schum.) Merr. subsp. *hagenii* (●) and subsp. *papuana* (Valeton) Ridsd. (▲); *N. morotaiensis* Ridsd. (✪).

(8–)12–18(–23) × (3–)5–9(–12) cm, coriaceous, above and below glabrous, apex and base acute, lateral nerves 6–10 pairs. Petiole up to 2 cm, usually minutely pubescent. *Inflorescence* terminal, flowering heads solitary, less frequently in triads, axis up to 5 cm. Mature flowering heads with diameter across calyces (15–)20–25 mm, across corollas (30–)35–45 mm. *Receptacle* hairy, interfloral bracteoles absent. *Hypanthium* 1.5–2 mm, glabrous. *Calyx:* persistent part 1–1.5 mm, densely pallidly pubescent, shaft 1.2–2 mm, pubescent, breaking at the middle or the top, upper apical portion somewhat trigonal to turbinate, 2.5–4 mm, pallidly pubescent, summit conical, 1–1.25 mm, ochre-brownish, somewhat papillate, often recurved. *Corolla* infundibular, 9–12 mm, glabrous, lobes oblong, (1.5–)2–2.5 mm, glabrous; anthers 1.5 mm, slightly protruding from the throat. *Style* exserted for 10–15 (–20) mm. Diameter across mature fruiting heads (20–)25–30 mm, fruitlets c. 10 mm long. — Plate 11.

Distribution. New Guinea. Fig. 22.

b. subsp. **papuana** (Valeton) Ridsd.

Nauclea papuana Valeton, Nova Guinea 8 (1911) 449. — *Neonauclea papuana* Merr. & Perry, J. Arnold Arbor. 25 (1944) 187. — *Neonauclea hagenii* subsp. *papuana* Ridsd., Gard. Bull. Sing. 25 (1970) 270, f. 9e. — Types: *Versteeg 1032* (BO, lecto), *Branderhorst 438* (BO).

Tree up to 30 m, dbh 45 cm. Outer bark brown, with a few fissures, flaking, underbark pink, inner bark brown. Wood yellow-brown. Ultimate branchlets without myrmedomes. Terminal vegetative bud conical. Stipules not persistent, involute, 10–15(–20) × 2–3(–5) mm, glabrous. *Leaves* elliptic, (8–)13–21 × (3–)5–9 cm,

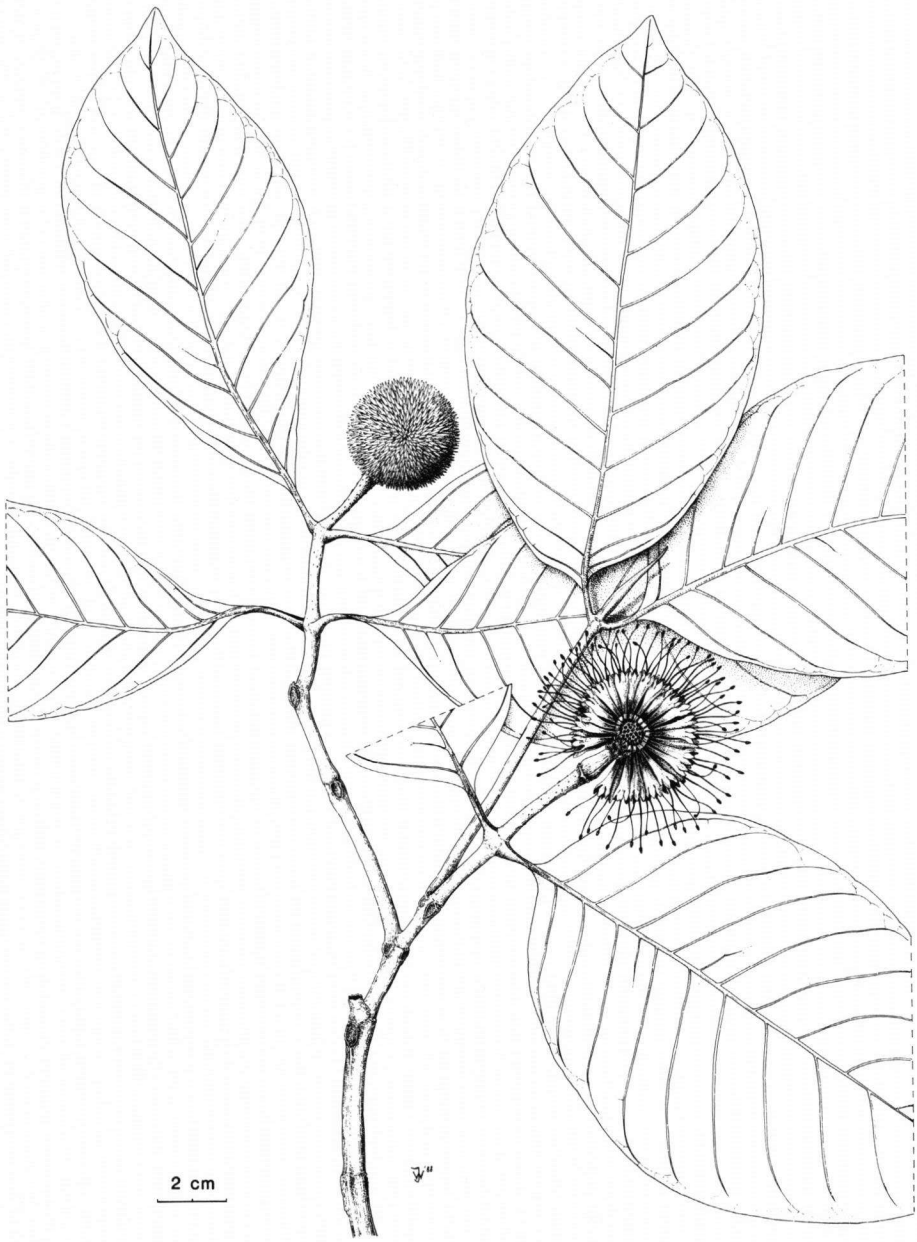


Fig. 23. *Neonauclea morotaiensis* Ridsd. Flowering branchlet (*Kostermans 1350*).

coriaceous, above and below glabrous, apex acute, base acute or obtuse, lateral nerves 7–10 pairs. Petiole up to 2.5 cm long, pubescent. *Inflorescence* terminal, flowering heads solitary or in triads. Mature flowering heads with diameter across calyces 15–20 mm, across corollas 20–25 mm. *Receptacle* pubescent, interfloral bracteoles absent. *Hypanthium* 1 mm, glabrous. *Calyx:* persistent part 1–1.5 mm, outside and inside densely pallidly pubescent, shaft 1.5–2.5 mm, usually breaking at the base, upper part 2.5–3.5 mm, clavate, summit conical, brownish, sometimes recurved. *Corolla* infundibular, 7–9 mm, outside finely pubescent-farinose in upper third, lobes 1–2 mm long, outside pubescent-farinose; anthers 1.5 mm long, top protruding from throat. *Style* exserted for 10–14 mm. Diameter across mature fruiting heads 20–25 mm, fruitlets 6 mm long, crowned by calyx remnants.

Distribution. Moluccas (Ceram), Aru Islands, New Guinea. Fig. 22.

35. Neonauclea morotaiensis Ridsd., *spec. nov.* – Fig. 23.

Arbores usque ad 18 m altae. Gemmae terminales vegetativae conicae. Stipulae involutae, 15–27 mm longae et 2–3 mm latae, glabrae. Folia elliptica, 15–22 cm longa et 7–12 cm lata, coriacea, utrinque glabra, apice acuta, basi acuta vel obtusa, nervis lateralibus (8–)9–13-paribus, petiolo 1–2 cm longo. Capitula florifera terminalia solitaria, axe florifero usque ad 4 cm longo. Capitula florifera subplana per anthesim super calyces 30–35 mm, super corollas 35 mm diametro. Flores 5-meri, receptaculo hirsuto; bracteolae interflorales deficientes. Hypanthium glabrum 1,5 mm longum; calycis pars persistens 2 mm longa utrinque pubescens, caule 3 mm longo; pars apicalis peranguste conica, 7–9 mm longa, verticibus indistinctis. Corolla infundibularis 10 mm longa, lobis extus pubescentibus. Stylus 8–10 mm exsertus. Capitula fructifera non vidi. — Typus: *Kostermans 1350* (L).

Tree up to 18 m, dbh 35 cm. Bark grey. Ultimate branchlets without myrmedomes. Terminal vegetative bud conical. Stipules not persistent, involute, 15–27 × 2–3 mm, glabrous. *Leaves* elliptic, 15–22 × 7–12 cm, coriaceous, above and below glabrous, apex acute, base acute to obtuse, lateral nerves (8–)9–13 pairs. Petiole 1–2 cm, glabrous. *Inflorescence* terminal, solitary, axis up to 4 cm. Mature flowering heads with diameter across calyces 30–35 mm, across corollas 35 mm. *Receptacle* hairy, interfloral bracteoles absent. *Hypanthium* 1.5 mm, glabrous. *Calyx:* persistent part 2 mm, outside and inside finely pallidly pubescent, shaft 3 mm long, breaking at the base; upper apical portion narrowly conical, 7–9 mm long, pallidly pubescent, gradually narrowing into an ill defined summit. *Corolla* 10 mm long, infundibular, lobes 2 mm long, upper third of tube and lobes outside sparsely pubescent; anthers 1 mm included. *Style* exserted for 8–10 mm. Fruiting stage unknown. — Plate 11.

Distribution. Moluccas (Morotai). Fig. 22.

36. Neonauclea acuminata Ridsd.

Neonauclea acuminata Ridsd., Gard. Bull. Sing. 25 (1970) 279. — Type: *NGF 24952* (K, holo; L).

Tree up to 35 m, dbh 70 cm. Bark grey-brown, often deeply longitudinally fissured, finely flaky to scaly, rarely pustular; underbark greenish brown; inner bark

salmon to red-brown, sometimes pallid near cambium. Ultimate branchlets without myrmedomes. Terminal vegetative bud conical. Stipules not persistent, involute, often very variable in size on the same plant, 12–28 × 3–6 mm, glabrous. *Leaves* (broadly) elliptic, rarely obovate or somewhat orbicular, (10–)20–36 × (5–)12–18 (–22) cm, above and below glabrous, apex acute, base acute to obtuse, lateral nerves 10–14 pairs. Petiole stout, up to 4 cm long, glabrous. *Inflorescence* terminal, flowering heads solitary or in triads. Mature flowering heads with diameter across calyces 25–30 mm, across corollas (35–)40–55 mm. *Receptacle* hairy, interfloral bracteoles absent. *Hypanthium* 1–2 mm, glabrous. *Calyx:* persistent part (1.5–)2–3 mm, outside and inside densely pubescent, shaft 2–3 mm, densely pubescent, breaking at the base, rarely spasmodically at middle or top; apical upper portion (1.5–)3–5 mm, clavate to trigonal, pallid to pale brown pubescent, summit shortly pyramidal to slightly conical, brown to blackish, shortly hairy. *Corolla* infundibular, 11–14 mm, outside and inside glabrous, lobes narrowly elongate, 2.5–3 mm long, apiculate-glandular; anthers 1.5–2 mm long, slightly protruding from the throat. *Styles* exserted for 8–10 mm. Diameter across mature fruiting heads 8–12 mm, crowned by calyx remnants. — Plate 11.

Distribution. New Guinea. Fig. 24.

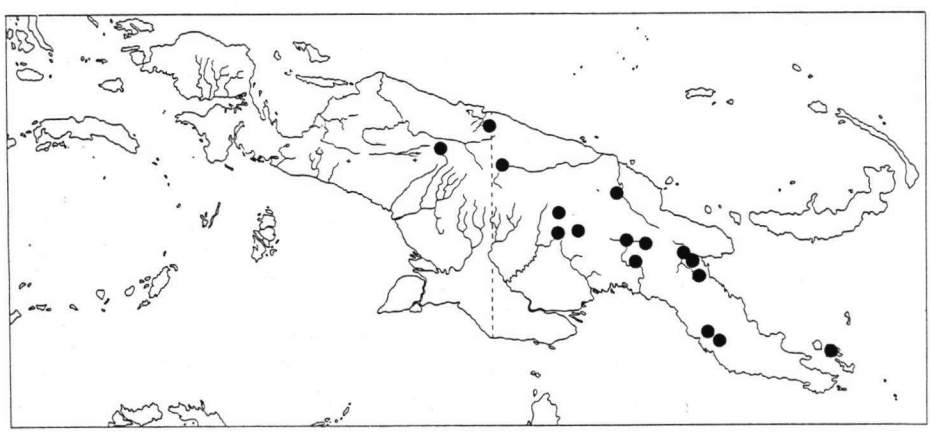


Fig. 24. Known localities of *Neonauclea acuminata* Ridsd.

37. Neonauclea rupestris Bakh. f. & Ridsd., *spec. nov.*

Arbores ramunculis myrmecophylis. Gemmae terminales vegetativae ellipsoideae, complanatae. Stipulae late ellipticae c. 20 mm longae et 15 mm latae carinatae, glabrae. Folia late elliptica (ad obovata), 12–23 cm longa et 8–15 cm lata subsessilia, coriacea utrinque glabra, apice rotundata vel leviter acuta, basi truncata vel subcordata, nervis lateralibus 8–10-paribus. Capitula florifera terminalia solitaria, axe florifero 5–12 cm longo. Flores non vidi, receptaculo sparsim hirsuto; bracteolae interflorales deficientes. Hypanthium glabrum 2 mm longum; calycis pars persistens 2 mm longa;

partem apicalem non vidi. Capitula fructifera 30 mm diam., fructibus 8–10 mm longis. — Typus: *Teijsmann 12245* (BO).

Tree, ultimate branchlets with myrmedomes. Terminal vegetative bud flattened, ellipsoidal. Stipules not persistent, broadly elliptic, c. 20 × 15 mm, keeled, glabrous. *Leaves* broadly elliptic(-obovate), 12–23 × 8–15 cm, those below the flowering heads often smaller, coriaceous, above and below glabrous, drying greenish above, apex rounded to slightly acute, base truncate to subcordate, lateral nerves 8–10 pairs. Petiole more or less absent, glabrous. *Inflorescence* terminal, flowering heads usually solitary, axis 5–12 cm long. Mature flowering heads not known. *Receptacle* sparsely hairy, interfloral bracteoles absent. *Hypanthium* 2 mm, glabrous. *Calyx:* persistent part 2 mm, densely pubescent, shaft breaking at the base, shaft and upper apical portion unknown. *Corolla* unknown. Diameter across fruiting heads 30 mm, fruitlets 8–10 mm long.

Distribution. SW Celebes. Fig. 25.

Ecology. Apparently restricted to limestone rocks in the Maros-Pangkadjene area. Not recollected since Teijsmann in 1877.

38. Neonauclea cyclophylla (Miq.) Merr.

Nauclea cyclophylla Miq., Ann. Bot. Mus. Lugd.-Bat. 4 (1869) 181. — *Neonauclea cyclophylla* Merr., J. Wash. Acad. Sci. 5 (1915) 539. — Type: *de Vriese s.n.* (L sh. 908-219.821 & 909-286.52), Batjan Archipelago.

Tree up to 13 m. Ultimate branchlets thought to be without myrmedomes. Terminal vegetative bud obovoidal, flattened. Stipules not persistent, obovoid, 30 × 18–20 mm, glabrous, slightly keeled. *Leaves* broadly elliptic to orbicular, 35–50 × 25–35

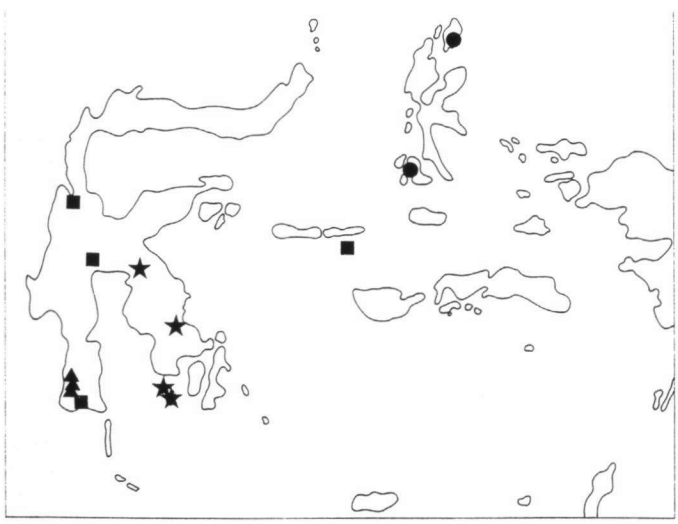


Fig. 25. Known localities of *Neonauclea rupestris* Bakh.f. & Ridsd. (▲); *N. cyclophylla* (Miq.) Merr. (●); *N. unicapitulifera* Ridsd. (★); *N. intercontinentalis* Bakh.f. & Ridsd. (■).

cm, those subtending the inflorescence sometimes smaller, 20–25 × 13–20 cm, coriaceous, above glabrous, below glabrous to finely pubescent, apex and base rounded, lateral nerves 7–10 pairs. Petiole stout, 2.5–6 cm long. *Inflorescence* terminal, solitary, axis up to 12 cm long. Mature flowering heads with diameter across calyces (25–)30–50 mm, across corollas 40 mm or more. *Receptacle* hairy, interfloral bracteoles absent. *Hypanthium* 2 mm, glabrous but with a few hairs at the base. *Calyx:* persistent part (2–)3–4 mm, outside and inside densely pubescent, shaft 2–3 mm, pubescent, breaking at the base, upper apical portion 5–7 mm, densely long pallidly pubescent, usually gradually tapering into an apiculate summit. *Corolla* 9–13 mm, hypocrateriform, tube 4–6 mm, glabrous, lobes ovate, 2 mm, outside glabrous or sparsely pubescent; anthers 2 mm, included. *Style* exserted for 12 mm. Diameter across mature fruiting heads 50 mm, fruitlets 12–15 mm long, glabrous, surmounted by calyx remnants. — Plate 12.

Distribution. Moluccas (Morotai, ?Halmahera, Batjan). Fig. 25.

39. Neonauclea celebica (Havil.) Merr.

Nauclea celebica Havil., J. Linn. Soc. Bot. 33 (1897) 54. — *Neonauclea celebica* Merr., J. Wash. Acad. Sci. 5 (1915) 539. — Type: *Riedel s.n.* (BO).

Tree up to 40 m, bole 10–20 m, dbh 40–45 cm, sometimes buttressed. Bark grey-brown, fissured, strongly peeling; inner bark yellowish turning dirty brown. Sapwood ochre, heartwood orange-yellow. Ultimate branchlets with myrmedomes. Stipules not persistent, narrowly obovate-oblong to lingulate, (7–)10–15(–17) × (2–)3–6 mm, slightly keeled, glabrous. *Leaves* elliptic to oblanceolate, (8–)12–20 (–28) × (2.5–)4–7 cm, chartaceous to coriaceous, above and below glabrous, apex and base acute, base sometimes slightly attenuate, lateral nerves 6–10 pairs. Petiole up to 2 cm long, glabrous. *Inflorescence* terminal, flowering heads solitary, in triads or fives, axis 3–6(–9) cm. Mature flowering heads with diameter across calyces c. 10 mm, across corollas 20–25 mm. *Receptacle* sparsely hairy, interfloral bracteoles absent. *Hypanthium* 0.7–1 mm, glabrous or with a few scattered hairs. *Calyx:* persistent part 0.7–1 mm, outside and inside finely densely pubescent, shaft 1–2.5 mm, sparsely pubescent, breaking at the base; upper apical portion 1–2 mm, turbinate to clavate, pallid coloured, summit shortly conical, dark brown, lower part pallidly hairy. *Corolla* hypocrateriform, 6–7 mm, tube 4 mm, lobes 1–2 mm long, glabrous; anthers 1 mm, slightly protruding. *Style* exserted for 6 mm. Diameter across fruiting heads (12–)15–20(–30) mm, fruitlets (4–)7–10 mm long, crowned by calyx remnants. — Plate 12.

Distribution. Celebes, ?Sula Is. (sterile collection). Fig. 26.

Note. *Koorders 18641* mentions that it nearly always occurs in stony river beds, suggesting a facultative rheophytic habit. No other collectors have noted this.

40. Neonauclea glandulifera Ridsd., *spec. nov.*

Arbores usque ad 20 m altae. Gemmae terminales vegetativae complanatae. Stipulae obovatae, 8–10(–20) mm longae et 4–6(–10) mm latae, glabrae, leviter carinatae. Folia obovata vel elliptica,

(6–)15–20 cm longa et (4–)9–12(–14) cm lata, coriacea, utrinque glabra apice acuta, basi acuta vel coriacea, nervis lateralibus 7–11-paribus, petiolo usque ad 3 cm longo. Capitula florifera subplana per anthesim super calyces 15 mm diametro. Flores non vidi, receptaculo hirsuto, bracteolae interflorales deficientes. Hypanthium glabrum; calycis pars persistens brevis, caule 1,5 mm longo; pars apicalis clavata 2–2,5 mm longa, pallido-hirsuta, verticibus brevis. Capitula fructifera 15 mm diam., fructibus 4–5 mm longis. — T y p u s: *Pleyte 274* (L).

Tree up to 20 m. Outer bark dark grey, scaly. Myrmedomes possibly present on ultimate branchlets. Terminal vegetative bud flattened. Stipules not persistent, obovate, 8–10(–20) × 4–6(–10) mm, glabrous, slightly keeled. *Leaves* obovate to elliptic, (6–)15–20 × (4–) 9–12(–14) cm, coriaceous, above and below glabrous, apex acute, base acute to cuneate, lateral nerves 7–11 pairs. Petiole up to 3 cm. *Inflorescence* terminal, flowering heads solitary or in triads, axis up to 6 cm. Mature flowering heads with diameter across calyces 15 mm, across corollas unknown. *Receptacle* hairy, interfloral bracteoles absent. *Hypanthium* 0.7 mm, glabrous. *Calyx:* persistent part probably short, shaft 1.5 mm, slightly hairy, upper apical portion 2–2.5 mm, clavate, densely pallidly hairy, summit short, rounded, shortly pallidly hairy, sometimes ultimate top slightly papillate and ochre coloured. Mature corollas unknown, lobes of immature corollas glandular outside. Diameter across fruiting heads 15 mm, fruitlets 4–5 mm long. — Plate 12.

D i s t r i b u t i o n. Moluccas (Halmahera). Fig. 26.

N o t e. *Pleyte 274* has an ant-infected gall on one of the branches; alternatively this could be an anomalous myrmedome.

41. Neonauclea ceramensis Ridsd., *spec. nov.*

Arbores usque ad 15 m altae. Gemmae terminales vegetativae complanatae. Stipulae late ellipticae, 15–25 mm longae et 6–15 mm latae, glabrae, leviter carinatae. Folia elliptica, (8–)14–20 (–31) cm longa et 5–10(–19) cm lata, coriacea, utrinque glabra, apice basique acuta, nervis lateralibus 7–9-paribus, petiolo usque ad 2,5 cm longo. Capitula florifera terminalia solitaria vel tricephala, axe florifero usque ad 12 cm longo. Capitula florifera subplana per anthesim super calyces 15–18 mm, super corollas 25–35 mm diametro. Flores 5-meri, receptaculo sparse hirsuto, bracteolis interfloralibus interdum conicis. Hypanthium glabrum 1 mm longum; calycis pars persistens 1,5 mm longa, utrinque pubescens, caule 2 mm longo; pars apicalis obturbinata 1,5–2 mm longa, verticibus rotundatis. Corolla infundibularis, 9–11 mm longa. Stylus 9–11 mm exsertus. Capitula fructifera non vidi. — T y p u s: *Kornassi 491* (L, holo; BO, iso).

Tree up to 15 m. Ultimate branchlets without myrmedomes. Terminal vegetative bud flattened. Stipules not persistent, broadly elliptic, up to 15–25 × 6–15 mm, slightly keeled, glabrous. *Leaves* elliptic, (8–)14–20(–31) × 5–10(–19) cm, coriaceous, above and below glabrous, apex and base acute, lateral nerves 7–9 pairs. Petiole up to 25 mm, glabrous. *Inflorescence* terminal, flowering heads solitary or in triads, axis up to 12 cm. Diameter of mature flowering heads across calyces 15–18 mm, across corollas 25–35 mm. *Receptacle* with a few scattered hairs, interfloral bracteoles present, irregular in shape, somewhat conical, sometimes rather sparse. *Hypanthium* 1 mm, glabrous. *Calyx:* persistent part 1.5 mm, outside and inside finely pallidly pubescent, shaft 2 mm, sparsely pubescent; upper apical portion 1.5–2 mm, obturbinate, densely pallidly hairy, summit rounded, short brown hairy.

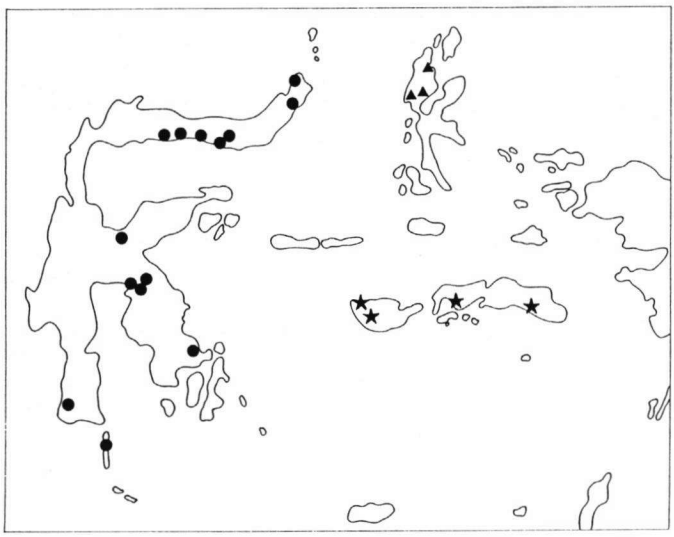


Fig. 26. Known localities of *Neonauclea celebica* (Havil.) Merr. (●); *N. glandulifera* Ridsd. (▲); *N. ceramensis* Ridsd. (★).

Corolla infundibular, glabrous, white, 9–11 mm, lobes ovate, 1 mm long; anthers 1.3 mm, tips slightly protruding. *Style* exserted for 9–11 mm. Fruiting heads unknown. — Plate 12.

Distribution. Moluccas (Buru, Ceram). Fig. 26.

42. Neonauclea unicapitulifera Ridsd., *spec. nov.*

Arbores ramunculis myrmecophylis. Gemmae terminales vegetativae complanatae. Stipulae ovatae, 12–18 mm longae et 5–10 mm latae, glabrae, leviter carinatae. Folia elliptica, (10–)12–20 cm longa et (4–)5–8 cm lata, coriacea, utrinque glabra, apice acuta, basi cuneata, nervis lateralibus 8–10-paribus, petiolo usque ad 2 cm longo. Capitula florifera subplana per anthesim super calyces 20–25 mm, super corollas 25 mm diametro. Flores 5-meri, receptaculo sparse hirsuto; bracteolae interflorales deficientes. Hypanthium 1 mm longum; calycis pars persistens 1 mm, caule 3 mm longo dense pubescenti; pars apicalis clavata 2–2,5 mm longa, verticibus conicis. Corolla infundibularis 9 mm longa, glabra, lobis ovatis 1 mm longis. Stylus 10 mm exsertus. Capitula fructifera (15–)20–30 mm diam., fructibus 6 mm longis. — Typus: *Elbert 3477* (L).

Tree. Ultimate branchlets with myrmedomes. Terminal vegetative buds flattened. Stipules not persistent, ovate, 12–18 × 5–10 mm, glabrous, faintly keeled. *Leaves* elliptic, (10–) 12–20 × (4–)5–8 cm, coriaceous, above and below glabrous, apex acute, base cuneate, lateral nerves 8–10 pairs. Petiole stout, up to 2 cm. *Inflorescence* terminal, solitary, axis up to 6 cm. Mature flowering heads with diameter across calyces 20–25 mm, across corollas 25 mm. *Receptacle* sparsely hairy, interfloral bracteoles absent. *Hypanthium* 1 mm. *Calyx:* persistent part 1 mm, outside densely pubescent, shaft 3 mm, densely pubescent; upper apical portion 2–2.5 mm,

clavate, densely brownish pubescent, summit conical, dark brown, densely short pubescent. *Corolla* infundibular, 9 mm, glabrous, lobes ovate, 1 mm; anthers 1 mm, included. *Style* exserted for c. 10 mm. Diameter across mature fruiting heads (15–) 20–30 mm, fruitlets 6 mm, glabrous, crowned by persistent calyx remnants. — Plate 13.

Distribution. Celebes. Fig. 25.

43. Neonauclea intercontinentalis Bakh. f. & Ridsd., *spec. nov.*

Arbores usque ad 40 m altae. Gemmae terminales vegetativae complanatae. Stipulae spathulatae vel obovatae, 20–35 mm longae et 12–20 mm latae, glabrae vel sparse pubescentes, interdum leviter carinatae. Folia late elliptica vel obovata, (10–)15–36 cm longa et (5–)10–26 cm lata, chartacea vel coriacea, supra glabra, infra glabra vel pubescentia, apice rotundata vel acuta, basi obtusa vel subcordata, raro acuta, nervis lateralibus 7–14-paribus, petiolo usque ad 6 cm longo. Capitula florifera terminalia solitaria vel tricephala, axe florifero usque ad 12 cm longo. Capitula florifera subplana per anthesim super calyces 25 mm, super corollas 40–50 mm diametro. Flores 5-meri, receptaculo hirsuto; bracteolae interflorales deficientes. Hypanthium glabrum 1,3–2 mm longum; calycis pars persistens 1,5–1,7 mm longa, utrinque dense pubescens, caule (1,5–)2–3 mm longo; pars apicalis clavata vel obturbinata (2–)3–5 mm longa; verticibus conicis. Corolla hypocrateriformis, 12–14 mm longa, glabra, lobis ovatis 2 mm longis. Stylus 10–12 mm exsertus. Capitula fructifera 30 mm diam., fructibus 7–9 mm longis. — T y p u s: *bb 28759* (L).

Tree up to 40 m, dbh 40 cm. Outer bark light grey-brown, warty, inner bark yellowish to mottled ochre, cream by cambium. Sapwood dirty ochre to orange-brown. Ultimate branchlets without myrmedomes. Terminal vegetative bud flattened. Stipules not persistent, spathulate to obovate, 20–35 × 12–20 mm, glabrous to sparsely pubescent, sometimes slightly keeled. *Leaves* broadly elliptic to obovate, (10–)15–36 × (5–)10–26 cm, chartaceous to coriaceous, above glabrous, below glabrous to slightly pubescent, apex rounded to acute, base obtuse to subcordate, rarely acute, lateral nerves 7–14 pairs. Petiole up to 6 cm long. *Inflorescence* terminal, solitary or in triads, axis up to 12 cm long. Mature flowering heads with diameter across calyces c. 25 mm, across corollas 40–50 mm. *Receptacle* sparsely to densely hairy, interfloral bracteoles absent. *Hypanthium* 1.3–2 mm, glabrous or with a few hairs at base. *Calyx:* persistent part 1.5–1.7 mm, outside and inside densely pubescent, shaft (1.5–)2–3 mm, pubescent; upper apical portion clavate to obturbinate, (2–)3–5 mm, summit shortly conical, dark, papillate at apex, lower part densely pallid to russet pubescent. *Corolla* hypocrateriform, 12–14 mm, glabrous, lobes ovate, 2 mm; anthers 2 mm, protruding from throat. *Style* exserted for 10–12 mm. Diameter across mature fruiting heads 30 mm, fruitlets 7–9 mm long. — Plate 13.

Distribution. Celebes, Moluccas (Sula Is.). Fig. 25.

44. Neonauclea glabra (Roxb.) Bakh. f. & Ridsd., *comb. nov.*

Nauclea glabra Roxb., [Hort. Beng. (1814) 86, nom. nud.] Fl. Ind. ed. 1, 2 (1824) 121. — *Bancalus glaber* O. Ktze, Rev. Gen. Pl. 1 (1891) 277. — T y p e: *Roxburgh s.n.* (n.v.).

Nauclea moluccana Miq., Ann. Bot. Mus. Lugd.-Bat. 4 (1869) 183. — *Neonauclea moluccana* Merr., J. Wash. Acad. Sci. 5 (1915) 541. — T y p e: *Teijsmann & de Vriese s.n.* (L), Buru.

Nauclea gordoniana F.M. Bailey, Bot. Bull. Dept. Agric. Brisbane 10 (1895) 22. — *Neonauclea gordoniana* Ridsd., Gard. Bull. Sing. 25 (1970) 272, f. 2D & 10. — T y p e: *Cowley 92D* (BRI).

Nauclea nitida Havil., J. Linn. Soc. Bot. 33 (1897) 53. — *Neonauclea nitida* Merr., J. Wash. Acad. Sci. 5 (1915) 541. — T y p e: *Calléry 55* (P).

Nauclea ovata Merr., Philipp. J. Sci. 8 (1913) Bot. 42. — *Neonauclea ovata* Merr., J. Wash. Acad. Sci. 5 (1915) 541. — T y p e: *BS 14597* (n.v.).

Nauclea venosa Merr., Philipp. J. Sci. 8 (1913) Bot. 45. — *Neonauclea venosa* Merr., J. Wash. Acad. Sci. 5 (1915) 542. — T y p e: *FB 9183 (Whitford & Hutchinson)* (n.v.).

Neonauclea kobbei Elmer, Leafl. Philipp. Bot. 8 (1919) 3100. — T y p e: *Calycosa s.n.*, Aug. 1914 (n.v.).

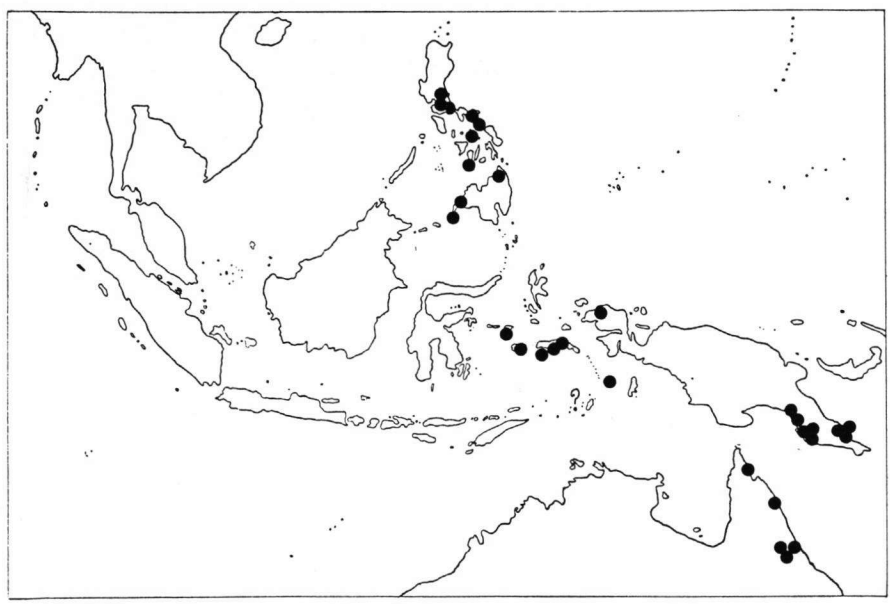


Fig. 27. Known localities of *Neonauclea glabra* (Roxb.) Bakh.f. & Ridsd.

Tree up to 45 m, rarely slightly buttressed; bole up to 18 m. Outer bark greyish brown, cracked, small flaky; inner bark yellow to brown. Sapwood yellow, heartwood red-brown to amber. Ultimate branchlets without myrmedomes. Terminal vegetative bud lingulate, flattened. Stipules not persistent, lingulate to obovate, (8–)12–20(–28) × (2–)3–5(–8) mm, sometimes slightly keeled, glabrous. *Leaves* elliptic to broadly elliptic, 10–18(–22) × (4–)5–10 cm, coriaceous, above and below glabrous, apex slightly acute, base rounded to acute and decurrent, lateral nerves 5–9 pairs. Petiole stout, 10–20 mm long. *Inflorescence* terminal, usually in triads or up to 5, axis up to 5 cm. Mature flowering heads with diameter across calyces 10 mm, across corollas 20(–25) mm. *Receptacle* hairy, interfloral bracteoles absent. *Hypanthium* 0.75 mm, glabrous. *Calyx:* persistent part 0.75(–1.5) mm, finely, rarely den-

sely pubescent, shaft 1–1.5 mm, finely pubescent; upper apical portion clavate, 0.7–1(–1.5) mm, summit short, dark, not conspicuously papillate or (in Moluccas and Philippines) shortly conical and pallidly papillate, lower part sparsely to densely pallidly pubescent. *Corolla* infundibular, 5–8 mm, glabrous; lobes 1 mm long, glabrous. *Stamens* 0.7 mm, included. *Style* exserted for c. 5 mm. Diameter across mature fruiting heads 10–20 mm, fruitlets 4–5 mm long, crowned by calyx remnants. — Plate 13.

Distribution. Moluccas, Philippines, New Guinea, Australia. Fig. 27.

Note. Two specimens, *Brass 25477* and *Womersley & Brass 8608*, both collected on 18 April 1956 from Waikaiuma, Normanby I., probably belong to this species. Stipules are absent. The diameter across the corollas is 25 mm. The persistent part of the calyx is 1.5 mm and densely pallidly pubescent, summit short, dark. Corolla 8 mm. The size of the flowering heads and components is at the upper limit for *'Neonauclea gordoniana'* and in the future the status of these collections may have to be reconsidered.

45. Neonauclea obversifolia (Valeton) Merr. & Perry

Nauclea obversifolia Valeton, Bot. Jahrb. 60 (1925) 52. — *Neonauclea obversifolia* Merr. & Perry, J. Arnold Arbor. 25 (1944) 188. — Type: *Schlechter 16785* (K).

Large tree, up to 46 m, usually buttressed to 1–2 m. Outer bark grey-brown, flaky; inner bark yellow-brown to straw coloured. Sapwood pale straw-brown, heartwood orange-brown. Ultimate branchlets without myrmedomes. Terminal vegetative buds linear to ensiform. Stipules not persistent, linear to linear-ovate, 6–10 × 1.5–2 mm, minutely finely pubescent, usually drying greyish. *Leaves* elliptic, 7–11(–16) × 3–6 cm, those below the flowering head often smaller, above and below glabrous, apex acute, sometimes apiculate, base cuneate, lateral veins 6–8 pairs. Petiole up to 1.5 cm. Flowering heads terminal, solitary or in triads, axis (1.5–)4–7 cm. Mature flowering heads with diameter across calyces 6–10 mm, across corollas (17–)20–25(–30) mm. *Receptacle* hairy, interfloral bracteoles absent. *Hypanthium* 1.5–2 mm, with a few scattered hairs. *Calyx:* persistent part 0.5 mm, shaft 1 mm, sparsely hairy; upper apical portion clavate to obturbinate, 1.5–2.5 mm, pallidly pubescent, summit shortly conical, brown, lower part pubescent. *Corolla* infundibular, 5–7 mm long, glabrous, lobes ovate, 1 mm long; anthers 0.7 mm. *Style* exserted for 4–6 mm. Diameter across fruiting heads 12–15 mm, fruitlets 3–4 mm long. — Plate 13.

Distribution. New Guinea. Fig. 28.

46. Neonauclea anthraciticus Ridsd., *spec. nov.*

Arbores usque ad 25 m altae. Gemmas terminales vegetativas non vidi. Stipulae semipersistentes, 10–12 mm longae et 4–5 mm latae, crassae, glabrae. Folia elliptica, 14–20 cm longa et 8–13 cm lata, coriacea utrinque glabra, apice obtusa, basi cuneata, nervis lateralibus, 9–11-paribus,

petiolo usque ad 2 cm longo, glabro. Capitula florifera terminalia solitaria vel tricephala, axe florifero usque ad 5 cm longo. Capitula florifera subplana per anthesim super calyces 15 mm, super corollas 22 mm diametro. Flores 5-meri, receptaculo pubescenti; bracteolae interflorales deficientes. Hypanthia glabra, 0,5–0,7 mm longa; calycis pars persistens 1 mm longa, utrinque leviter pubescens, caule 2–3 mm longo, pars apicalis dilatata clavata 1–1,3 mm leviter pallido-pubescens, verticibus brevis. Corolla hypocrateriformis 7–8 mm longa, glabra, tubo 4–4,5 mm longo, lobis 1,5 mm longis. Stylus 5–6 mm exsertus. Capitula fructifera non vidi. — T y p u s: *van Royen 4021* (L).

Tree up to 25 m, bole 15 m, dbh 60 cm, shallowly buttressed. Bark greyish brown, flaky. Heartwood orange. Ultimate branchlets without myrmedomes. Terminal vegetative buds not seen. Stipules ovate, 10–12 × 4–5 mm, thick, glabrous, semipersistent. *Leaves* elliptic, 14–20 × 8–13 cm, coriaceous, above and below glabrous, apex obtuse, base cuneate, lateral nerves 9–11 pairs. Petiole up to 2 cm long, glabrous. *Inflorescences* terminal, solitary or in triads, axes up to 5 cm. Diameter of mature flowering heads across calyces 15 mm, across corollas 22 mm. *Receptacle* hairy, interfloral bracteoles absent. *Hypanthium* 0.5–0.7 mm, glabrous with a few hairs at the base. *Calyx:* persistent part 1 mm, outside and inside faintly pubescent, shaft 2–3 mm, glabrous; upper apical portion clavate, 1–1.3 mm, pallidly pubescent, summit short, brownish hairy, not papillate. *Corolla* hypocrateriform, 7–8 mm, glabrous, tube 4–4.5 mm, lobes 1.5 mm long; anthers 1 mm, included. *Style* exserted for 5–6 mm. Fruiting heads unknown. — Plate 13.

D i s t r i b u t i o n. New Guinea (Irian Jaya: Vogelkop Peninsula). Fig. 28.

N o t e s. Closely related to *Neonauclea tricephala,* only the leaves differing in shape.

The species is named after the type locality 'Steenkool', Dutch for coal, anthracite.

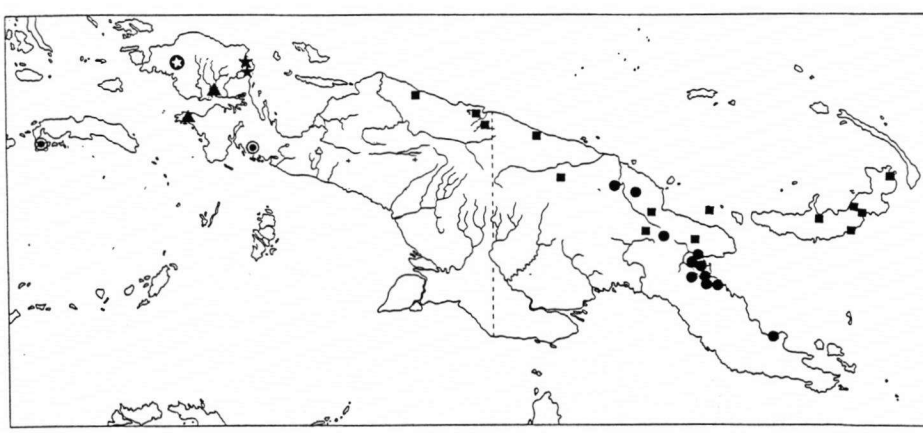


Fig. 28. Known localities of *Neonauclea obversifolia* (Valeton) Merr. & Perry (■); *N. anthraciticus* Ridsd. (▲); *N. vinkiorum* Ridsd. (✪); *N. subulifera* Ridsd. (◉); *N. kraboensis* Ridsd. (★); *N. clemensii* Merr. & Perry (●).

Fig. 29. *Neonauclea vinkiorum* Ridsd. Flowering branchlet (*BW 4982*).

47. Neonauclea vinkiorum Ridsd., *spec. nov.* – Fig. 29.

Frutices usque ad 7 m alti. Gemmae terminales vegetativae lingulatae, complanatae. Stipulae lingulatae vel elongato-obovatae, 7–10 mm longae at 3–5 mm latae, glabrae, carinatae. Folia obovata, 4–8 cm longa et 2–4 cm lata, coriacea, utrinque glabra, apice obtusa, basi acuta, nervis lateralibus 4–7-paribus, petiolo 3–10 mm longo, glabro. Capitula florifera terminalia plerumque tricephala. Capitula florifera subplana per anthesim super calyces 7–8 mm, super corollas 12–14 mm diametro. Flores 5-meri, receptaculo hirsuto, bracteolae interflorales deficientes. Hypanthia glabra 0,5–0,7 mm longa; calycis pars persistens 0,5–0,7 mm longa, utrinque leviter pubescens,

caule 1,3–1,5 mm longo; pars apicalis clavata. Corolla infundibularis 4–5 mm longa. Stylus 4–5 mm exsertus. Capitula fructifera 10–14 mm diam., fructibus 3–3,5 mm longis. — T y p u s: *BW 4982* (L).

Small shrub up to 4–7 m. Ultimate branchlets without myrmedomes. Terminal vegetative buds lingulate, flattened. Stipules not persistent, lingulate to elongate-obovate, 7–10 × 3–5 mm, glabrous, keeled. *Leaves* obovate, 4–8 × 2–4 cm, coriaceous, above and below glabrous, apex obtuse, base acute, lateral nerves 4–7 pairs. Petiole 3–10 mm, glabrous. Flowering heads terminal, usually in triads, axis up to 5 cm. Mature flowering heads with diameter across calyces 7–8 mm, across corollas 12–14 mm. *Receptacle* hairy, interfloral bracteoles absent. *Hypanthium* 0.5–0.7 mm, glabrous, with a few hairs at the base. *Calyx:* persistent part 0.5–0.7 mm, inside and outside finely shortly pubescent, shaft 1.3–1.5 mm, finely pubescent, breaking near the base; upper apical portion clavate, summit pallid, somewhat papillate, below long pallidly hairy. *Corolla* infundibular, 4–5 mm long, glabrous; anthers 0.7 mm, included. *Style* exserted for 4–5 mm. Diameter across fruiting heads 10–14 mm, fruitlets 3–3.5 mm long, crowned by persistent calyx remnants. — Plate 13.

D i s t r i b u t i o n. New Guinea (Irian Jaya: Vogelkop Peninsula). Fig. 28.

N o t e. This species is named in honour of Dr. W. and Mrs. M. Vink, who collected it under the number *BW 15304*.

48. Neonauclea subulifera Ridsd., *spec. nov.*

Frutices. Gemmae terminales vegetativae lingulatae, complanatae. Stipulae lingulatae, 12–15 mm longae et 2–3 mm latae, glabrae. Folia elliptica, 9–14(–18) cm longa et 3–5(– 6) cm lata, coriacea, utrinque glabra, apice acuta, basi cuneata, nervis lateralibus 7–9-paribus, petiolo glabro 0,5–2 cm longo. Capitula florifera terminalia, solitaria, axe florifero usque ad 5 cm longo. Capitula florifera subplana per anthesim super calyces 10 mm, super corollas 14 mm diametro. Flores 5-meri, receptaculo hirsuto, bracteolae interflorales deficientes. Hypanthia 0,5–0,7 mm longa; calycis pars persistens 1 mm longa utrinque dense pubescens. Corolla hypocrateriformis 4 mm longa, tubo 2 mm longo, lobis 0,3 mm longis. Stylus 4 mm exsertus. Capitula fructifera 12–15(–17) mm diam., fructibus 3–4 mm longi. — T y p u s: *BW 7600* (L).

Shrub. Ultimate branchlets without myrmedomes. Terminal vegetative bud lingulate, flattened. Stipules not persistent, lingulate, 12–15 × 2–3 mm, glabrous, not keeled. *Leaves* elliptic, 9–14(–18) × 3–5(–6) cm, those below the flowering heads often smaller, c. 5–7 × 2 cm, coriaceous, above and below glabrous, apex acute to acuminate, base cuneate, lateral nerves 7–9 pairs. Petiole 0.5–2 cm, glabrous. *Inflorescences* terminal, solitary, axes up to 5 cm. Diameter of mature flowering heads across calyces 10 mm, across corollas 14 mm. *Receptacle* hairy, interfloral bracteoles absent. *Hypanthium* 0.5–0.7 mm. *Calyx:* persistent part 1 mm, inside and outside densely pubescent, shaft 1 mm, densely hairy, breaking at the base, apical part obturbinate, clavate, 1–1.5 mm, brownish pubescent, summit pyramidal, brownish pubescent. *Corolla* hypocrateriform, 4 mm, glabrous, tube c. 2 mm, lobes 0.3 mm long; anthers 0.7 mm, included. *Style* exserted for 4 mm, ridged. Diameter across mature fruiting heads 12–15(–17) mm, fruitlets 3–4 mm long. — Plate 13.

Distribution. Moluccas (Ambon Waai), New Guinea (Irian Jaya: Fak Fak). Fig. 28.

49. Neonauclea kraboensis Ridsd., *spec. nov.*

Arbores usque ad 18 m altae. Gemmae terminales vegetativae obovatae, complanatae. Stipulae obovatae, 20 mm longae et 12–15 mm latae extus leviter pubescentes. Folia late elliptica vel obovata 21–28 cm longa et 10–16 cm lata, coriacea, supra glabra, infra ad nervos pilosa, apice rotunda vel leviter acuta, basi acuta interdum inaequalia, nervis lateralibus 9–12-paribus, petiolo usque ad 3 cm longo. Capitula florifera terminalia solitaria vel tricephala, axe florifero usque ad 10 cm longo. Capitula florifera subplana per anthesim super calyces 12–15 mm, super corollas 30–35 mm diametro. Flores 5-meri, receptaculo hirsuto; calycis pars persistens 1,3 mm longa, caule 2–2,3 mm longo; pars apicalis dilatata 2 mm longa, verticibus indistinctis. Corolla tubularis vel infundibularis 10 mm longa, tubo 6 mm, lobis ovatis 1,3 mm longis. Stylus 7 mm exsertus. Capitula fructifera non vidi. — Typus: *BW 10769* (L, holo).

Tree up to 18 m, bole 15 m, dbh 45 cm. Outer bark fissured or not, peeling with small flakes, inner bark brownish yellow. Sapwood yellow, heartwood pink to salmon-red. Ultimate branchlets without myrmedomes. Terminal vegetative bud obovate, flattened. Stipules not persistent, obovate, 20 × 12–15 mm, outside finely pubescent. *Leaves* broadly elliptic to obovate, 21–28 × 10–16 cm, coriaceous, above glabrous, below with minute hairs particularly on the nerves, apex rounded to slightly acute, base acute, sometimes unequal, lateral nerves 9–12 pairs. Petiole stout, up to 3 cm. *Inflorescence* terminal, solitary or in triads, axes up to 10 cm. Mature flowering heads with diameter across calyces 12–15 mm, across corollas 30–35 mm. *Receptacle* hairy, interfloral bracteoles absent. *Hypanthium* 1 mm, sparsely hairy. *Calyx:* persistent part 1.3 mm with thickened strands of sclerenchyma, shaft 2–2.3 mm, sparsely pubescent, breaking at the base; upper apical portion 2 mm, densely pallidly hairy, summit ill defined. *Corolla* tubular to infundibular, 10 mm, glabrous, yellow, tube c. 6 mm, lobes ovate, 1.3 mm long; anthers 1.3 mm, included. *Style* exserted for 7 mm. Fruiting heads unknown. — Plate 13.

Distribution. New Guinea (Irian Jaya). Fig. 28.

Ecology. Primary forest on clay, common, sometimes gregarious.

Note. The name of this species is derived from the type locality, Mt Krabo.

50. Neonauclea clemensii Merr. & Perry

Neonauclea clemensii Merr. & Perry, J. Arn. Arbor. 29 (1948) 164. — Type: *Clemens 10800* (A).

Large tree, up to 30 m, bole to 15 m, rarely buttressed; crown large. Outer bark pale greyish-ash to dark brown, fissured, flaking in large pieces, underbark brown, inner bark straw to pale brown. Sapwood straw to pale brown, heartwood pinkish. Ultimate branchlets without myrmedomes. Terminal vegetative bud obovoid, flattened. Stipules not persistent, obovate, 20–25 × 10–12 mm, keeled, densely pubescent. *Leaves* orbicular to obovate, (12–)18–28(–35) × (8–)14–20(–25) cm, chartaceous, above glabrous, below pubescent particularly on the veins, apex slightly acute, base truncate to subcordate, lateral nerves 7–12 pairs. Petiole short, 0–6 mm.

Inflorescences borne on 1–3 axes bearing up to 3(–5) heads. Mature flowering heads with diameter across calyces 12–15 mm, across corollas 15–30 mm. *Receptacle* hairy, interfloral bracteoles absent. *Hypanthium* 1.3–1.8 mm, glabrous with basal hairs. *Calyx:* persistent part 1.5–2 mm, outside and inside pubescent, shaft 2–3 mm, pubescent; upper apical portion somewhat clavate to obtrigonal, 2 mm, summit 1 mm, shortly conical, finely hairy, usually brown to ochre coloured, lower part pallidly hairy. *Corolla* infundibular, 11 mm, glabrous, lobes ovate, 3–4 mm long; anthers 1.5–2 mm. *Style* exserted for 6–8 mm. Diameter across mature fruiting heads 30–40 mm, fruitlets 8 mm long. — Plate 13.

Distribution. Papua New Guinea. Fig. 28.

51. Neonauclea bomberaiensis Ridsd., *spec. nov.*

Arbores usque ad 16 m altae. Gemmae terminales vegetativae lineares, complanatae. Stipulae lineares 10–20 mm longae et 1–2 mm latae, glabrae. Folia elliptica, (5–)9–15 cm longa et (1,5–)3–4,5 cm lata, tenuia, supra glabra, infra ad nervos pilosa, apice acuta, basi cuneata, nervis lateralibus 7–9-paribus, petiolo usque ad 2 cm longo. Capitula florifera terminalia plerumque tricephala. Capitula florifera subplana per anthesim super calyces 8–10 mm, super corollas 15 mm diametro. Flores 5-meri, receptaculo hirsuto; bracteolae interflorales deficientes. Hypanthia 0,7 mm longa; calycis pars persistens 0,5–0,7 mm longa, glabra, caule 1,7 mm longo; pars apicalis dilatata obturbinata, verticibus brevis. Corolla infundibularis 5–5,5 mm longa, glabra, lobis 1–1,3 mm longis extus leviter farinosis. Stylus 5 mm exsertus. Capitula fructifera non vidi. — Typus: *BW 13018* (L).

Tree up to 16 m. Ultimate branchlets without myrmedomes. Terminal vegetative bud linear, flattened. Stipules not persistent, linear, 10–20 × 1–2 mm, glabrous, not keeled. *Leaves* elliptic, (5–)9–15 × (1.5–)3–4.5 cm, thin, above glabrous, below with a few scattered hairs on nerves, apex acute, base cuneate, somewhat decurrent, lateral nerves 7–9 pairs, slightly hairy. Petiole up to 2 cm, glabrous. *Inflorescences* terminal, usually in triads, axis up to 5 cm. Diameter of mature flowering heads across calyces 8–10 mm, across corollas 15 mm. *Receptacle* hairy, interfloral bracteoles absent. *Hypanthium* 0.7 mm. *Calyx:* persistent part 0.5–0.7 mm, glabrous, shaft 1.7 mm, glabrous; upper apical portion obturbinate, 0.3–0.5 mm, sparsely pallidly hairy, summit short, brown hairy. *Corolla* infundibular, 5–5.5 mm, glabrous, lobes 1–1.3 mm, outside medianly slightly farinose; anther 0.8 mm, included. *Style* exserted for 5 mm. Fruiting heads unknown. — Plate 13.

Distribution. New Guinea (Irian Jaya: Bomberai Peninsula). Fig. 30.

52. Neonauclea tricephala Ridsd., *spec. nov.*

Arbores usque ad 33 m altae. Gemmae terminales vegetativae obovatae complanatae. Stipulae obovatae, 10–12 mm longae et 7–10 mm latae, semipersistentes, crassae et coriaceae, glabrae. Folia elliptica vel obovata, (8–)16–25 cm longa et (4–)7–15 cm lata, supra glabra, infra ad nervos hirsuta, apice rotundata vel leviter acuta, basi cuneata vel attenuata, nervis lateralibus 9–12-paribus, petiolo usque ad 2 cm longo. Capitula florifera terminalia plerumque tricephala. Flores non vidi, receptaculo hirsuto, bracteolae interflorales deficientes. Hypanthium glabrum; calycis pars persistens c. 2 mm longa, caule 0,5–1 mm longo; pars apicalis dilatata 1 mm longa, verticibus indistinctis. Corolla non vidi. Capitula fructifera 25 mm diam., fructibus c. 8 mm longis. — Typus: *BW 2972* (L).

Tree attaining 33 m, bole 21 m, dbh 40 cm. Bark grey, strongly scaling. Sapwood creamy yellow, heartwood red. Ultimate branchlets without myrmedomes. Terminal vegetative bud obovate, flattened. Stipules obovate, 10–12 × 7–10 mm, semipersistent, thick and coriaceous, glabrous. *Leaves* elliptic to obovate, (8–)16–25 × (4–)7–15 cm, coriaceous, above glabrous, below hairy on the nerves, apex rounded to slightly acute, base cuneate to attenuate, lateral nerves 9–12 pairs. Petiole up to 2 cm long. *Inflorescence* terminal, usually in triads. Mature flowering heads unknown. *Receptacle* hairy, interfloral bracteoles absent. *Flowers* unknown, only fragments of undeveloped flowers from fruiting head observed. *Hypanthium* glabrous. *Calyx:* persistent part c. 2 mm, shaft 0.5–1 mm, glabrous, breaking near the top; upper apical portion c. 1 mm, pallidly pubescent, summit ill defined. *Corolla* unknown. Diameter across fruiting heads 25 mm, fruitlets c. 8 mm, crowned by calyx remnants. — Plate 13.

Distribution. New Guinea (Irian Jaya: Warsamson River area). Fig. 30.

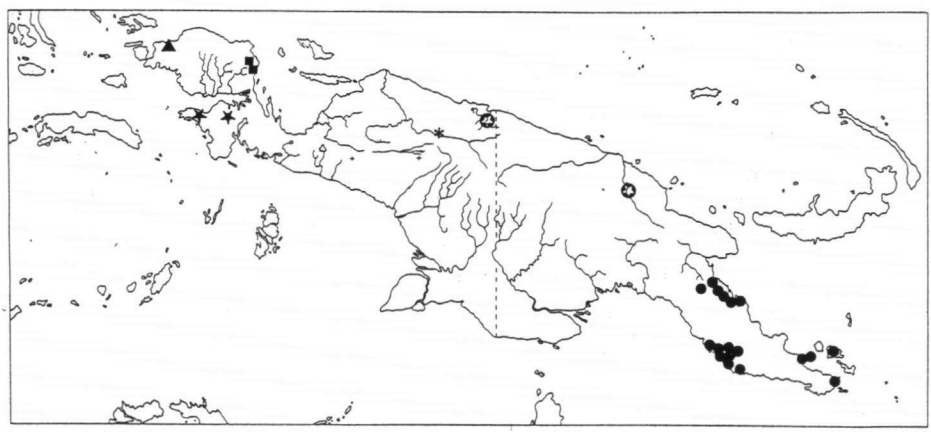


Fig. 30. Known localities of *Neonauclea bomberaiensis* Ridsd. (★); *N. tricephala* Ridsd. (▲); *N. versteeghii* Merr. & Perry (✱); *N. colla* Ridsd. (■); *N. coronata* Ridsd. (✪); *N. chalmersii* (F.Muell.) Merr. (●).

53. Neonauclea versteeghii Merr. & Perry

Neonauclea versteeghii Merr. & Perry, J. Arnold Arbor. 25 (1944) 188. — Type: *Brass & Versteegh 13509* (A).

Tree up to 22 m, dbh 56 cm. Outer bark scaly, inner bark 10 mm thick, brown. Sapwood brown, heartwood red. Ultimate branchlets without myrmedomes. Terminal vegetative bud flattened. Stipules not persistent, elliptic to obovate, 25 × 15 mm, slightly keeled, hairy at the base. *Leaves* suborbicular to broadly obovate, (10–)20–37 × (9.5–)20–25 cm, subcoriaceous, above glabrous, below slightly puberulous on the nerves, apex obtuse to slightly apiculate, base rounded, lateral nerves 8–10 pairs. Petiole stout, up to 6 cm long, glabrous. *Inflorescence* terminal, flowering

heads solitary or in triads, axis up to 8 cm long. Flowering heads unknown. *Calyx:* persistent part 1.5 mm, outside slightly pubescent, shaft 2 mm; upper apical portion 1.5–2.5 mm, summit long conical, 1–1.5 mm, shortly brown hairy, lower part 1 mm, densely pallidly hairy. *Corolla* unknown. Diameter across slightly immature fruiting heads 20 mm, fruitlets 6 mm long, crowned by calyx remnants. — Plate 13.

Distribution. New Guinea. Fig. 30.

54. Neonauclea colla Ridsd., *spec. nov.*

Arbores usque ad 28 m altae. Gemmae terminales vegetativae ellipsoideae, complanatae. Stipulae ellipticae, 20–30 mm longae et 10–12 mm latae, sparse hirsutae. Folia elliptica, (7–)15–22 cm longa et (4–)7–9 cm lata, coriacea, supra glabra, infra ad nervos pubescentia, apice acuta, basi acuta vel leviter rotundata, nervis lateralibus 8–11-paribus, petiolo usque ad 3,5 cm longo. Capitula florifera terminalia solitaria, axe florifero usque ad 4 cm longo. Capitula florifera subplana per anthesim super calyces 30 mm, super corollas 50 mm diametro. Flores 5-meri, receptaculo hirsuto; bracteolae interflorales deficientes. Hypanthium glabrum 1,5 mm longum; calycis pars persistens 1,3 mm longa pubescens, caulium partes liberae 3–4 mm longae basi per 2,5–3 mm connatae circumscissiles deciduae; pars apicalis elongato-clavata 3 mm longa, verticibus pyramidalis. Corolla infundibularis 13 mm longa, lobis ovatis 2 mm longis. Stylus 10 mm exsertus. Capitula fructifera 15 mm diam., fructibus c. 5 mm longis. — Typus: *van Royen & Sleumer 7538* (L).

Tree up to 28 m, bole 20 m, dbh 45 cm. Ultimate branchlets without myrmedomes. Terminal vegetative bud ellipsoidal, flattened. Stipules elliptic, 20–30 × 10–12 mm, sparsely finely hairy, usually not persistent. *Leaves* elliptic, (7–)15–22 × (4–)7–9 cm, coriaceous, above glabrous, below pubescent particularly on the veins, apex acute, base acute to slightly rounded, lateral nerves 8–11 pairs. Petiole up to 3.5 cm. *Inflorescence* terminal, solitary, axis up to 4 cm. Mature flowering heads with diameter across calyces 30 mm, across corollas 50 mm. *Receptacle* hairy, interfloral bracteoles absent. *Hypanthium* 1.5 mm, glabrous. *Calyx:* persistent part 1.3 mm, outside finely pubescent, inside densely hairy, free part of shaft 3–4 mm, mutually connate at the base into a collar 2.5–3 mm; upper apical portion elongate-clavate, 3 mm long, densely pallidly hairy, summit pyramidal, light brown, shortly hairy, not papillate. *Corolla* infundibular, 13 mm long, glabrous, lobes ovate, 2 mm; anthers 2 mm long, included. *Style* exserted for c. 10 mm. Diameter across mature fruiting heads 15 mm, fruitlets c. 5 mm long. — Plate 14.

Distribution. New Guinea (Irian Jaya: Vogelkop Peninsula, S. Manokwari). Fig. 30.

55. Neonauclea coronata Ridsd., *spec. nov.* – Fig. 31.

Arbores usque ad 25 m altae. Gemmae terminales vegetativae ellipsoideae, complanatae. Stipulae ellipticae, 20–25 mm longae et 8–12 mm latae, carinatae, pubescentes. Folia elliptica vel obovata, (7–)10–20 cm longa et (3–)6–10(–13) cm lata, coriacea, supra glabra, infra ad nervos pubescentia, apice acuta, basi acuta vel obtusa, plerumque leviter subcordata vel inaequilatera, nervis lateralibus 7–10-paribus, petiolo usque ad 4 cm longo, pubescenti. Capitula florifera terminalia solitaria, axe florifero usque ad 3 cm longo. Capitula florifera subplana per anthesim super calyces 15 mm, super corollas 25 mm diametro. Flores 5-meri, receptaculo hirsuto, bracteolae interflorales deficientes. Hypanthium 1 mm longum; calycis pars persistens 1 mm longa, pubescens, caulibus basi 1,5–2

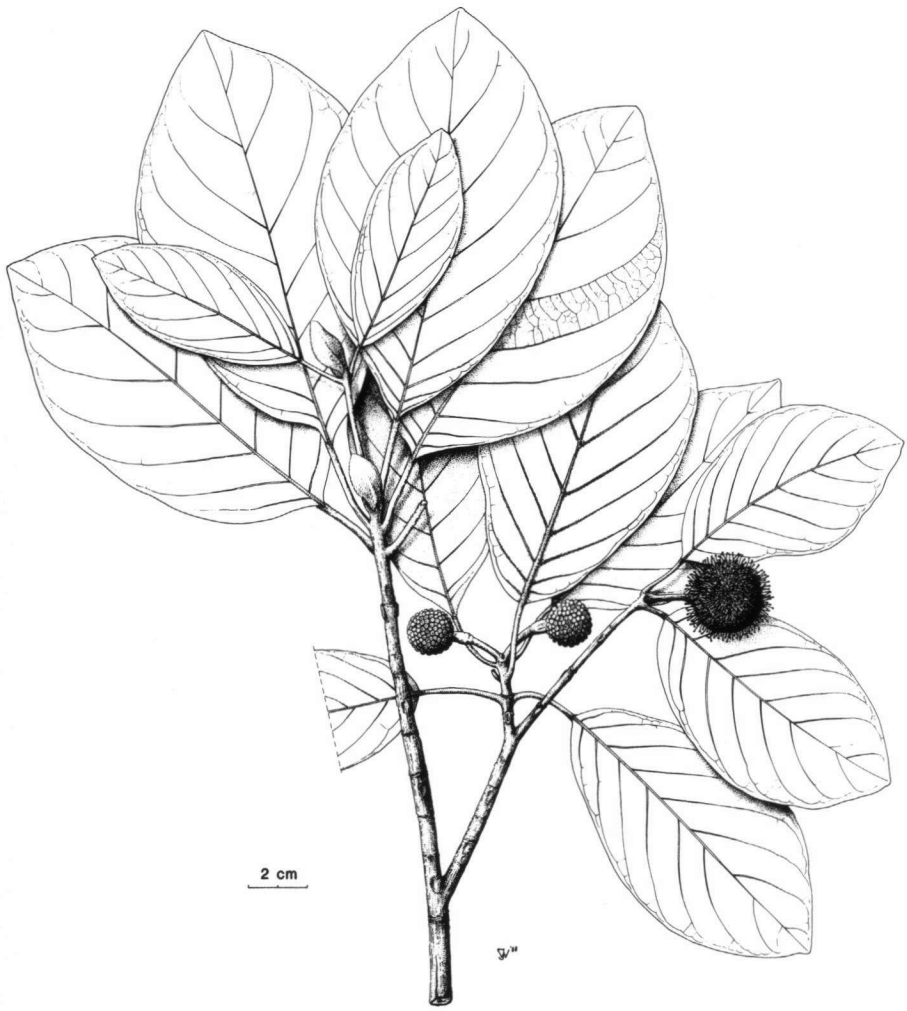


Fig. 31. *Neonauclea coronata* Ridsd. Branchlet with flowering head (*NGF 45879*).

mm connatis, circumscissilibus deciduis, pars apicalis clavata 0,5–1 mm, verticibus pyramidalis. Corolla tubularis 5–7 mm longa, lobis ovatis 1 mm longis. Stylus 5–7 mm exsertus. Capitula fructifera non vidi. — T y p u s: *NGF 45879* (L).

Tree up to 25 m, bole 15 m, dbh 40 cm, sometimes buttressed up to 1 m. Bark dark brown with medium to large flakes, inner bark pinkish to red. Sapwood straw to pink, heartwood yellow to red. Ultimate branchlets without myrmedomes. Terminal vegetative bud ellipsoid, flattened. Stipules not persistent, elliptic, 20–25 × 8–12 mm, keeled, pubescent particularly on the keel. *Leaves* elliptic to obovate, (7–)10–20 × (3–)6–10(–13) cm, coriaceous, above glabrous, below pubescent with soft flat-

tened hairs particularly on the veins, apex acute, base acute to obtuse, sometimes slightly subcordate or unequal, lateral nerves 7–10 pairs. Petiole up to 4 cm, sparsely to densely pubescent. *Inflorescences* terminal, solitary, axes up to 3 cm. Mature flowering heads with diameter across calyces 15 mm, across corollas 25 mm. *Receptacle* hairy, interfloral bracteoles absent. *Hypanthium* 1 mm. *Calyx:* persistent part 1 mm, outside densely pubescent, inside pubescent, basal part of shafts mutually connate for 1.5–2 mm, outside sparsely pubescent, inside densely so; upper apical portion clavate, 0.5–1 mm, pallidly pubescent, summit pyramidal, dark coloured, shortly pubescent. *Corolla* tubular, 5–7 mm, glabrous, lobes ovate, 1 mm. *Style* exserted for 5–7 mm. Fruiting heads not seen. — Plate 14.

Distribution. New Guinea (Irian Jaya: Jayapura Prov.; Papua New Guinea: Madang Prov.). Fig. 30.

Note. Similar to *Neonauclea colla* but flowering organs smaller.

56. Neonauclea chalmersii (F. Muell.) Merr.

Nauclea chalmersii F. Muell., Notes on Papuan Plants 8 (1886) 44. — *Neonauclea chalmersii* Merr., J. Wash. Acad. Sci. 5 (1915) 539. — Syntypes: *Chalmers s.n.* (n.v.), *Edelfelt s.n.* (n.v.).

Rheophytic shrub up to 4 m, often with horizontally spreading branches, less frequently a small tree up to 11 m. Ultimate branchlets without myrmedomes. Terminal vegetative bud lingulate to ovate, flattened. Stipules not persistent, lingulate to narrowly ovate(-oblong), 18–20(–30) × 2–4(–8) mm, slightly keeled, finely pubescent particularly on the keel. *Leaves* linear-lanceolate to narrowly elliptic, 8–18 × 1–3(–4) cm, those below the flowering heads often smaller, 2–4 × 0.5–1 cm, chartaceous to coriaceous, above and below glabrous, rarely pubescent when young, apex acute to long-acuminate, base acute to decurrent, lateral nerves 7–9(–11) pairs. Petiole 0–6 mm. *Inflorescence* terminal, solitary, axis up to 5 cm long. Mature flowering heads with diameter across calyces (12–)15–20 mm, across corollas 25–30 mm. *Receptacle* glabrous, interfloral bracteoles absent. *Hypanthium* 0.5–1 mm, glabrous. *Calyx:* persistent part 1.5–2 mm, inside and outside glabrous but with thick vertical sclerenchyma bands, shaft 1.5–2 mm, breaking at basal 1/3, upper apical portion 4–6 mm, obturbinate, slightly pallidly pubescent, summit filiformly elongated, 2–4 mm long, glabrous. *Corolla* 10–11 mm long, glabrous, lobes ovate, 1.5–2 mm long, glandular at the apex; anthers 2 mm, protruding from the throat. *Style* exserted for 6–9 mm. Diameter across mature fruiting heads (20–)25–30 mm, fruitlets 7–10 mm long, upper 1/3 with minute stiff hairs which lead to cocci sticking together. — Plate 15.

Distribution. New Guinea. Fig. 30.

57. Neonauclea maluensis (Valeton) S. Moore

Nauclea maluensis Valeton, Bot. Jahrb. 60 (1925) 51. — *Neonauclea maluensis* S. Moore, J. Bot. 65 (1927) Suppl. 242. — Syntypes: *Ledermann 7872 , 10570* (both lost, n.v.).

Tree up to 20 m. Outer bark light brown, thin, pustular; inner bark yellowish. Wood cream. Ultimate branchlets without myrmedomes. Terminal vegetative bud lingulate, flattened. Stipules not persistent, lingulate, sometimes semi-persistent, (7–)10–14(–20) × 2–4 mm, glabrous. *Leaves* (broadly) elliptic, (6–)12–16(–20) × (2–)4–6(–10) cm, coriaceous, above and below glabrous, apex acute, base acute, lateral nerves 6–10 pairs. Petiole up to 2 cm. Mature flowering heads with diameter across calyces 15–20 mm, across corollas unknown. *Receptacle* hairy, interfloral bracteoles absent. *Hypanthium* 1 mm, glabrous. *Calyx:* persistent part 1.3 mm, inside and outside sparsely pubescent, shaft 1.5–2 mm, sparsely to densely pubescent, breaking near the base, upper apical portion 2–2.8 mm, summit conical, 1–1.3 mm, papillate, orange coloured, lower part 1–1.5 mm, densely pallidly hairy. Mature *corollas* not seen. Diameter across mature fruiting heads (vide Valeton) 20–30 mm. — Plate 15.

Distribution. New Guinea. Fig. 32.

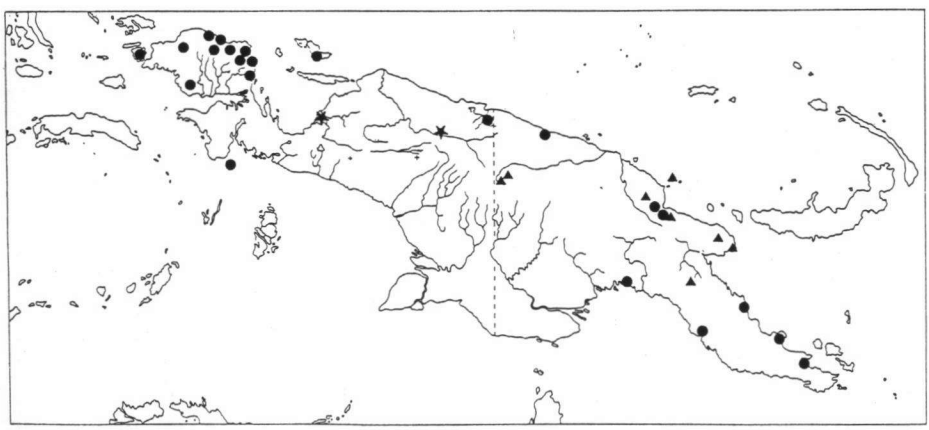


Fig. 32. Known localities of *Neonauclea maluensis* (Valeton) S. Moore (▲); *N. perspicuinervia* Merr. & Perry (★); *N. brassii* S. Moore (●).

Note. The types of this species have been lost and consequently it has been consistently confused by subsequent authors, myself (1970) included. Valeton's description calls for a plant with a calyx appendage with a grey basal part and a flavescent superior part. The use of the term flavescent suggests a papillate type and a coloration similar to that of *Neonauclea excelsa*. Three specimens, *Clemens 8309A, Pullen 6536* and *NGF 48099* have these characters and lingulate stipules with rounded apices. The only remaining fertile specimen, *Ledermann 12912*, has orange calyx apices but stipules are lacking. This was identified by Valeton as *Neonauclea hagenii* and I suspect this accounts for the "yellowish hairy at the tip" in his description of the calyx of *Neonauclea hagenii*. No other material of this species has this coloration. Thus, I conclude that *Neonauclea hagenii* in Valeton's description is a mixture of *N. hagenii* and his own species *Neonauclea maluensis*.

58. Neonauclea perspicuinervia Merr. & Perry

Neonauclea perspicuinervia Merr. & Perry, J. Arnold Arbor. 25 (1944) 188. — T y p e: *Kanehira & Hatusima 12387* (A).

Large tree up to 30 m. Bark flaky, inner bark straw coloured. Ultimate branchlets without myrmedomes. Terminal vegetative buds not seen. Stipules thought to be broadly elliptic, 15–25 × 10–15 mm. *Leaves* broadly elliptic to obovate, (8–)15–20(–35) × 8–15(–25) cm, chartaceous to coriaceous, glabrous, apex acute, base acute to obtuse, lateral nerves 7–11 pairs. Petiole up to 3 cm. *Inflorescence* terminal, flowering heads usually solitary, axis up to 4 cm long. Diameter of mature flowering heads across calyces 40–45 mm, across corollas c. 50 mm. *Receptacle* sparsely hairy, interfloral bracteoles absent. *Hypanthium* 2.5–3 mm, persistent part of calyx 1.5–2(–3) mm, pubescent, shaft 2 mm, upper apical portion clavate, 4 mm, apex shortly pyramidal, lower part pallidly pubescent. *Corolla* infundibular, 15 mm long, lobes ovate, 2–3.5 mm. *Style* exserted for 10 mm. Diameter across mature fruiting heads 35–45 mm, fruitlets 10–12 mm, crowned by calyx remnants.

D i s t r i b u t i o n. New Guinea (Irian Jaya). Fig. 32.

N o t e. The interpretation of the stipular form is based on *Docters van Leeuwen 10769*, which has highly immature flowering heads. The determination is, therefore, not for 100% certain.

59. Neonauclea brassii S. Moore

Neonauclea brassii S. Moore, J. Bot. 65 (1927) Suppl. 241. – T y p e: *Brass 658* (BM).

Tree up to 40 m, bole up to 21 m, dbh up to 70 cm, mostly with low buttresses 1–2 m high by 2–4 m long. Outer bark slightly or not fissured, slightly to strongly peeling in irregular flakes, underbark light brown to pink, inner bark whitish to pink. Sapwood straw to yellowish brown, heartwood orange-brown to salmon. Ultimate branchlets without myrmedomes. Terminal vegetative buds lingulate, flattened. Stipules not persistent, lingulate, (6–)10–16(–25) × 4–6(–10) mm, glabrous, strongly keeled. *Leaves* obovate, rarely elliptic, (7–)12–20(–28) × (3–)6–10(–15) cm, coriaceous, above and below glabrous, apex obtuse, base acute to cuneate, lateral nerves 6–10 pairs. Petiole up to 4.5 cm long. *Inflorescence* solitary, axis up to 7 cm. Diameter of mature flowering heads across calyces 20–25 mm, across corollas (25–)30 mm. *Receptacle* hairy, interfloral bracteoles absent. *Hypanthium* 1–1.5 mm, glabrous. *Calyx:* persistent part 1.3–1.8 mm, outside and inside densely pallidly pubescent, shaft (1.5–)2–3 mm, pubescent, breaking near the base; upper apical portion clavate, summit apiculate, 1.5–2 mm, greyish brown pubescent, not papillate, lower part 1.5–2 mm, greyish to pallidly hairy. *Corolla* hypocrateriform, 8–9 mm, glabrous, tube 6 mm, lobes ovate, 1 mm; anthers 2 mm. *Style* exserted for 6–9 mm. Diameter across mature fruiting heads 20–25 mm, fruitlets 5–6 mm long, glabrous, surmounted by calyx remnants. — Plate 15.

D i s t r i b u t i o n. New Guinea. Fig. 32.

60. Neonauclea solomonensis Ridsd.

Neonauclea solomonensis Ridsd., Gard. Bull. Sing. 25 (1970) 274. — T y p e: *BSIP 8739* (K, holo; L).

Tree up to 30 m, dbh up to 80 cm, bole straight, rarely fluted, buttresses usually present, equal or spreading, thick. Outer bark light to greyish brown, dippled to fine scaly fissured; underbark dull yellow; inner bark sulphurous yellow discolouring brown on exposure. Wood yellow to brown, hard. Ultimate branchlets without myrmedomes. Terminal vegetative bud flattened. Stipules not persistent, lingulate to obovate, 10–15 × 4–7 mm, sometimes slightly keeled, glabrous. *Leaves* elliptic to obovate, 10–20 × (4–)5–10 cm, those below inflorescence sometimes smaller, 3–10 × 2–4 cm, coriaceous, above and below glabrous, apex acute, base obtuse to cuneate; lateral nerves 5–9 pairs. Petiole up to 2 cm long. *Inflorescence* terminal, solitary or in triads, axis up to 7 cm. Diameter of mature flowering heads across calyces 10–15 mm, across corollas 20–30 mm. *Receptacle* hairy, interfloral bracteoles absent. *Hypanthium* 1 mm, glabrous. *Calyx:* persistent part 1–1.5 mm, densely finely pubescent, shaft 2–2.5 mm, sparsely to densely pubescent, detaching near the base; upper apical portion obturbinate to clavate, 1–1.5(–2) mm, pallidly pubescent, summit dark brownish black, sometimes with an ochraceous or pallid, somewhat papillate central part. *Corolla* hypocrateriform, 6–8 mm long, glabrous, tube 4–5 mm, lobes ovate, 1–1.5 mm long; anthers 1 mm long, included. *Style* exserted for 4–5 mm. Diameter across mature fruiting heads 10–15 mm, fruitlets 4–6 mm long. — Plate 15.

D i s t r i b u t i o n. New Ireland, Bougainville, Solomon Islands, New Hebrides.

61. Neonauclea forsteri (Seem. ex Havil.) Merr.

Nauclea rotundifolia auct. non Roxb. (1824): Hook. & Arn., Bot. Capt. Beechey's Voy. (1832) 64; Guillemin, Ann. Sci. Nat. sér. 2, 7 (1837) 250.

Nauclea forsteri Seem. [Fl. Vit. (1866) 121, nom. nud.] ex Havil., J. Linn. Soc. Bot. 33 (1897) 56. — *Neonauclea forsteri* Merr., J. Wash. Acad. Sci. 5 (1915) 540. — L e c t o t y p e (Ridsdale, 1970): *J.R. & G. Forster s.n.* (K).

Neonauclea vitiensis Gillespie, Bull. Bishop Mus. 74 (1930) 28, f. 38. — T y p e: *Gillespie 4188* (BISH).

Neonauclea cardiophylla Merr. & Perry, J. Arnold Arbor. 25 (1944) 189. — T y p e: *Waterhouse 25* (A).

Tree up to 25 m, dbh up to 1.5 m, buttresses present and equal or steep or absent. Bark pale, greyish, smooth or scaly to flaky, rarely pustular, inner bark cream turning brown. Ultimate branchlets without myrmedomes. Terminal vegetative bud flattened. Stipules not persistent, lingulate to broadly elliptic, (10–)20–40(–60) × 12–20 mm, glabrous or slightly hairy at the base, keeled or not. *Leaves* (broadly) elliptic, rarely slightly obovate, 10–40 × 8–20 cm, those below the flowering heads often smaller, 5–10 × 3–6 cm, coriaceous, above and below glabrous, below rarely pubescent particularly on the nerves, apex acute, base obtuse to rounded, less fre-

quently acute, lateral nerves 7–12 pairs. Petiole up to 5 cm. *Inflorescence* terminal, usually solitary, flowering axis up to 7 cm. Diameter of mature flowering heads across calyces, 25–30 mm, across corollas (35–)40–50 mm. *Receptacle* hairy, interfloral bracteoles absent. *Hypanthium* 1–1.5 mm, glabrous. *Calyx:* persistent part 1.2–1.8 mm, outside densely hairy, rarely sparsely hairy or glabrous (*NGF 26952*), shaft 1–3 mm, breaking near the base, upper apical portion clavate, 2–2.5 mm, densely hairy, pallid or russet coloured, summit conical, short hairy, sometimes brownish black. *Corolla* infundibular to hypocrateriform, 7–14 mm long, glabrous; lobes 1.2–2 mm; anthers 1.5–2 mm, included. *Style* exserted for 6–16 mm. Diameter across mature fruiting heads 35–45 mm, fruitlets 8–10 mm, crowned with calyx remnants. — Plate 15.

Distribution. New Guinea, New Britain, New Ireland, Bougainville, Solomon Islands, New Hebrides, Fiji, Tonga, Samoa, Society Islands.

Note. *Neonauclea forsteri* as defined here is rather heterogeneous, particularly in material referable to *Neonauclea cardiophylla* from New Britain to Solomon Islands. The specimens seen from Tahiti, Samoa and Fiji are rather homogeneous, generally having glabrous or slightly pubescent leaves in the range 12–20 × 6–12 cm, calyx 6–7 mm long, corolla 8–10(–12) mm long. The specimens collected from New Britain to Bougainville generally have larger leaves, 20–35 × 15–25 cm, calyx 7–9 mm, corolla 12–14 mm. The material from the Solomon Islands completely bridges the range of floral measurements.

DUBIOUS SPECIES

As previous authors, I have not been able to interprete the species described by Spanoghe from Timor under the genus *Nauclea:*

1. Nauclea glandulifera Spanoghe, Linnaea 15 (1841) 315. — Type: *Spanoghe s.n.*, Timor (n.v.).

Arbor procera foliis obovatis, basi subcordatis utrinque glabris, parallelo-costatis, integerrimis, basi petiolorum in axillis 1-glandulosis. Folior long. 6–10 poll., folior lat. 5–9 poll., petiol. long 1 poll. Stipulis ovalibus obtusis glabris, dorso basi carinatis, petiolo longioribus. Pedunculis terminalibus solitariis; fructu subangulato. — In paludosis et in fructicetis humidis circa Koepang.

2. Nauclea sericea Spanoghe, Linnaea 15 (1841) 314, nom. illeg., non Wall. ex G. Don (1834).

Arbor excelsa, foliis subrotundatis integerrimis, supra in venis pubescentibus, subtus glaucis, ramulis et petiolis sericeo-pubescentibus. Folior. long. 6–8 poll., folior. lat. 4–5 poll., petiolo brevioribus, sericeus. Pedunculis terminalibus solitariis, petiolo paulo longioribus. — In montanis Timor; floret Octobri.

EXCLUDED FROM NEONAUCLEA*

1. *Neonauclea bernardoi* Merr., Philipp. J. Sci. 10 (1915) Bot. 101 = **Ludekia bernardoi** (Merr.) Ridsd.; see Ridsd., Blumea 24 (1979) 335.

2. *Neonauclea fagifolia* Merr., J. Wash. Acad. Sci. 5 (1915) 539 = **Adinauclea fagifolia** (Teijsm. & Binn. ex Havil.) Ridsd.; see Ridsd., Blumea 24 (1979) 350.

3. *Neonauclea formosana* (Matsum.) Merr., J. Wash. Acad. Sci. 5 (1915) 539 = **Uncaria hirsuta** Havil.; see Ridsd., Blumea 24 (1978) 94.

4. *Neonauclea foveolata* Capuron, Adansonia II, 12 (1972) 383, pl. 3 = **Gyrostipula foveolata** (Capuron) Leroy; see Ridsd., Blumea 22 (1975) 550.

5. *Neonauclea macrostipula* Capuron, Adansonia II, 12 (1972) 385 = **Janotia macrostipula** (Capuron) Leroy; see Ridsd., Blumea 22 (1975) 550.

6. *Nauclea megaphylla* S. Moore, J. Bot. 62 (1924) Suppl. 47. — *Neonauclea megaphylla* S. Moore, J. Bot. 64 (1926) Suppl. 146. — T y p e: *Forbes s.n.*, s.l. Sumatra (BM) = **Anthocephalus cadamba** (Roxb.) Miq. [*Neolamarckia cadamba* Bosser, Bull. Mus. Nat. Hist. Nat. Paris IV, 6, sect. B, Adansonia 3 (1984) 247, nom. superfl.]

7. *Neonauclea rheophila* Steen., Bull. Jard. Bot. Buitenz. III, 12 (1932) 200 = **Myrmeconauclea rheophila** (Steen.) Ridsd.; see Ridsd., Blumea 24 (1979) 344.

8. *Neonauclea strigosa* Merr., J. Wash. Acad. Sci. 5 (1915) 542 = **Myrmeconauclea strigosa** (Korth.) Merr.; see Ridsd., Blumea 24 (1979) 344.

9. *Neonauclea zeylanica* Merr., J. Wash. Acad. Sci. 5 (1915) 542 = **Diyaminauclea zeylanica** (Hook.f.) Ridsd.; see Ridsd., Blumea 24 (1979) 345.

* See C.E. Ridsdale, A revision of the tribe Naucleeae s.s. (Rubiaceae). Blumea 24 (1979) 307–366.

Legends to the Plates (pages 258–272):

Calyces of species of *Neonauclea*, the numbers corresponding with the species numbers in the text. The drawings are based on the collections mentioned. Magnification all × 12 except when indicated otherwise.

Plate 1: **1:** *Forbes 969*; **2:** *van Steenis 11176*; **3:** *PNH 87797*; **4:** *Kostermans 5954*.
Plate 2: **5a:** *SAN 28564*; **b:** *SAN 66973*, both × 6; **6:** *Endert 3291*; **7:** *bb 11376*.
Plate 3: **8a:** *Kahar NBFD 10216*; **b:** *Enggoh NBFD 10425*.
Plate 4: **9:** *S 34764*; **10 a, b:** *BRUN 762*.
Plate 5: **11:** *Ramlanto & Fanani 777*, × 6; **12:** *Lörzing 14996*.
Plate 6: **13:** *Forbes 2605A*.
Plate 7: **14 a:** *S 33411*; **b:** *S 41394*; **15:** *BS 2106*.
Plate 8: **16:** *BS 80109*; **17:** *PNH 11705*; **18:** *BS 28267*; **19:** *FB 26045*; **20:** *Kjellberg 273*.
Plate 9: **21 a:** *PNH 18462*; **b:** *Cuming 833*; **22:** *FB 30302*; **23:** *de Vogel 5756*; **24:** *Koorders 18699*; **25:** *Hallier 1615*; **26:** *S 36470*; **27:** *Waitz s.n.* (L sh. 908.219-264); **28:** *S 30432*.
Plate 10: **29:** *Wenzel 348*; **30:** *Ebalo 922*; **31:** *Elmer 15442*; **32:** *Merrill 542*.
Plate 11: **33:** *bb 33808*; **34:** *NGF 33836*; **35:** *Kostermans 1350*; **36:** *Jacobs 9305*.
Plate 12: **38:** *de Vriese & Teijsmann s.n.* (L sh. 908.219-821); **39:** *de Vogel 6055*; **40:** *Pleyte 274*; **41:** *Kornassi 491*; **42:** *Elbert 3477*; **43:** *Bünnemeijer 11167*.
Plate 13: **44 a:** *Hartley 12196*; **b:** *Brass 21647*; **c:** *Reinwardt s.n.* (L sh. 908.219-444); **45 a:** *NGF 12234*; **b:** *NGF 5276*; **46:** *van Royen 4021*; **47:** *BW 4952*; **48:** *BW 7600*; **49:** *BW 10769*; **50:** *Hartley 10921*; **51:** *BW 13018*; **52:** *BW 5691*; **53:** *Brass & Versteegh 13509*.
Plate 14: **54:** *van Royen & Sleumer 7538*; **55:** *NGF 45879*.
Plate 15: **56:** *Schodde 2580*; **57:** *NGF 48099*; **59:** *BW 2147*; **60:** *BSIP 2623*; **61:** *BSIP 9306*.

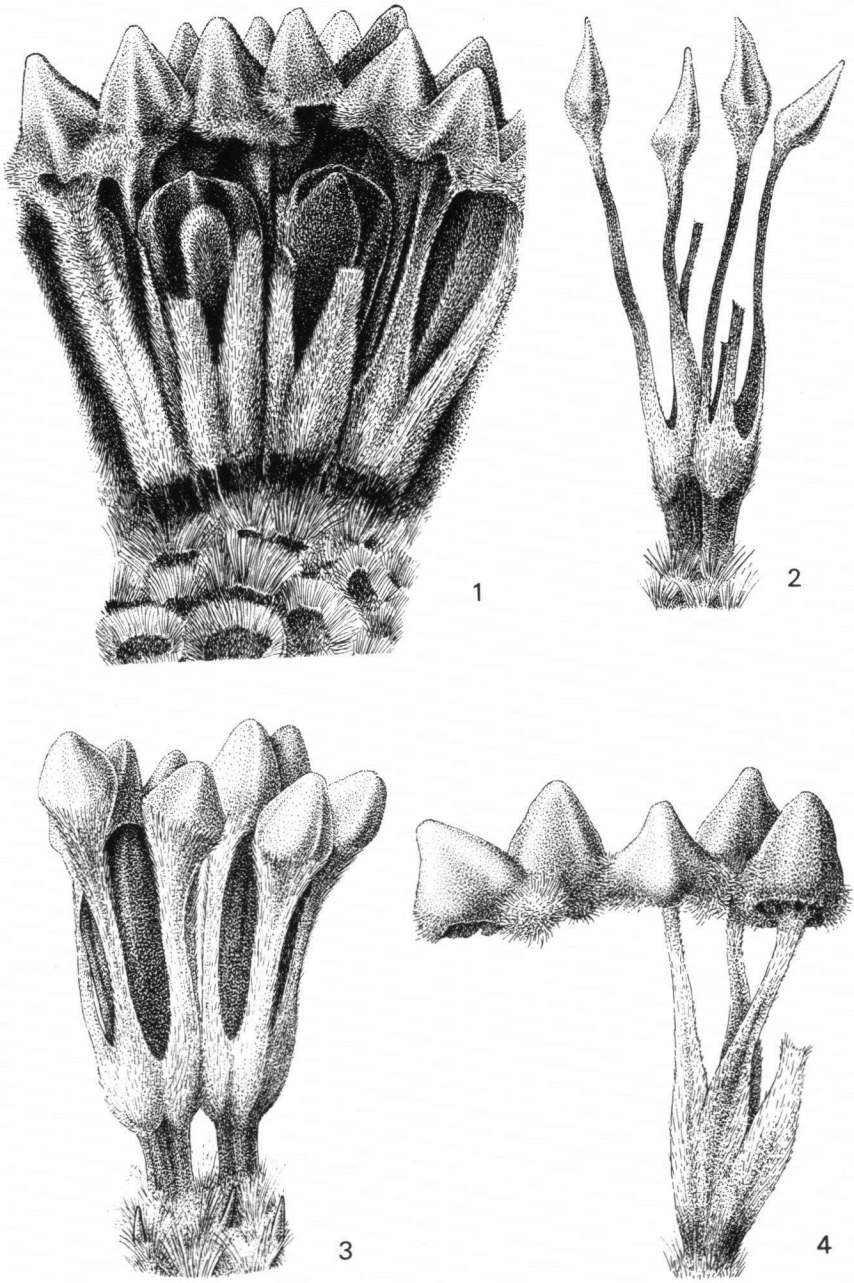
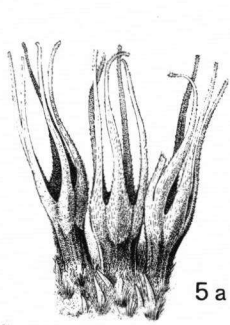


PLATE 1



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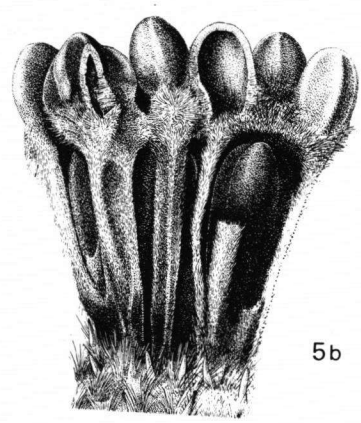

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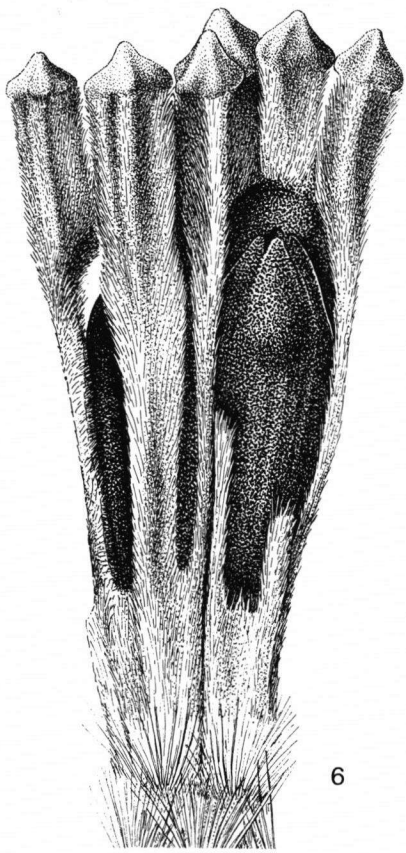

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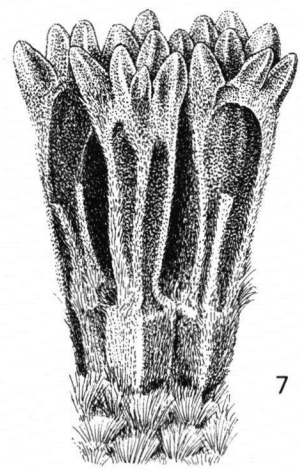

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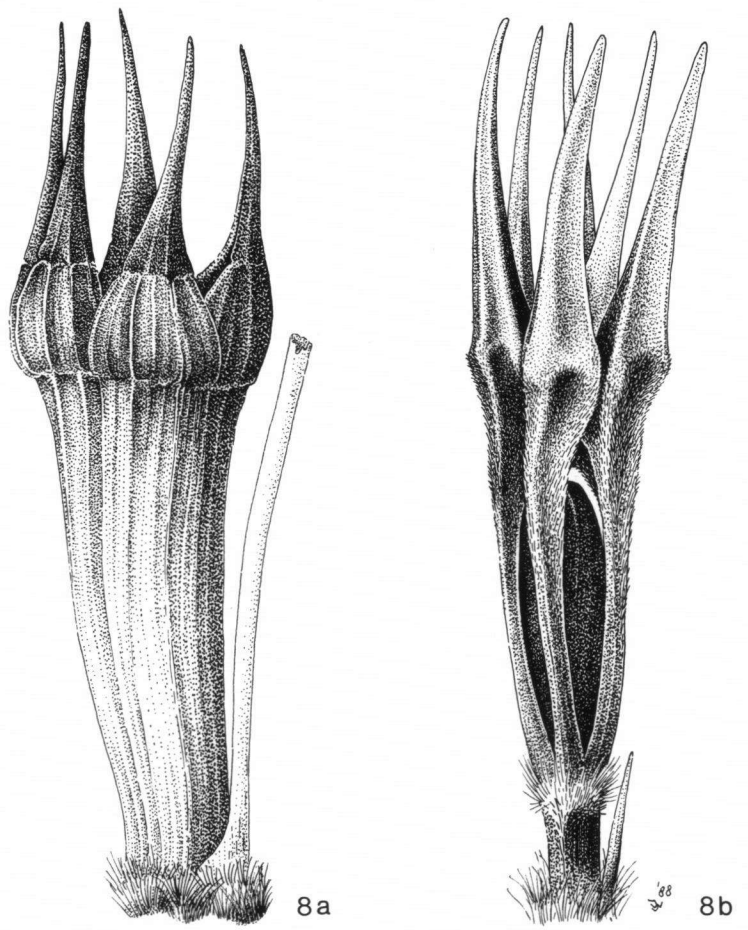

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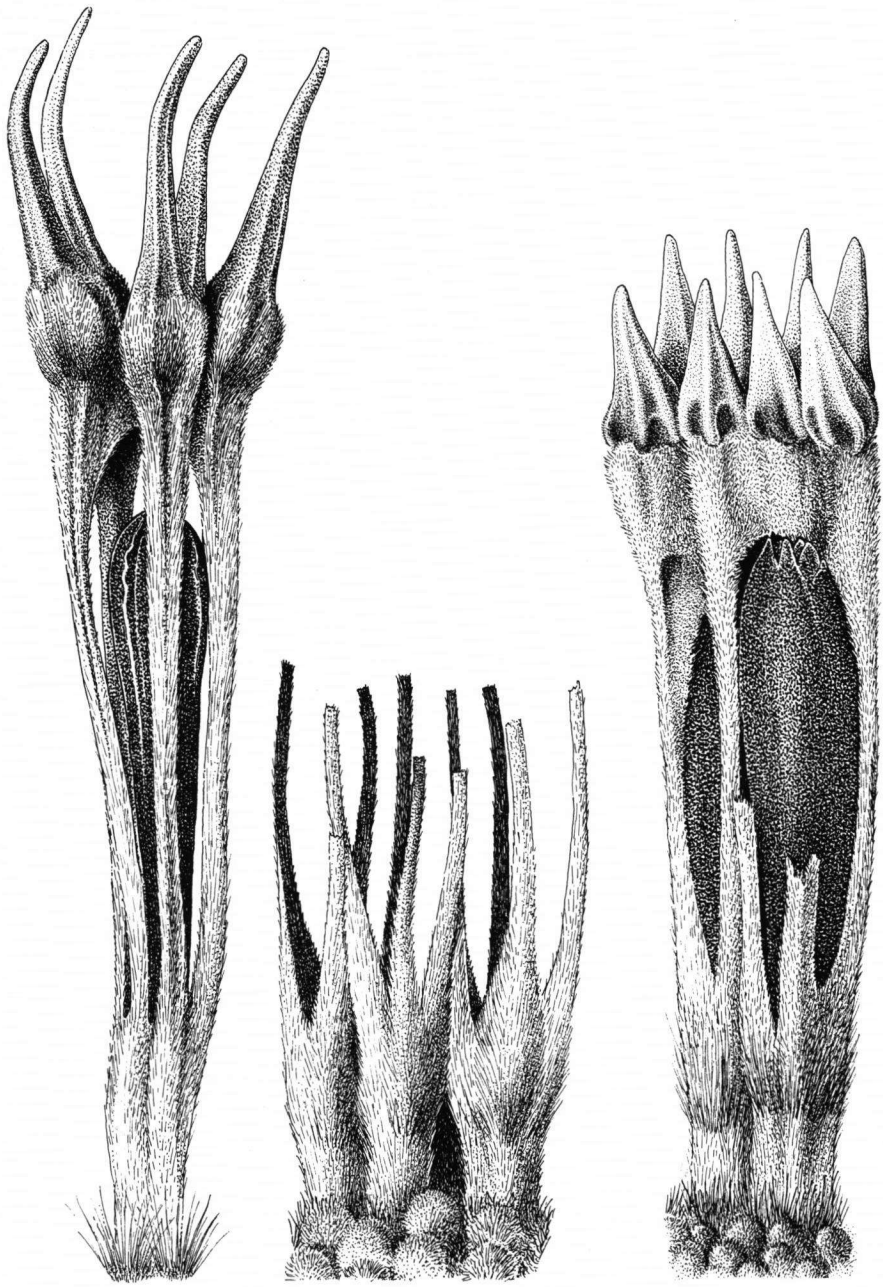

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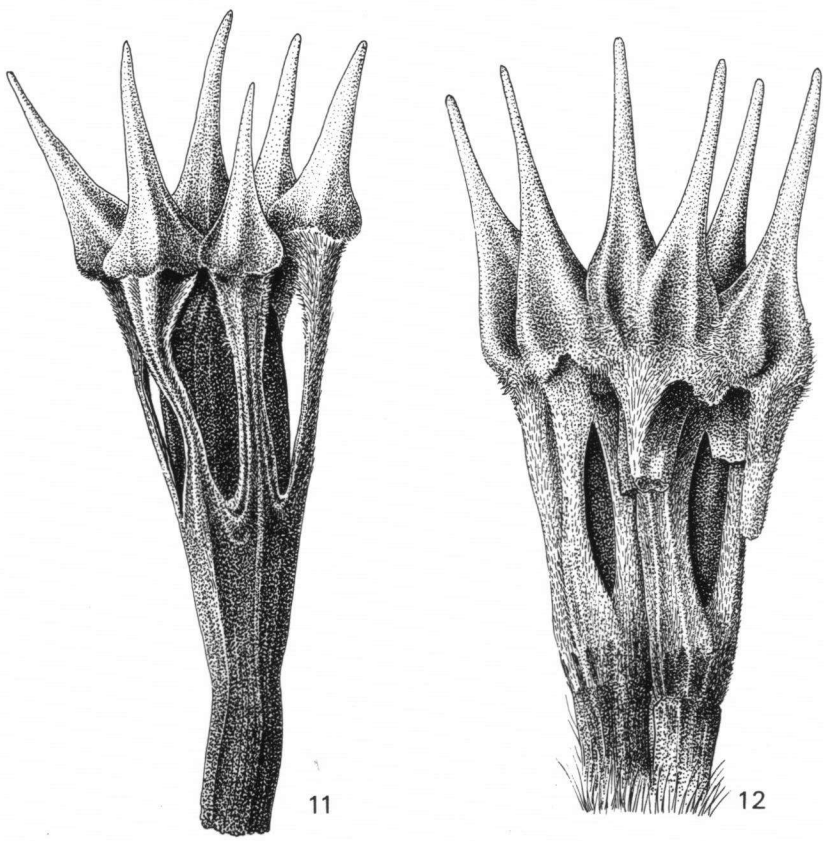

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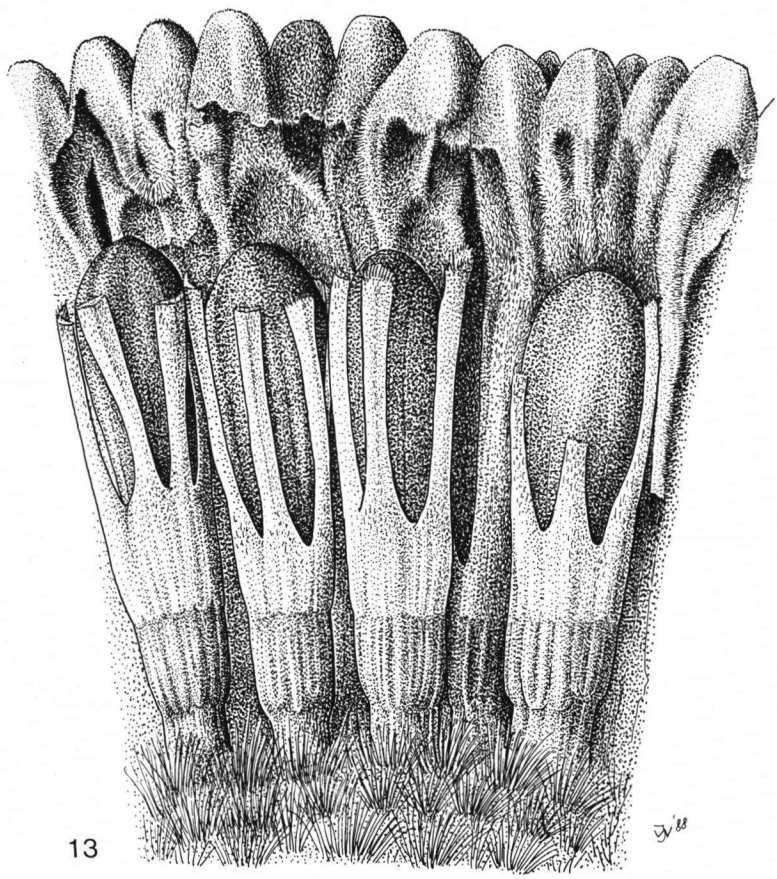

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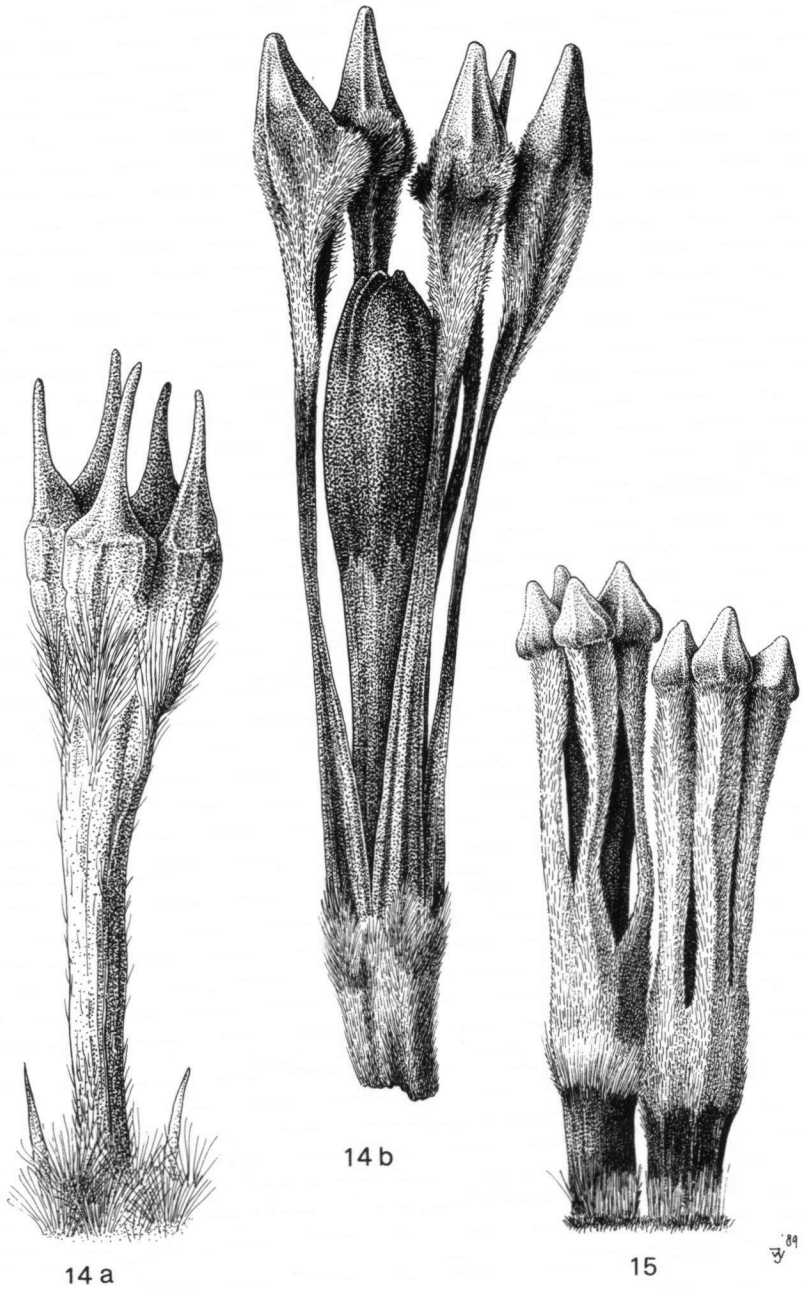

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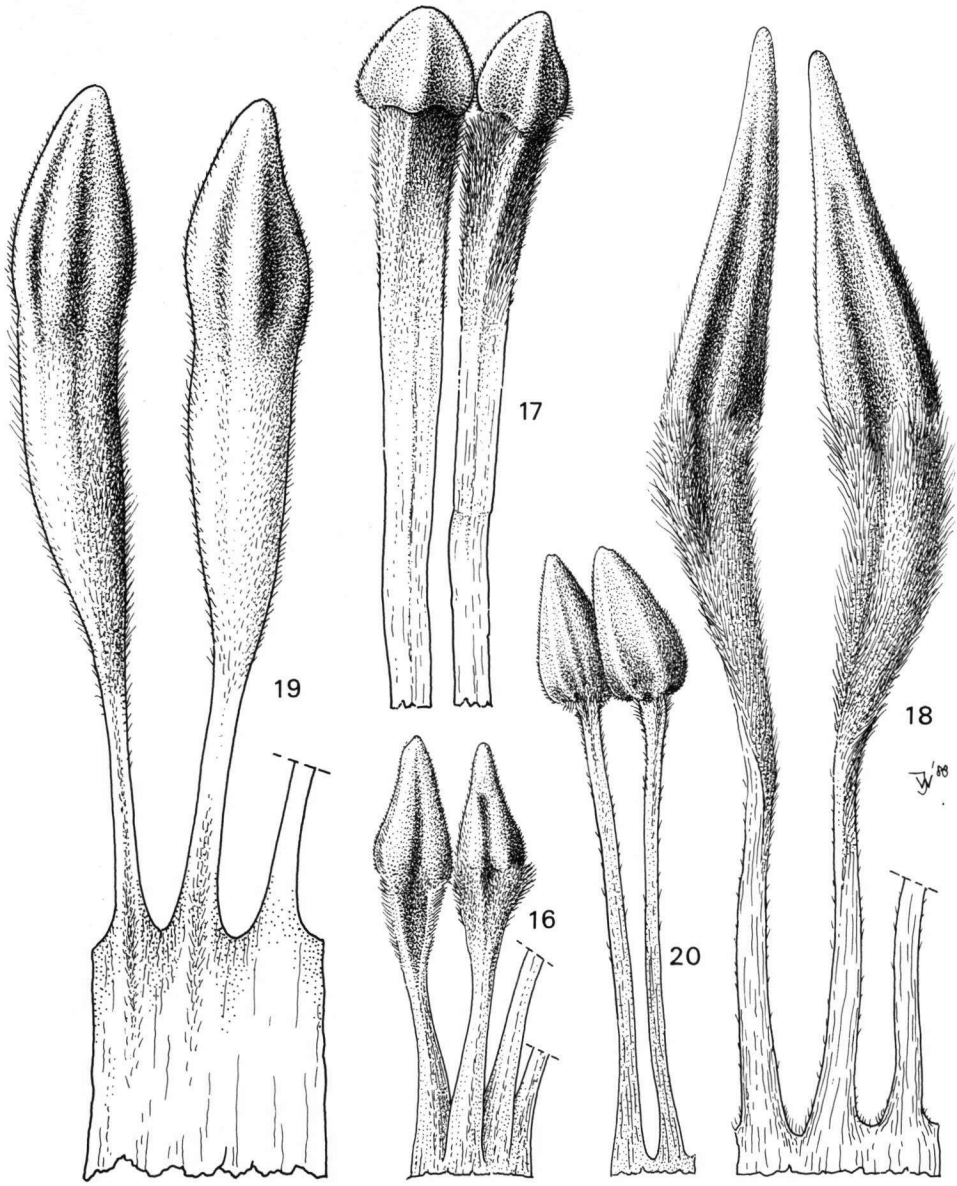

PLATE 8

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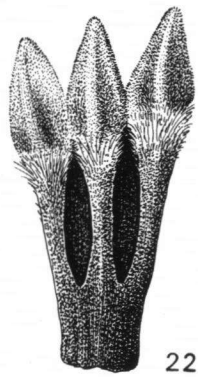

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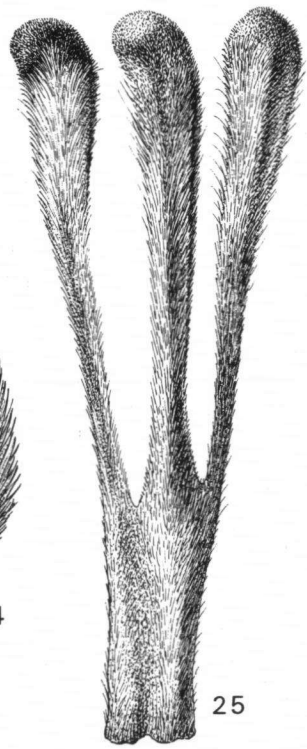

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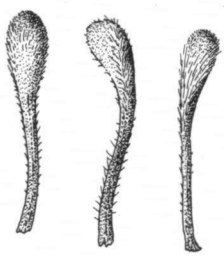

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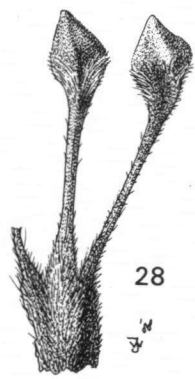

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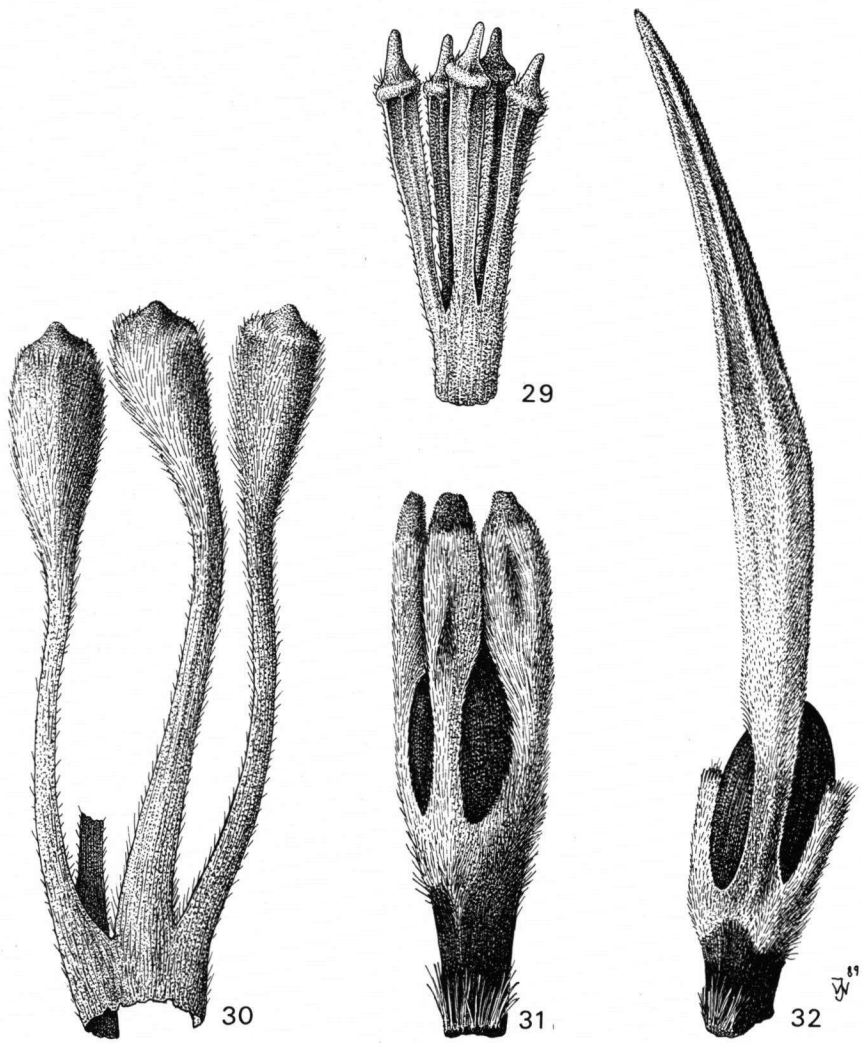
PLATE 9



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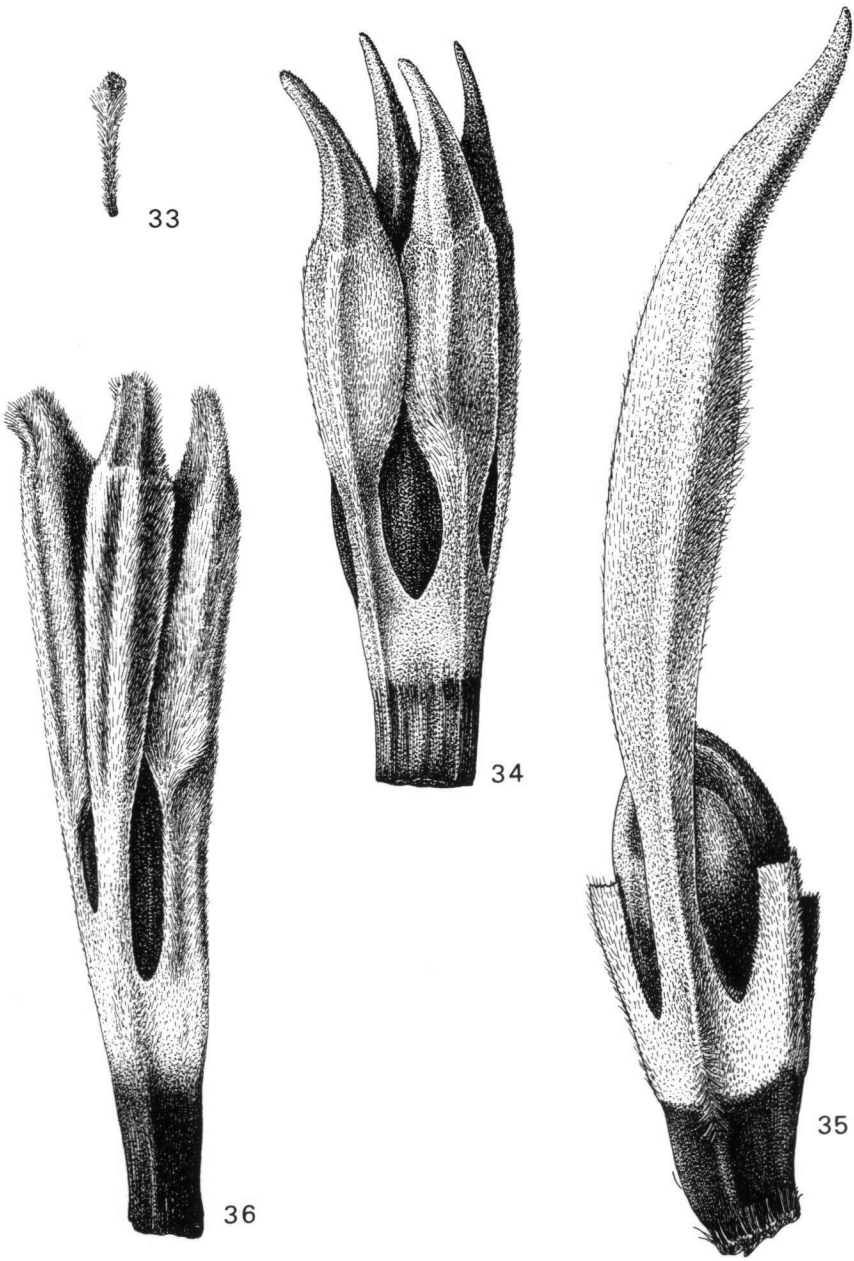

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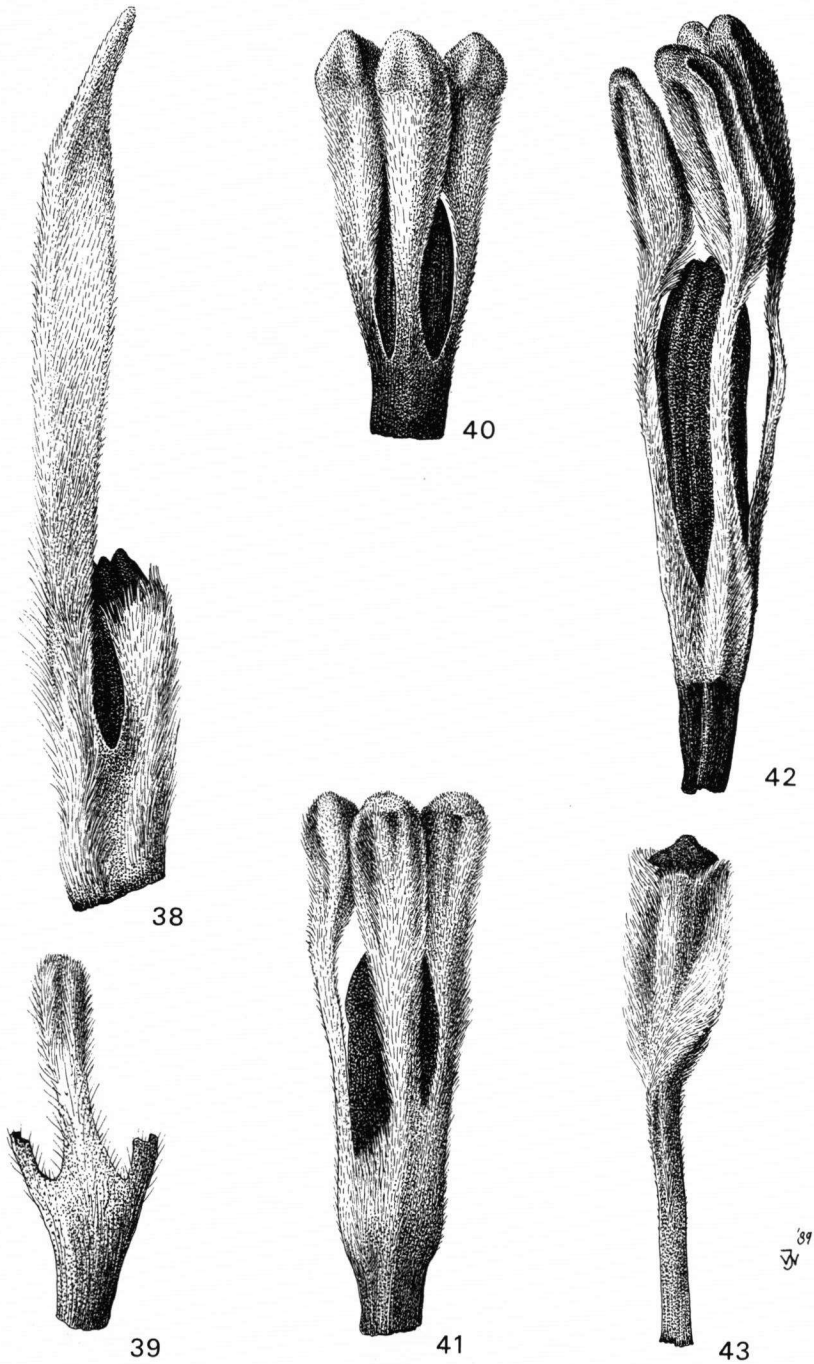

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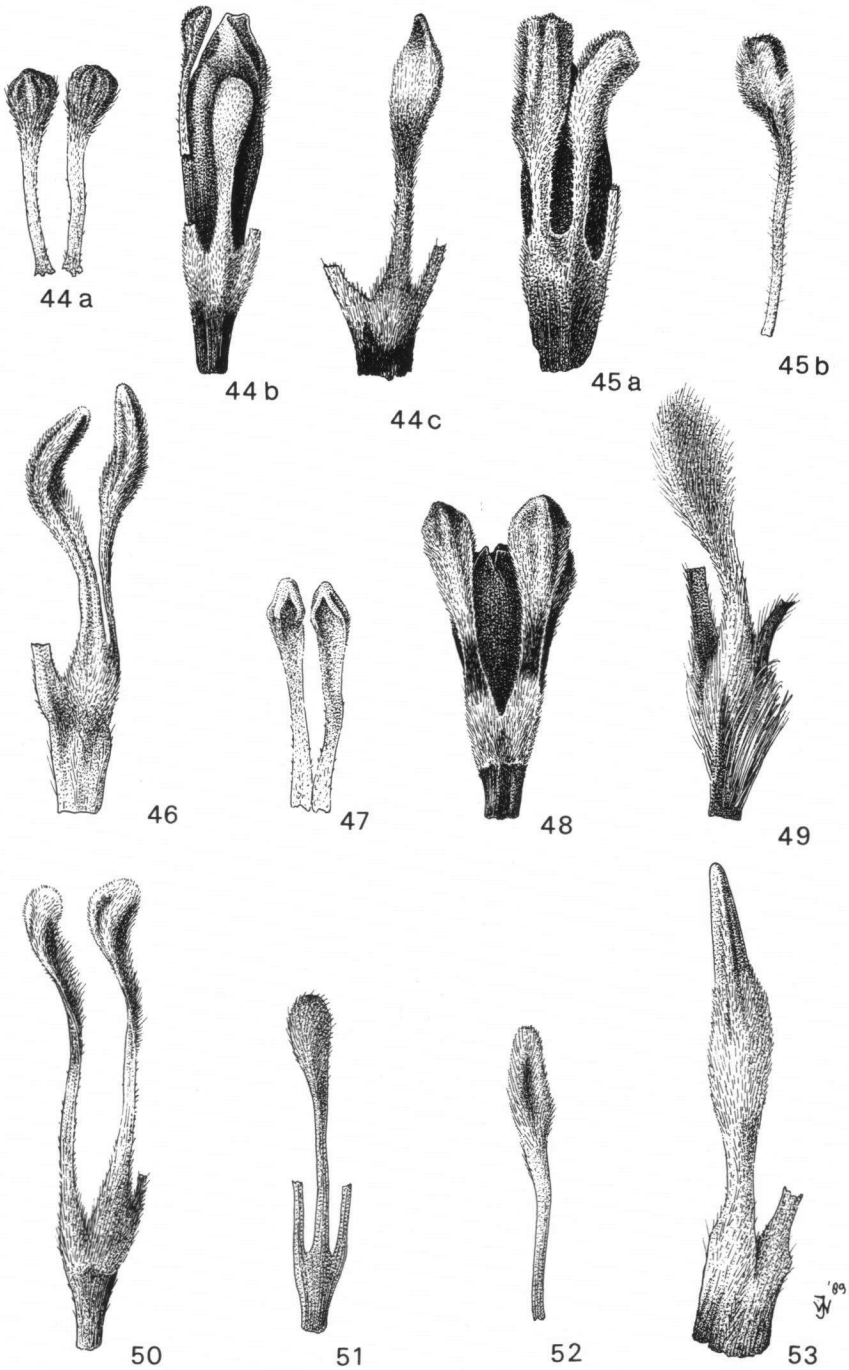

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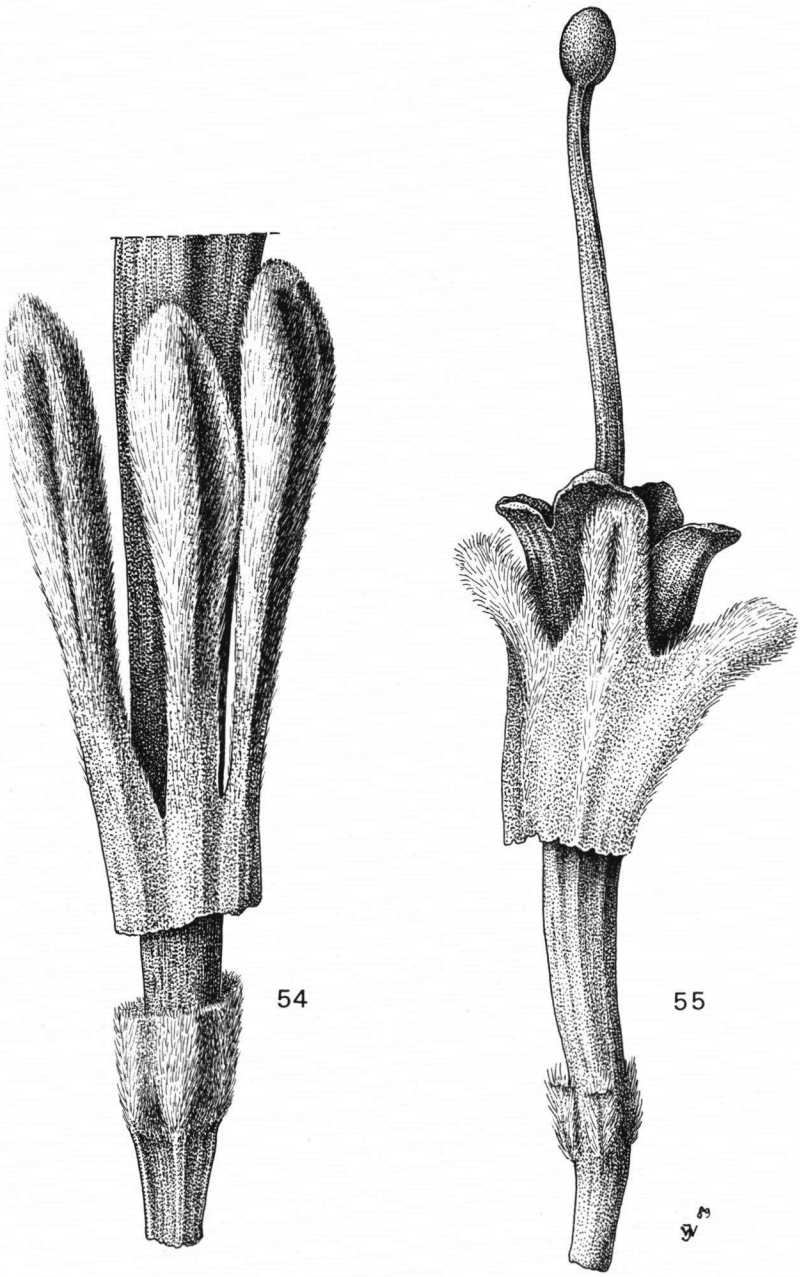

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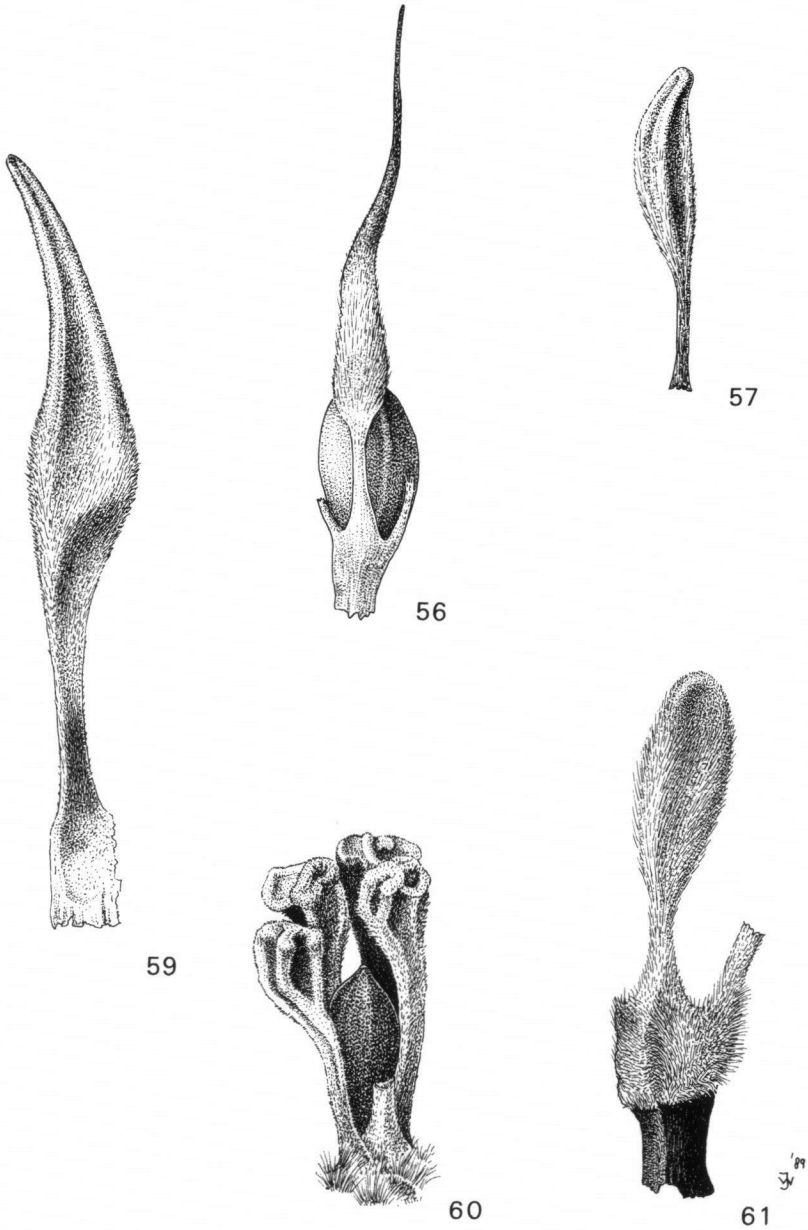

PLATE 15

INDEX OF SPECIFIC AND INTRASPECIFIC NAMES

Numbers and letters refer to the number and letter of accepted species and infraspecific categories. Accepted names are in roman type, new names and combinations in **bold type**, synonyms in *italics*. 'Excl.' and 'Dub.' refer to excluded and dubious species listed at the end of the paper; 'Key' refers to some SE Asian genera and species included in the key, previously treated by Ridsdale (1979), and not included in the present text; here the *italic* numbers following refer to the couplet in the key.