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THE PENINSULAR MALAYAN SPECIES OF DISCHIDIA (ASCLEPIADACEAE)

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SUMMARY

A critical study is given of 23 species of *Dischidia*. The ecology, morphology, and floral biology are discussed, and there is a key to the species. Full attention is paid to synonomy, resulting in many reductions. *Dischidia subulata* subsp. *angustata* subsp. nov. is described; *D. klossii* Ridl. is reduced to *D. acutifolia* subsp. *klossii* (Ridl.) Rintz *comb. nov.*

INTRODUCTION

In 1923 Ridley (fl. Mal. Pen. 2: 402) recognized 24 species of *Dischidia*, occurring within peninsular Malaya and Singapore. Ridley's treatment was an uncritical expansion of the work of Hooker *f.* (Fl. Brit. Ind. 4, 1884: 49) and King & Gamble (J. As. Soc. Beng. 74, 2 (1908) 580), to which he added a number of new species. He doesn't seem to have consulted Beccari (Malesia 2, 1886: 248), several of Beccari's species being obviously identical to those cited by Ridley, but the latter makes no mention of synonomy.

While Ridley's work was in progress, Merrill in 1921 (J. Str. Br. Roy. As. Soc. 84: 504) published an enumeration of the Bornean species, and in 1923 (En. Phil. Fl. Pl. 3: 347) an enumeration of the Philippine species. Neither work, however, was critical in its approach to synonomy. In 1951 Kerr (in Craib, Fl. Siam. En. 3, 1: 42) published a critical account of the Thai species and in 1965 Backer & Bakhuizen (Fl. Java 2: 262) published a rather uncritical review of the Javan species. The very local approach taken by most authors has resulted in large numbers of endemic species, many of which are probably identical to species occurring in other areas.

In this study attention has been given to the problem of synonomy, as it affects the Malayan species. Ridley's 24 species have been reduced in number to 21, two having been reduced to synonomy and one omitted for lack of information. In addition, a number of species from neighbouring areas have been found identical to Malayan species, and 5 of these have been given name priority over the names Ridley used. The known distributions of several Malayan species have subsequently been extended. Also two newly described species have been added for a total number of 23 species currently known from peninsular Malaya.

This paper is the result of 1 year of intensive field study in Malaya. Eighteen of the 23 species here described were collected and 12 of the 15 lowland species were grown at my house near Kuala Lumpur. All of the pertinent material in the herbaria at the Univ. of Malaya (KLU), Forest Research Institute (KEP), Singapore Botanic

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Gardens (SING), Kew (K), British Museum (BM), Berlin (B), and Leiden (L) was examined. My own personal collection was divided between L and the Universiti Pertanian Malaysia (UPM) herbarium, where I worked. Eighteen of the species were illustrated from living material, the remaining five from material at K, L and SING.

ECOLOGY

The genus *Dischidia* comprises only epiphytes. The species occur throughout Malaya and are particularly abundant in well-lighted areas. Trees and bamboos along the coasts, along river banks, on ridges, limestone hills, and on high mountains, as well as trees in orchards, plantations, and parks are often host to dense growths of *Dischidias*. Several different species often occur on the same tree, and it is common to find as many as 4 or 5 different species along 100 m of river bank or mountain trail. In the lowland forests *Dischidias* seem to occur most abundantly from 1 – 10 m above the ground. In the mountain forests, which are frequently cloud covered, they occur abundantly from 1 m to the tops of the trees, often 30 m or more above the ground.

In Malaya *Dischidia* comprises both lowland and mountain species (see Table 1). Thirteen species occur only from Sealevel to *c.* 1000 m and eight species are found only above 1000 m. Two species, however, occur in both areas. *Dischidia bengalensis* is commonly encountered from sealevel to *c.* 1700 m and *D. albida*, though predominantly a mountain species, can be found in the lowlands as well, particularly on limestone hills. Numerous attempts to cultivate mountain species in the lowlands failed. Once collected and relocated, the plants would cease blooming, make only feeble attempts to grow, and usually die after 6 – 8 months.

Table 1. The topographical distributions of the Malayan species of *Dischidia*.

Lowland Species (below 1000 m)	Mountain Species (above 1000 m)
1. *D. albiflora*	1. *D. albida* [2]
2. *D. acutifolia*	2. *D. astephana*
3. *D. bengalensis* [1]	3. *D. longepedunculata*
4. *D. cochleata*	4. *D. subulata*
5. *D. complex*	5. *D. parvifolia*
6. *D. fruticulosa*	6. *D. rhodantha*
7. *D. hirsuta*	7. *D. scortechinii*
8. *D. imbricata*	8. *D. dolichantha*
9. *D. major*	9. *D. vadosa*
10. *D. nummularia*	
11. *D. punctata*	
12. *D. singaporensis*	
13. *D. superba*	
14. *D. tomentella*	

[1] Occurs less commonly above 1000 m.
[2] Occurs less commonly below 1000 m.

COMPARATIVE MORPHOLOGY

Stems and Roots. *Dischidia* stems are long and slender. They range in thickness from *c.* 1 mm in *D. vadosa* to *c.* 4 mm in the succulent stems of *D. bengalensis.* Most species have smooth, glabrous stems, at least at maturity, but those of *D. astephana, D. hirsuta,* and *D. longepedunculata* are hirsute, while those of *D. tomentella* are tomentose.

Dischidias have 2 rooting types. Species with flat or lenticular leaves, e.g. *D. nummularia.* produce roots both at the nodes and irregularly along the stem. These roots branch freely and may spread for 5 – 10 cm along the surface of the tree. Species with convex leaves, e.g. *D. imbricata,* produce roots only at the nodes, and these roots are restricted in their development to the areas beneath the adjacent leaves. The leaves are held closely appressed to the surface of the tree, and provide a dark, humid environment for the roots. Both *D. complex* and *D. major* are unique among the Malayan species in producing both spreading and restricted roots, the latter of which grow down into the pitcher leaves and ramify therein. All parts of the plant contain latex.

Leaves. There are 4 distinct types of leaves. In most species they are essentially flat or lens-shaped in x-section and ovate or elliptical in outline, with entire margins. There is a gland on the upper surface at the base of the blade. A smaller group of species has shell-like leaves which are convex in x-section and orbicular in outline, with entire margins. There is a 1 – 2 mm long, conical projection just above the base on the upper surface of each blade. The leaves are held closely appressed to the surface of the tree on which the plant is growing, and the cavity formed is frequently occupied by ants. Plants in this group were formerly placed in the genus *Conchophyllum* Bl., on the basis of leaf shape, but have since been incorporated into *Dischidia.* Two species, *D. complex* and *D. major,* produce pitcher leaves in tight clusters and flat, ovate leaves on elongate stems. The pitcher leaves are open at the base next to the attachment of the petiole; a single root grows into each leaf and ramifies throughout the empty interior. The pitcher leaves are readily occupied by ants. A fourth leaf type occurs only on *D. bengalensis;* this type is flat in x-section and oblanceolate in outline, with a retuse apex and entire margins. As these leaves age they become nearly round in x-section and obtuse at the apex.

Most leaves are borne oppositely and are glabrous. Only 2 species, *D. fruticulosa* and *D. superba,* commonly bear leaves both alternately as well as oppositely on the same plant. The four species previously cited as having pubescent stems also have pubescent leaves, at least when young. In most cases the vesture of the leaves declines with age, and is often entirely absent from the oldest leaves.

The shade leaves of most species are green. The leaves of lowland species become yellow or buff brown when growing in direct sunlight, while the leaves of mountain species become deep red in exposed situation.

Inflorescence. *Dischidia* flowers are borne on a spirally-elongating raceme. The raceme is long-lived, and may bear 100 or more flowers during its functional lifetime. At any one time, however, only 1 – 8 flowers are present, and these may range in development from small buds to fully opened flowers. In some species the racemes are continuously producing flowers; in others small umbels of flowers are produced at irregular intervals. In most species the raceme is simple but in some it is double; 3 and even 4 racemes occasionally occur on a single peduncle in *D. imbricata.*

The peduncle of the raceme varies in length from nearly absent in *D. bengalensis* to *c.* 10 cm long in *D. complex* and *D. longepedunculata*. In most cases the peduncle is borne erect at the nodes, with the apices of the flowers pointing either horizontally or upward. However, in both *D. hirsuta* and *D. punctata* the peduncle is reflexed, and the apices of the flowers point either horizontally or downward.

F l o w e r . The flower is 5-merous and radially symmetrical (see Fig. 1). The calyx is small, and often has a gland in the angles of the lobes. The corolla is fleshy and, either narrowly or broadly, urceolate. Narrowly urceolate corollas occur in most species, and the corolla lobes are either strongly reflexed, thereby exposing the throat, or are held straight, and afford only a meager opening into the corolla tube. Broadly urceolate corollas occur in only four of the Malayan species, and all have strongly reflexed corolla lobes and little or no inner vesture. The gynostegium is easily visible through the wide throat. It is noteworthy that all but two of the species with convex orbicular leaves, i.e. species which are commonly host to colonies of ants, have the narrowest openings between the lobes.

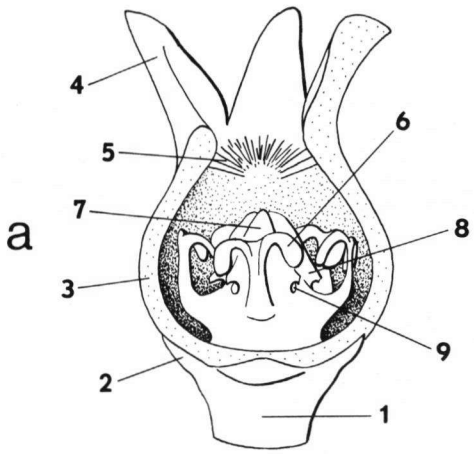
The outer surface of the corolla is generally smooth and glabrous. In *D. astephana*, *D. hirsuta*, *D. punctata*, and *D. rhodantha*, the outer surface of the throat is muricate, and in *D. major* the lobes are puberulous outside. Most species have predominantly white or yellow corollas, often with red lobes; a few have predominantly red corollas, and two species have greenish-yellow ones.

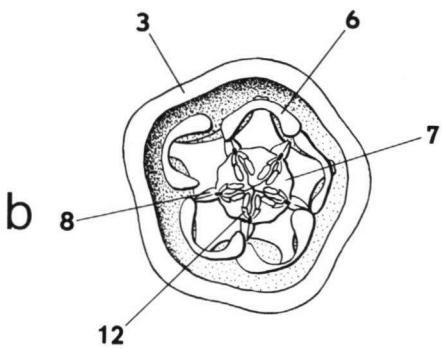
The inner vesture of the corolla varies from none to full lobal and throat pubescence (see Fig. 2). Seven species are entirely or nearly glabrous within, six are pubescent only on the inner surface of the lobes, and six are pubescent only on the throat. The vesture of these latter six species varies from sparsely villous to densely hirsute, with the hairs borne either horizontally or erect. Three species are pubescent on both the lobes and the throat, and a single species, *D. hirsuta*, has glabrous lobes, a pubescent throat, and an additional ring of patent hairs between the base of the corolla and the throat.

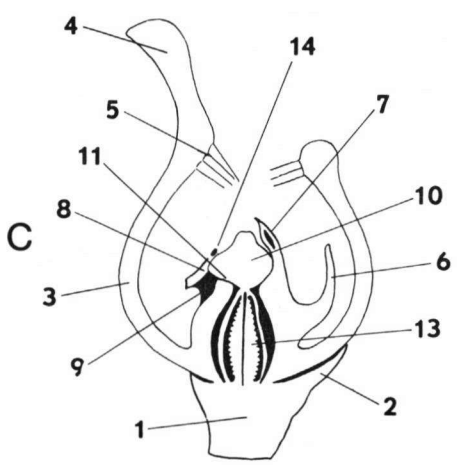
The corolline corona occurs in *c.* 1/3 of the Malayan species, mostly in those species which have convex orbicular, or pitcher, leaves. It commonly consists of five distinct lobes on the inner surface of the corolla alternate with, and immediately below, the corolla lobes. It may also occur as an annulus in the inner throat of the corolla tube. In *D. astephana* the corolline corona is very well developed, with 5 long, bifid lobes projected downward like stalagtites into the gynostegial chamber. In *D. imbricata* and *D. major* it occurs as five small lobes and in *D. cochleata* and *D. albiflora* it occurs as an annulus. All of these species have convex orbicular or pitcher leaves, and all are regularly colonized by ants. In *D. parvifolia*, *D. singaporensis*, and *D. superba*, in which the corolline corona also occurs as distinct lobes, the leaves are flat and do not lend themselves to colonization by ants.

Most *Dischidias* have similar staminal coronas. The staminal corona is composed of hyaline appendages, located directly behind each stamen. These appendages are stalked, and have 2 incurved or reflexed lobes at the apex. They are generally borne parallel to the stamens, and are often referred to in the literature as anchor-shaped.

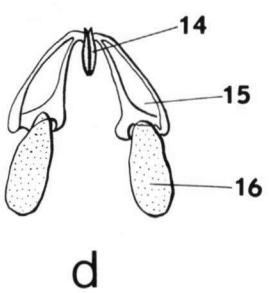
Fig. 1. A representative flower of the genus *Dischidia* (*D. nummularia*). — a. Side view with part of the corolla cut away. — b. top view with the upper corolla cut away. — c. median sectional view. — d. twin-pollinium (*D. subulata*).

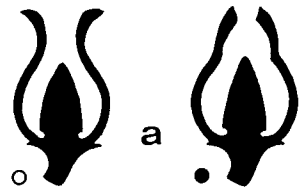






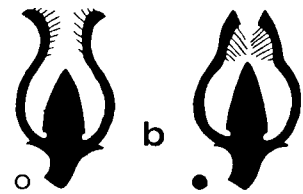
1 Pedicel
2 Calyx
3 Corolla Tube
4 Corolla Lobe
5 Corolla Hairs
6 Corona
7 Anther
8 Anther Wing
9 Access Groove
10 Stigma
11 Receptive Area
12 Twin Pollinia
13 Ovary
14 Corpuscle
15 Caudicle
16 Pollinium





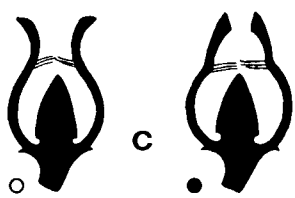
COROLLA ENTIRELY GLABROUS

- ● D. albiflora
- ● D. cochleata
- ○ D. complex
- ○ D. longepedunculata
- ○ D. monticola
- ○ D. parvifolia



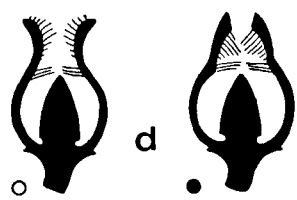
COROLLA LOBES ONLY PUBESCENT

- ● D. albida
- ● D. imbricata
- ● D. major
- ○ D. rhodantha
- ○ D. scortechinii
- ● D. singaporensis



COROLLA THROAT ONLY PUBESCENT

- ● D. acutifolia
- ○ D. astephana
- ○ D. bengalensis
- ○ D. nummularia
- ● D. punctata
- ○ D. tomentella
- ○ D. vadosa



COROLLA LOBES AND THROAT PUBESCENT

- ● D. fruticulosa
- ○ D. superba
- ○ D. tubuliflora

- ○ COROLLA LOBES REFLEXED
- ● COROLLA LOBES INFLEXED

COROLLA THROAT DOUBLY PUBESCENT

- ○ D. hirsuta

Fig. 2. Corolla and corolla vesture types in the Malayan species of *Dischidia*.

Immediately below each coronal appendage is a gland which secrets nectar. In a few species, e.g. *D. rhodantha*, this gland is a pubescent knob just below each coronal appendage.

Several unusual staminal coronas occur in species currently classified under *Dischidia*. In *D. vadosa* the coronal appendages are spatulate with a shallowly bifid apex, and are borne perpendicular to the stamens. In *D. superba* the coronal appendages are short-stalked and saddle-shaped. In *D. astephana*, *D. imbricata*, and *D. parvifolia* there are only small bifid lobes in place of a well developed corona, and *D. longepedunculata* has no corona at all.

The gynostegium in *Dischidia* is generally conical in shape. This is due to the conical stigma, which is usually entirely enclosed by the anthers, and to the well developed anther wings which flare out at the base of the gynostegium. A notable exception is *D. vadosa* in which the gynostegium is short-truncate, with a broad, flat stigma closely covered by the anthers. The anther wings are very small.

There are two basic forms of twin-pollinium in the Malayan *Dischidias*, the major difference being in the shape and length of the caudicles. In most species, the caudicles are approximately twice the length of the corpuscle and broadly triangular in shape. Less commonly, however, the caudicles are either shorter or longer than the corpuscle, but of nearly uniform width from top to bottom.

F o l l i c l e . There are four distinguishable types of follicle. The commonest type occurs in *D. albida* and many others, and is *c.* $6-10 \times 0.2-0.5$ cm, terete, and with an acute apex. The color is usually a shade of green or red. In *D. major* and three others the follicle is *c.* $5 \times$ c 0.5 cm, reniform in x-section, and with a blunt apex. The color is usually green. In *D. astephana* and three others it is *c.* 3×0.5 cm, half-terete in x-section, and with an acute apex. The color is green to deep red. In *D. superba* the follicle is *c.* 7×1 cm, deeply triangular in x-section, and with an acute apex. It is golden yellow in color. In most species of *Dischidia* the follicle is held pendant, but in both *D. cochleata* and *D. parvifolia* it is held erect.

The seeds are comose. Germination is rapid with no apparent resting period.

POLLINATION

Pollination in *Dischidia* requires the insertion of a twin-pollinium into the groove formed by the anther wings. Although pollination was not observed, the structure and color of the flowers suggest moths and/or butterflies as vectors. The pale urceolate corolla with its often narrow mouth, and pubescent inner surface, is ideally suited to the lepidopterous proboscis. Indeed, the stiff lobal and throat hairs seem so placed as to hinder the entry of small insects, but to facilitate the passage of a filiform object. If the proboscis were inserted into the corolla in a probing manner, it could easily lodge in a corpuscle on the up stroke, and pull a twin-pollinium free. Another down and up motion could insert a twin-pollinium into the groove formed by the anther wings, and so pollinate the flower. It follows that the flowers are self-pollinated.

Dischidia flowers are frequently visited by ants, and this has led to claims that ants are vectors of pollination (Ong Siew Ling, Master's Thesis, 1974, Univ. of Malaya). This theory, however, overlooks the size relationship between ants and twin-pollinia. Any ant small enough to negotiate within the flower would be *c.* $3 \times$ or less the length of the twin-pollinia. It is unlikely that such an ant could accidently

dislodge a firmly-held twin-pollinium 1/3 as long as itself, and proceed to accidently insert it between the anther wings of the same or neighbouring flower. Such a process would require a much larger insect. I might add that I grew 12 species of *Dischidia* in moth-proof huts for over 1 year without their setting a single fruit, though both flowers and ants were abundant.

TAXONOMY

The scope of this study was too small for a revision of the sections, but some interesting observations were made. The species which have convex-orbicular or pitcher leaves, and which are commonly placed together in section *Conchophyllum*, are actually a disparate group containing species with 2 different forms of twin-pollinium. *Dischidia complex*, which has pitcher leaves, and a staminal corona similar to that in *D. major*, is actually more closely related to *D. longepedunculata*, a species lacking both of these structures. The similarity in peduncles, corollas, and twin-pollinia between *D. complex* and *D. longepedunculata* leaves no doubt as to the closeness of their relationship, while their total discontinuity in staminal coronal characters is indicative of the insignificance of this structure in delimiting relationships between species. *Dischidia major* is linked by similarities in gynostegia, twin-pollinia, and follicles to a very natural group of 4 species, *D. hirsuta*, *D. punctata*, *D. rhodantha*, and *D. singaporensis*, all of which have flat ovate leaves. Section *Conchophyllum* is no longer tenable.

There are several other natural relationships apparent. *Dischidia acutifolia* and *D. fruticulosa* are very closely related, with nearly identical flowers and twin-pollinia; *D. albida*, *D. monticola* and *D. scortechinii* have similar gynostegia and twin-pollinia, and the same holds for *D. minor* and *D. bengalensis*, and for *D. albiflora* and *D. parvifolia* which seem to form natural pairs. The remaining species are too distinct for speculation.

GEOGRAPHY

The known distributions of the Malayan species of *Dischidia* are somewhat vague, due to unresolved synonomy and insufficient collecting. Their approximate distributions are presented in Table 2. Eight of the 23 species occurring within Malaya are endemic. Of the ramaining 17 species, 13 also occur in Borneo and 11 in Sumatra. Java has 13, and Thailand 9 species in common with Malaya, and the numbers decrease rapidly both east and west of these 2 areas. India-Assam has only 5 species in common with Malaya, and New Guinea-Australia 4.

KEY TO THE SPECIES

1a. Some leaves pitcher-shaped 2
b. All leaves convex, flat or lenticular 3
2a. Pitcher leaves lanceolate-ovate. . . . . **4. D. major**
b. Pitcher leaves orbicular . . . . . **14. D. complex**
3a. Leaves convex 4
b. Leaves flat or lenticular 8

	NE. India-Assam	Indochina	S. Thailand-S. Burma	Malaya	Sumatra	Borneo	Java	Philippines	Celebes	Moluccas	New Guinea
D. acutifolia			O	O	O	O	O	O	O		
D. albida				O	O	O			O		
D. albiflora	O		O	O		O					
D. astephana				O		O					
D. bengalensis	O	O	O	O	O	O	O	O	O	O	O
D. cochleata				O	O	O	O				
D. complex				O		O					
D. fruticulosa				O							
D. hirsuta		O	O	O	O	O	O	O	O	O	O
D. imbricata	O	O	O	O	O	O	O				
D. longepedunculata				O							
D. major	O	O	O	O	O	O	O	O	O	O	O
D. subulata				O	O						
D. nummularia	O	O	O	O	O	O	O	O	O	O	O
D. parvifolia				O							
D. punctata			O	O	O	O	O	O			
D. rhodantha				O							
D. scortechinii				O							
D. singaporensis				O							
D. superba				O							
D. tomentella			O	O							
D. tubuliflora				O	O	O					
D. vadosa				O							
Total:	5	5	9	23	11	13	8	6	6	4	4

Table 2

4a. Plant hirsute, at least when young 5
b. Plant glabrous at all stages 6
5a. Peduncles less than 1 cm long . . . . . **2. D. astephana**
b. Peduncles 5 – 10 cm long . . . . . **13. D. longepedunculata**
6a. Peduncles less than 0.8 cm long 7
b. Peduncles 1 – 4 cm long . . . . . **3. D. imbricata**
7a. Corolla lobes 1/4 – 1/3 as long as the tube. . . . . **1. D. cochleata**
b. Corolla lobes 1/2 – 2/3 as long as the tube. . . . . **9. D. albiflora**
8a. Leaves oblanceolate . . . . . **15. D. bengalensis**
b. Leaves ovate, elliptical, or lanceolate 9
9a. Leaves 1 – 3 cm long 10
b. Leaves more than 3 cm long 19
10a. Apex of leaf retuse . . . . . **6. D. rhodantha**
b. Apex of leaf acute 11
11a. Peduncles reflexed 12
b. Peduncles erect 13
12a. Plant hirsute. . . . . **8. D. hirsuta**
b. Plant glabrous . . . . . **7. D. punctata**
13a. Pedicels 7 – 10 mm long 14
b. Pedicels 2 – 3 mm long 15
14a. Corolla *c.* 3 × 2.5 mm. . . . . **10. D. parvifolia**
b. Corolla *c.* 2 × 4.5 mm. . . . . **11. D. vadosa**
15a. Internodes 1 – 3 cm long. . . . . **16. D. nummularia**
b. Internodes more than 4 cm long 16
16a. Plant tomentose . . . . . **17. D. tomentella**
b. Plant glabrous 17
17a. Corolla more than 1 cm long . . . . . **20. D. dolichantha**
b. Corolla less than 1 cm long. 18
18a. Corolla cylindrical. . . . . **19. D. albida**
b. Corolla ovoid . . . . . **5. D. singaporensis**
19a. Leaves lanceolate . . . . . **18. D. scortechinii**
b. Leaves elliptical or ovate 20
20a. Leaves more than 4 × as long as wide . . . **21b. D. acutifolia** ssp. **klossii**
b. Leaves *c.* 3 × as long as wide 21
21a. Peduncles less than 0.5 cm long . . . . . **23. D. superba**
b. Peduncles more than 1 cm long 22
22a. Corolla lobes strongly reflexed . . . . . **12. D. subulata**
b. Corolla lobes partially or not reflexed 23
23a. Leaf veins visible above . . . . . **21a. D. acutifolia** ssp. **acutifolia**
b. Leaf veins not visible above . . . . . **22. D. fruticulosa**

1. Dischidia cochleata Bl. – Fig. 3.

D. cochleata Bl., Bijdr. (1826) 1060; Mus. Bot. Lugd. Bat. 1 (1850) 148, f. 27. – T y p e : Java, *Blume 1692* (L).
D. coccinea Griff., Notul. 4 (1854) 192; Icon. Pl. As. 3 (1854) t. 409. – T y p e : Malaya, Malacca, *Griffith* (*n.v.*).

Stem glabrous. *Roots* nodal, restricted to beneath the leaves. *Leaves* convex-orbicular, 1.5 – 3 × 2 – 3 cm, glabrous, purple below; base with a *c.* 1 mm long conical projection. *Inflorescence* 1 – 7 flowered on erect peduncle *c.* 0.5 cm long; raceme simple; pedicels 2 – 3 mm long, glabrous. Corolla tube entirely glabrous inside, 3 – 4 × 3 mm, with erect muricate lobes *c.* 1.5 mm long; tube red or orange, lobes blue; corolline corona an annulus in the throat of the tube. *Corona appendages* stalked with a cordate apex and 2 incurved lobes; stigma with a capitate apex. *Caudicles* less than 1/2 the length of the corpuscle. *Follicle c.* 2.5 × 0.4 cm, half-terete, green, erect.

Distribution. Sumatra, Malaya, Java, and Borneo.

Ecology. Uncommon to rare on trees in lowland and hill forests in the southern 2/3 of the Peninsula; seen once in Selangor; reported from Malacca, Pahang, and Singapore.

Notes. Blume's type is without flowers, but his drawing matches Griffith's drawing exactly.

2. Dischidia astephana Scort. *ex* King & Gamble. – **Fig. 4.**

D. astephana Scort. ex King & Gamble, J. As. Soc. Beng. 74, 2 (1908) 582. — Type: Malaya, Perak, Bujong Malacca, *Scortechini 1897* (n.v.).
Conchophyllum angulatum Schltr., Engl. Bot. Jahrb. 40, Beibl. 92 (1908) 6. — Type: Malaya, Perak, Maxwell's Hill, *Schlechter 13176* (n.v.).

Stem and leaves hirsute, often becoming glabrous with age. *Roots* nodal, restricted to beneath the leaves. *Leaves* convex-orbicular, *c.* 2.5 × 2.5 cm, strongly ridged and purple below, bullate above between the veins; base with a *c.* 2 mm long conical projection. *Inflorescence* 1 – 4 flowered on erect peduncle *c.* 0.5 cm long; raceme simple; pedicels *c.* 2 mm long, pubescent. *Corolla tube c.* 5 × 7 mm long with reflexed lobes *c.* 2 mm long, prominently 5-angled, narrowing abruptly to the base of the lobes; angles and lobes yellow-orange to deep red, interspaced by deep blue; throat closed by a dense ring of white hairs; corolline corona of 5 deeply bifid lobes. *Corona appendages* recumbent, broadly spatulate and bilobed at the apex. *Caudicles* narrow, shorter than the corpuscle. *Follicle c.* 3 × 0.5 cm, half-terete, red, pendent.

Distribution. Malaya and Borneo.

Ecology. Abundant on trees in mountain forests, often completely enclosing entire branches. Occurs on the summit of Gunong Tahan at *c.* 2200 m, the highest elevation for *Dischidia* in Malaya. The hollows beneath the leaves are inhabited by ants. Often growing in association with *D. albida*, *D. parvifolia* and *D. vadosa*.

3. Dischidia imbricata (BL.) Steud. — **Fig. 5.**

D. imbricata (BL.) Steud., Nomencl. ed. II, 1 (1840) 519; DC., Prod. 8 (1844) 632. — *Conchophyllum imbricatum* Bl., Bijdr. (1826) 1060. — Type: Java, *Blume s.n.* (L.).
D. depressa Clarke *ex* King & Gamble, J. As. Soc. Beng. 74, 2 (1908) 582. — Type: Malaya, Malacca, *Maingay K. D. 1115* (K).

Stem glabrous. *Roots* nodal, restricted to beneath the leaves. Leaves convex-orbicular, *c.* 2 × 2.5 cm, deep red below with a green margin; base with a *c.* 1 mm

long conical projection, glabrous. *Inflorescence* 1 – 4 flowered on erect peduncle 1 – 2.5 cm long; raceme often multi-fid; pedicels *c.* 2 mm long, glabrous. *Corolla tube c.* 3 × 4 mm with erect lobes *c.* 2 mm long, pale yellow; inside surface of lobes with reflexed white hairs; corolline corona of 5 shallow lobes. *Corona appendages* of 2 minute lobes. *Caudicles* narrow, *c.* 2 × the length of the corpuscle. Follicle unknown.

Distribution. NE. India, Burma, Indo-China, Thailand, Sumatra, Malaya, Java, and Borneo.

Ecology. Rare on trees in lowland forests near the west coast; seen only at Wang Tangga, Perlis, but also recorded from Malacca.

Notes. Blume's type has no flowers but matches well in all other respects. Kerr's drawing at BM of a flower from Maingay's specimen matches my own. The drawing in Beccari (Malesia 2 (1878) t. 60, fig. 8 – 12) is also a good match.

4. Dischidia major (Vahl) Merr. — **Fig. 6.**

D. major (Vahl) Merr., Interpr. Rumph. (1917) 437. — *Collyris major* Vahl, Skrift. Nat. Hist. Sels. 6 (1810) 460. — Type: Malaya, *Koenig* (C).
D. rafflesiana Wall., Pl. As. Rar. 2 (1831) 35; Cat. (1831) 4208. — Type: Malaya, *Koenig* (BM).
D. clavata Wall., Pl. As. Rar. 2 (1831) 36; Cat. (1831) 4209. — Type: India, Attran R., *Wallich 4209* (K).
D. timorensis Decne., Nouv. Ann. Mus. 3 (1834) 377, t. 17. — Type: Timor (n.v.).
D. merguiensis Becc., Malesia 2 (1886) 264. — Type: Burma, Mergui, *Griffith s.n.* (K).
D. bauerlenii Schltr., Engl. Bot. Jahrb. 40, Beibl. 92 (1908) 2. — Type: Thursday I., *Bauerlen 99* (B).
D. pubiflora Schltr., Beih. Bot. Centralbl. 34, 2 (1916) 11. — Type: Celebes, Kabetan I., *Schlechter 20686* (B).

Stem glabrescent. *Roots* nodal and adventitious, spreading; those produced at pitcher-bearing nodes growing into and ramifying throughout the pitcher leaves. Leaves of two types: flat-orbicular, 2 – 3 × 1.5 – 2 cm, produced at nodes 10 – 15 cm apart; the other type pitcher-form, 6 – 12 × 2 – 4 cm, appressed to the surface of the host, deep purple inside, produced at nodes 1 – 3 cm apart; base truncate; both leaf types puberulescent. *Inflorescence* 1 – 6 flowered on erect peduncle 0.3 – 5 cm long; raceme simple or bifid; pedicels *c.* 3 mm long, puberulous. *Corolla tube* 6 – 8 × 3 – 4 mm long with erect lobes *c.* 2 mm long, yellow-green or striped yellow and green; inside surface of lobes with short white hairs, not closing the throat; corolline corona of 5 shallow lobes. *Corona appendages* stalked with a cordate apex and 2 incurved lobes. *Caudicles* narrow, as long as the corpuscle. *Follicle c.* 5 × 0.5 cm, reniform in x-section, yellow-green, pendent.

Distribution. NE. India, Burma, Indo-China, Thailand, Borneo, Sumatra, Malaya, Java, Celebes, Philippines, Australia, and New Guinea.

Ecology. Locally common on trees along the coasts and up to 1000 m on coastal mountains, forming large clusters on the branches. Common at Pulau Pangkor and abundant on Gunong Ledang (Mt. Ophir), where it grows on the grass at 800 m. The pitcher leaves are commonly inhabited by ants.

5. Dischidia singaporensis Ridl. — **Fig. 7.**

D. singaporensis Ridl., J. Str. Br. R. As. Soc. 61 (1912) 31. — Type: Singapore, Changi Police Station, *Ridley s.n.* (SING).

Stem glabrous. *Roots* nodal and adventitious, spreading. *Leaves* flat-ovate, 1.5 – 2.5 × 1 – 1.8 cm, glabrous; apex acute. *Inflorescence* 1 – 5 flowered on erect peduncle 1 – 2 cm long; raceme simple; pedicels 3 – 4 mm long, pubescent. *Corolla tube c.* 5 × 3 mm with erect lobes *c.* 1 mm long, color unknown; inside surface of lobes with short, reflexed hairs, not closing the throat; corolline corona of 5 narrow lobes. *Corona appendages* stalked with a cordate apex and 2 incurved lobes. *Caudicles* narrow, as long as the corpuscle. *Follicle* unknown.

Distribution. Malaya.

Ecology. Rare on trees in Singapore; known only from the type location.

Notes. In the original description, Ridley cites a second specimen from Bukit Mandi, Singapore. This specimen is without flowers but definitely belongs to *Hoya lacunosa* Bl.

6. **Dischidia rhodantha** Ridl. — **Fig. 8**

D. rhodantha Ridl., J. Str. Br. R. As. Soc. 79 (1918) 97. – *D. rosea* Ridl., J. Str. Br. R. As. Soc. 61 (1912) 31, *non D. rosea* Schltr. (1906). — Type: Malaya, Selangor, Sempang mines (near Bukit Fraser), *Ridley s.n.* (SING).

Stem glabrous. *Roots* nodal and adventitious, spreading. *Leaves* flat-ovate, 2 – 2.5 × 1 – 1.5 cm, glabrous; apex retuse. *Inflorescence* 1 – 5 flowered on erect peduncle 0.5 – 2 cm long; racemes simple; pedicels 2 – 3 mm long, glabrous. *Corolla tube c.* 7 × 5 mm with partially reflexed lobes *c.* 2 mm long; surface muricate, deep pink; lobes pubescent inside; no corolline corona. *Corona appendages* stalked with an incurved phylliform lobe at the apex and 2 recurved outer lobes; base with a pubescent knob. *Caudicles* triangular, 2 × as long as the corpuscle. *Follicle c.* 6 × 0.3 cm, terete, reddish green, pendent.

Distribution. Malaya.

Ecology. Occasional on trees in mountain forests; at Cameron Highlands and Frazer's Hill, Pahang, and probably throughout the Main Range.

7. **Dischidia punctata** (Bl.) Decne. — **Fig. 9.**

D. punctata (Bl.) Decne. in DC., Prodr. 8 (1844) 631. — *Leptostemma punctatum* Bl., Bijdr. (1826) 1059. — Type: Java, *Blume s.n.* (L).
D. joloensis Schltr., Fedde Rep. 13 (1915) 557. – Type: Philippines, Jolo I., Mt. Dajo, *Merrill* 5327 (B).
D. viridiflora Ridl., J. F. M. S. Mus. 10 (1920) 146. — Type: Malaya, Kelantan, Chaning. *Ridley s.n.* (SING).
D. punctatoides Bakh. f., Blumea 6 (1950) 377. — Type: Java, *Docters v. Leeuwen 8754* (L).

Stem glabrous. *Roots* nodal and adventitious, spreading. *Leaves* flat-ovate, 2 – 3 × 1.2 – 1.5 cm, glabrous; apex acute. *Inflorescence* 1 – 5 flowered on reflexed peduncle *c.* 0.5 cm long; raceme simple; pedicels *c.* 3 mm long, pubescent. *Corolla tube c.* 7 × 4 mm with partially reflexed lobes *c.* 2 mm long; surface muricate, yellow-green with dark green stripes, turning yellow before falling; inside of tube with a wide ring of patent white hairs; no corolline corona. *Corona appendages* stalked with a smooth obtuse apex and 2 recurved lobes. *Caudicles* triangular, 2 × as long as the corpuscle. *Follicle* 6 – 7 × 0.4 cm, reniform in x-section, green, pendent.

Distribution. S. Thailand, Sumatra, Malaya, Java, Borneo, and Philippines.

Ecology. Locally common on trees in lowland and hill forests in Selangor; recorded elsewhere only from Kelantan but probably occurring throughout the Peninsula.

Notes. Ridley described his specimen as lacking a corona, but a dissection of one of the flowers from his type by Kerr (in Craib, Fl. Siam. En. 3, 1951: 48) showed that a corona is definitely present.

8. Dischidia hirsuta (Bl.) Decne. — **Fig. 10.**

D. hirsuta (Bl.) Decne, in DC., Prodr. 8 (1844) 632. — *Leptostemma hirsutum* Bl., Bijdr. (1826) 1058. — Type: Java, *Blume s.n.* (L).
Leptostemma fasciculatum Bl., Bijdr. (1826) 1058; — *D. fasciculata* (Bl.) Decne. in DC., Prodr. 8 (1844) 632. — Type: Java, *Blume* (L).
D. brunoniana Griff., Notul. 4 (1854) 44 — Type: Burma, Mergui, *Griffith* (n.v.)
D. euryloma Schltr. in K. Sch. & Laut., Nachtr. Fl. Deutsch. Südsee (1905) 356. — Type: Neu Mecklenburg, *Schlechter 14620* (B).
D. subpeltagira Schltr. in K. Sch. & Laut., Nachtr. Fl. Deutsch. Südsee (1905) 360. — Type: New Guinea, Torricelli Mts., *Schlechter 14601* (B).
D. pulchella Schltr., Beih. Bot. Centralbl. 34, 2 (1916) 12. — Type: Celebes, Minahassa, *Schlechter 20636* (B).
D. verruculosa Schltr., Beih. Bot. Centralbl. 34, 2 (1916) 13. — Type: Celebes, Kuala Besar, *Schlechter 20650* (B).

Stem densely hirsute when young, becoming less so, and occasionally glabrous, with age. *Roots* nodal and adventitious, spreading. *Leaves* flat-ovate, 1.5–2.5 × 1–1.5 cm, hirsute on both surfaces when young; apex acute; margins recurved. *Inflorescence* 1–5 flowered on reflexed peduncle *c.* 0.8 cm long; raceme simple; pedicels *c.* 3 mm long, glabrous. *Corolla tube c.* 6 × 5 mm with partially reflexed lobes *c.* 3 mm long; base angled; surface muricate; tube deep red; lobes pink; inside with 2 rings of up-curved hairs, one just below the lobes, the other in the throat; 5 small erect lobes in the angles of the corolla lobes. *Corona appendages* stalked with a truncate apex and 2 incurved lobes. *Caudicles* triangular, 1.5 × as long as the corpuscle. *Follicle c.* 6 × 0.5 cm, reniform in x-section, green, pendent.

Distribution. Burma, Indo-China, Thailand, Borneo, Sumatra, Malaya, Java, Philippines, Celebes and New Guinea.

Ecology. Common throughout the Peninsula on trees in lowland and hill forests and on limestone hills. The comparatively large and vivid flowers are very striking.

9. Dischidia albiflora Griff. — **Fig. 11.**

D. albiflora Griff., Notul. 4 (1854) 47. — Type: Malaya, Malacca, Tabong, *Griffith 3779* (K).
D. collyris Wall., Pl. As. Rar. 2 (1831) 37; Cat. (1831) 4207 (nomen.). — Type: India, Assam, Attran R., *Wallich 4207* (not at K).
D. borneensis Becc., Malesia 2 (1886) 262, t. 60, fig. 7–12. — Type: Borneo, Sarawak, Kuching, *Beccari 793* (n.v.).

Stem glabrous, *Roots* nodal, restricted to beneath the leaves. *Leaves* convex-orbicular, 1–2 × 2–2.5 cm, glabrous, purple below; base with a *c.* 1 mm long conical projection. *Inflorescence* 1–5 flowered on erect peduncle 2–5 mm long;

raceme simple; pedicels *c.* 2 mm long, glabrous. *Corolla tube c.* 2 × 4 mm with erect lobes *c.* 2 mm long, pale yellow with pink lobes, entirely glabrous inside; throat constricted; corolline corona of an annulus in the throat of the tube. *Corona appendages* stalked, with an emarginate apex and incurved lobes. *Caudicles* broad-triangular, 2 × as long as the corpuscle. *Follicle* 5 – 6 × 0.5 cm (*n.v.*).

Distribution. NE. India, Burma, Thailand, Malaya, and Borneo.
Ecology. Rare on trees along the coasts.

10. Dischidia parvifolia Ridl. — **Fig. 12.**

D. parvifolia Ridl., J. F. M. S. Mus. 5 (1914) 41. – Type: Malaya, Selangor, Gunong Mengkuang Lebah, *Robinson* (n.v.).

Stem glabrous. *Roots* nodal and adventitious, spreading. *Leaves* flat or lenticular-ovate, 1.5 – 2 × 0.8 cm, glabrous; apex acute. *Inflorescence* 1 – 6 flowered on erect peduncle *c.* 0.3 cm long; raceme simple; pedicels *c.* 10 mm long, glabrous. *Corolla tube c.* 2 × 2.5 mm with reflexed lobes *c.* 1 mm long, white with pink lobes, entirely glabrous inside; corolline corona of 5 narrow ridges. *Corona appendages* of 3 truncate lobes at the base of each stamen, with a sparsely pubescent knob between the 2 outer lobes and below the central lobe; stigma with a bulbous apex. *Caudicles* broad-triangular, 2 × as long as the corpuscle. *Follicle c.* 5 × 0.3 cm, terete, pale green with red spots, borne erect.

Distribution. Malaya.
Ecology. Endemic and common throughout the Peninsula on trees in mountain forests; at Maxwell's Hill, Cameron Highlands, Genting Highlands, and on Gunong Tahan. When not in bloom this species can be easily confused with *D. albida* and *D. vadosa.*

11. Dischidia vadosa Rintz.

D. vadosa Rintz, Blumea 25 (1979) 225, fig. 3. — Type: Malaya, Pahang, Bukit Frazer, Bukit Pokok Pain, Rintz 130 (L).

Stem glabrous. *Roots* nodal and adventitious, spreading. *Leaves* flat or lenticular-ovate, *c.* 1.5 × 1 cm, glabrous; apex acute. *Inflorescence* 1 – 6 flowered on erect peduncle *c.* 0.4 cm long; raceme simple; pedicels *c.* 8 mm long, pubescent. *Corolla tube c.* 1.5 × 4.5 mm with reflexed lobes *c.* 1 mm long; with the lobes white to pink, inside with a few hairs below each lobe, otherwise glabrous; no corolline corona. *Corona appendages* spatulate with a shallowly bifid apex, borne perpendicular to the stamens; stigma broad and flat. *Caudicles* very broad-triangular, 2 × as long as the corpuscle. *Follicle* 2.5 – 3 × 0.5 cm, half-terete, red, pendent.

Distribution. Malaya.
Ecology. Endemic, and locally common on trees in mountain forests at Cameron Highlands and Frazer's Hill. Commonly associated with *D. astephana* and, when not in bloom, easily confused with *D. albida* and *D. parvifolia.*

12. Dischidia subulata Warb.

For synonomy, see under the subspecies.

Stem glabrous. *Roots* nodal and adventitious, spreading. *Leaves* flat-ovate or elliptical, 5 – 7 × 2 – 3 cm, glabrous; apex acute, with a pair of veins parallel to the midvein. *Inflorescence* 1 – 8 flowered on erect peduncle 0.5 – 5 cm long; raceme mostly bifid; pedicels *c.* 3 mm long. *Corolla tube* 3 – 5 × 3 – 4 mm or *c.* 7 × 2.5 mm, with reflexed lobes *c.* 3 mm long, cream or pink with cream or pink lobes, puberulous inside; no corolline corona. *Corona appendages* stalked, with a shallowly dentate apex and 2 short narrow reflexed lobes; base with a pubescent knob. *Caudicles* broad-triangular, *c.* 2.5 × the length of the corpuscle. *Follicle* 8 – 10 × 0.3 cm, terete, pale green with red, pendent.

Distribution. Sumatra and Malaya.
Ecology. Common on trees in mountain forests throughout the Peninsula; occurring only in the understory and not in the crowns of the trees.

KEY TO THE SUBSPECIES

1a. Corolla tube 3 – 5 × 3 – 4 mm . . . . . **a.** subsp. **subulata.**
b. Corolla tube *c.* 7 × 2.5 mm . . . . . **b.** subsp. **angustata.**

a. subsp. **subulata** — **Fig. 13.**

D. subulata Warb., Fedde Rep. 3 (1907) 345. — Type: Sumatra, Forbes 2548c (iso in K).
D. monticola King & Gamble, J. As. Soc. Beng. 74, 2 (1908) 591. — Syntypes: Malaya, Perak, Ulu Batang Padang, *Wray 1503* (K); Maxwell's Hill, Caulfield's Hill, *Scortechini 423* (K).
D. cordifolia King & Gamble, J. As. Soc. Beng. 74, 2 (1908) 590. — Type: Malaya, Perak, Maxwell's Hill, *Scortechini 424* (K).
D. ericaeflora Ridl., F. M. S. Mus. 10 (1920) 146; *non* Beccari (1886) — Type: Malaya, Kedah, Gunong Bintang, *Kloss s.n.* (K).

Corolla tube 3 – 5 × 3 – 4 mm long with reflexed lobes *c.* 3 mm long, cream or pink with either cream or pink lobes. Apex of corona appendages with 3 or 4 shallow dentations, lobes very short. Caudicles with a hook-like appendage on the lower inside margins.

Distribution. Sumatra and Malaya.
Ecology. Common on Maxwell's Hill and at Genting Highlands; also on Gunong Tahan.
Notes. There is some variation in the color of the corolla. On Maxwell's Hill the corollas are entirely cream colored, while on Genting Highlands the tubes are cream or pink with pink lobes.

b. subsp. **angustata** Rintz, *subsp. nov.* — **Fig. 14.**

Differt a subsp. subulata tubo corollae longo et angusto; apice coronae uni-dentato, lobis coronae 2plo longioris et caudiculis absque appendiculis curvis. — Typus: Malaya, Pahang, Cameron Highlands, Tanah Rata at 4700', October 8, 1963, W. L. Chew 873 (L).

Corolla tube *c.* 7 × 2.5 mm with reflexed lobes *c.* 3 mm long, tube and lobes cream colored. Corona appendages with the apex mucronulate, lobes twice as long as in

ssp. *subulata*. Caudicles without a hooklike appendage on the lower inside margins.

Distribution. Malaya.
Ecology. Known only from the type location.
Notes. The epithet refers to the narrow corolla tube.

13. Dischidia longepedunculata Ridl. — **Fig. 15.**

D. longepedunculata Ridl., J. Str. Br. R. As. Soc. 61 (913) 32. — Type: Malaya, Selangor, Sempang Mines, Semangkok Pass, *Ridley 15927* (K).

Stem and leaves hirsute, often becoming glabrous with age. *Roots* nodal, restricted to beneath the leaves. *Leaves* convex-orbicular, *c.* 2 × 2.5 cm, purple below; base with a 1 – 2 mm conical projection. *Inflorescence* 1 – 4 flowered on erect peduncle to *c.* 10 cm long; raceme bifid; pedicels *c.* 3 mm long, pubescent. *Corolla tube c.* 3 × 5 mm with reflexed lobes *c.* 1.5 mm long, pale yellow, lobes pink; inside sparsely pubescent at the base of the corolla lobes, otherwise glabrous; no corolline corona. *Corona appendages* not present. *Caudicles* broad-triangular, *c.* 2.5 × the length of the corpuscle. *Follicle c.* 7 × 0.4 cm, pendent.

Distribution. Malaya.
Ecology. Endemic and rare on trees in mountain forests in Selangor and Pahang.

14. Dischidia complex Griff. — **Fig. 16**

D. complex Griff., Notul. 4 (1854) 50. — Type: Malaya, Malacca, *Griffith* (K).
D. shelfordii Pearson, Ann. Bot. 17 (1903) 617. — Type: Borneo, Sarawak, Kuching, *Shelford* s.n. (K).

Stem glabrous. *Roots* nodal and adventitious, spreading, those produced at pitcher-bearing nodes growing into, and ramifying throughout, the pitcher leaves. *Leaves* of 2 types: flat-ovate, *c.* 1.2 × 0.8 cm, produced at nodes c. 6 cm apart; apex acute; the other type pitcher-form, orbicular, 3 – 6 × 0.8 – 1.5 cm, often with a second smaller pitcher inside, deep purple inside, produced at nodes 3 – 4 cm apart; both types glabrous. *Inflorescence* 1 – 4 flowered on erect peduncle to *c.* 10 cm long; raceme simple; pedicels *c.* 1 mm long, glabrous. *Corolla tube c.* 1.5 × 1.5 mm with reflexed lobes *c.* 1 mm long, pale yellow, inside with a few hairs at the base of the corolla lobes, otherwise glabrous; no corolline corona. *Corona appendages* stalked with an emarginate apex and 2 recurved lobes. *Caudicles* broad-triangular, *c.* 1.5 × as long as the corpuscle. *Follicle c.* 6 × 0.3 cm, terete, pendent.

Distribution. Malaya and Borneo.
Ecology. Rare on trees in lowland forests of the southern half of the Peninsula; recorded most frequently from Johore and Singapore.

15. Dischidia bengalensis Colebr. — **Fig. 17.**

D. bengalensis Colebr., Trans. Linn. Soc. 12 (1817) 357, t. 15. — Type: India, Silhet (n.v.).
D. spatulata Bl., Bijdr. (1826) 1060. — Type: Java, *Blume s.n.* (L).

D. cuneifolia Wall., Pl. As. Rar. 2 (1831) 36; Cat. (1831) 4206. — T y p e : India, Assam, Attran R., *Wallich 4206* (K).
D. littoralis Schltr. in K. Sch. & Laut., Nachtr. Fl. Deutsch. Südsee (1905) 359. — T y p e : Neu Pommern, Massaura, *Schlechter 13722* (B).
D. loeseneriana Schltr., Beih. Bot. Centralbl. 34 (1916) 10. — T y p e : Sumatra, Gunong Merapi, *Schlechter 15960* (B).

Stem glabrous. *Roots* nodal and adventitious, spreading. *Leaves* oblanceolate, 2 – 3 × 0.4 – 0.6 cm, glabrous, flat, with retuse apex when young, becoming round with obtuse apex with age. *Inflorescence* a 1 – 6 flowered sessile simple or bifid raceme; pedicels 2 – 3 mm long, puberulous. *Corolla tube c.* 3 × 4 mm with partially reflexed lobes *c.* 2 mm long, pale yellow or white; base of lobes pilose inside. *Corona appendages* stalked with a retuse apex and 2 recurved lobes. *Caudicles* broad-triangular, *c.* 1.75 × as long as the corpuscle. *Follicle* 5 – 7 × 0.3 cm, terete, pale green to pale brown, pendent.

D i s t r i b u t i o n . NE. India, Burma, Indo-China, Thailand, Sumatra, Malaya, Borneo, Java, New Guinea, and Bismarck Arch.

E c o l o g y . Common on trees throughout the Peninsula from sealevel to *c.* 1700 m on Gunong Tahan; locally abundant along the coasts, on limestone hills and rocky ridges; less common in dense forest.

16. Dischidia nummularia R. Br. — Fig. 18.

D. nummularia R. Br., Prodr. Fl. Nov. Hol. (1810) 461. — T y p e : Australia, Queensland, Endeavor R., *Banks s.n.* (BM). [*Nummularia lactea minor*, Rumph., Herb. Amb. 5 (1747) 472, t. 176, f. 1.]
Collyris minor Vahl, Skrift. Nat. Hist. Sels. 6 (1810) 111; — *D. minor* (Vahl) Merr., Lignan Sci. J. 13 (1939) 67. — T y p e : E. Indies, *Koenig s.n.* (C).
D. gaudichaudii Decne. in DC., Prodr. 8 (1844) 632. – T y p e : Timor, *Gaudichaud* (*n.v.*).
D. orbicularis Decne. in DC., Prodr. 8 (1844) 632. — T y p e : *Timor* (*n.v.*)
D. beiningiana Schltr., in K. Sch. & Laut., Nachtr. Fl. Deutsch. Südsee (1905) 356. — T y p e : Neu Pommern, Beiningbargu, *Schlechter 13686* (B).
D. dirhiza Schltr. in K. Sch. & Laut., Nachtr. Fl. Deutsch. Südsee (1905) 356. — T y p e : New Guinea, Tamara I., *Schlechter 13669* (B).
D. ridleyana Schltr. in K. Sch. & Laut., Nachtr. Fl. Deutsch. Südsee (1905) 358. — T y p e : Singapore, *Schlechter s.n.* (B).
D. schumanniana Schltr. in K. Sch. & Laut., Nachtr. Fl. Deutsch. Südsee (1905) 360. — T y p e : New Guinea, Dun Dorfu Bongu, *Schlechter 14291* (B).
D. copelandii Schltr., Phil. J. Sci., Suppl. 1 (1906) 298. — T y p e : Philippines, Mindanao, Davao, *Copeland 512* (B, iso in K).
D. microphylla Schltr., Engl. Bot. Jahrb. 40, Beibl. 92 (1908) 10. — T y p e : Borneo, Samarinda, *Schlechter 13327* (B).
D. aemula Schltr., Engl. Bot. Jahrb. 50 (1913) 100. — T y p e : New Guinea, Keneyia, Eitape, *Schlechter 18428* (B).
D. sepikana Schltr., Engl. Bot. Jahrb. 50 (1913) 98. — T y p e : New Guinea, Kaiserin-Augusta Fluss (Sepic R.), *Schlechter 19962* (B).
D. actephila Schltr., Beih. Bot. Centralb. 34, 2 (1916) 5. — T y p e : Celebes, Kuala Besar, *Schlechter 20647* (B).
D. decipiens Schltr., Beih. Bot. Centralb. 34, 2 (1916) 8. — T y p e : Celebes, Tondano, *Schlechter 20588* (B).

Stem glabrous. *Roots* nodal and adventitious, spreading. *Leaves* flat or lenticular-ovate, *c.* 1 × 0.8 cm, glabrous; apex mucronate. *Inflorescence* 1 – 5 flowered on erect peduncle *c.* 3 mm long; raceme simple; pedicels 1 – 2 mm long, glabrous. *Corolla*

tube 2 – 3 × 2 – 3 mm with reflexed lobes 1 – 2 mm long, white, inside with a sparse ring of hairs at the base of the lobes; no corolline corona. *Corona appendages* stalked with a retuse apex and 2 recurved spatulate lobes. *Caudicles* broad-triangular, *c.* 2 × as long as the corpuscle. *Follicle* 2 – 2.5 × 0.4 cm, reniform in x-section, pale green or yellow, pendent.

Distribution. NE. India, Burma, Indo-China, Thailand, Sumatra, Malaya, Java, Borneo, Philippines, Celebes, Moluccas, New Guinea and Australia.

Ecology. Very common on trees throughout the Peninsula, in lowland and hill forests, especially along the coasts, on limestone hills, in villages and plantations; not common in dense forest. Probably the most common *Dischidia* in Malaya, and the most abundant and widespread species within the genus.

Notes. The taxonomic confusion within *D. nummularia* is probably due to the large leaves on Brown's type, which give it an appearance different from the Malayan, Javan and Philippine specimens, and to its lack of flowers. Flowers from Australian specimens, however, are essentially the same as on the types of the synonyms, and the fruits are identical.

Both *D. glaucescens* Elmer and *D. pubicaulis* Schltr. are unpublished synonyms of *D. nummularia.*

17. Dischidia tomentella Ridl. — **Fig. 19.**

D. tomentella Ridl., J. Str. Br. R. As. Soc. 59 (1911) 137. — Type: Malaya, Perlis, Bukit Lagi, *Ridley 15225* (K).

Stem tomentose, often becoming glabrous with age. *Roots* nodal and adventitious, spreading. *Leaves* flat-ovate, *c.* 1.2 × 0.7 cm, tomentose when young; apex acute. *Inflorescence* 1 – 5 flowered on erect peduncle 1.5 – 2 cm long; raceme simple; pedicels 3 – 4 mm long, glabrous. *Corolla tube c.* 4 × 1.5 mm with reflexed lobes *c.* 2 mm long, white, with pink lobes; throat closed with stiff white hairs; no corolline corona. *Corona appendages* stalked with a cuneiform apex; anther appendages attenuated into a long column above the stigma. *Caudicles* broad-triangular, *c.* 1.5 × as long as the corpuscle. *Follicle* unknown.

Distribution. Peninsular Thailand and Malaya.

Ecology. Rare on trees on limestone hills in the lowlands.

18. Dischidia scortechinii King & Gamble. — **Fig. 20.**

D. scortechinii King & Gamble, J. As. Soc. Beng. 74, 2 (1908) 592. — Type: Malaya, Perak, *Scortechini 543* (K).

Stem glabrous. *Roots* nodal and adventitious, spreading. *Leaves* flat, most commonly lanceolate, 3 – 5 × 1 cm; less commonly ovate, 1.5 – 2 × 0.7 cm, glabrous; apex acute. *Inflorescence* 1 – 5 flowered on erect peduncle 0.2 – 1 cm long; raceme simple; pedicels 2 – 3 mm long, glabrous. *Corolla tube c.* 5 × 3 mm with reflexed lobes 2 – 3 mm long, creamy white; lobes and throat pubescent inside with short hairs; no corolline corona. *Corona appendages* stalked with a broad obtuse apex and 2 short reflexed lobes; base of gynostegium pubescent. *Caudicles* triangular, *c.* 2 × as long as the corpuscle. *Follicle* 5 – 6 × 0.3 cm, terete, pale green, pendent.

Distribution. Malaya.

Ecology. Endemic and common on trees in mountain forests; occurring only in the understory and not in the crowns of the trees.

19. Dischidia albida Griff. — Fig. 21.

D. albida Griff., Notul. 4 (1854) 46. — Type: Malaya, Malacca, Toondook, *Griffith 3781* (K).
D. kutchinensis Becc., Malesia 2 (1886) 266, *t.* 63, fig. 5–6. — Type: Borneo, Sarawak, Kuching *Beccari 407 (n.v.)*.
D. kawengica Schltr., Beih. Bot. Centralbl. 34 (1916) 9. — Type: Celebes, Gunong Kaweng, *Schlechter 20597* (B).
D. semperflorens Schltr., Beih. Bot. Centralbl. 34 (1916) 12. — Type: Sumatra, Padang Pandjang, *Schlechter 15873* (B).
D. lagenifera Ridl., J. F. M. S. Mus. 8 (1917) 63. — Type: Sumatra, Ridley *s.n.* (K).
D. fultonii Hend., Gard. Bull. S. S. 4 (1927) 51. — Type: Malaya, Johore, Gunong Belumut, *Holttum 10727* (SING).

Stem glabrous. *Roots* nodal and adventitious, spreading. *Leaves* flat or lenticular ovate, 1.5–2 × 1 cm, glabrous; apex acute. *Inflorescence* 1–5 flowered on erect peduncle 0.2–3 cm long; raceme often bifid; pedicels *c.* 2 mm long, glabrous. *Corolla tube c.* 4 × 2 mm with erect lobes *c.* 2 mm long, white, with pink lobes; lobes with short hairs inside, otherwise glabrous; no corolline corona. *Corona appendages* stalked, with a mucronate apex and 2 reflexed lobes; base with a pubescent knob. *Caudicles* triangular, *c.* 2 × as long as the corpuscle. *Follicle c.* 6 × 0.3 cm, terete, pale green, pendent.

Distribution. Sumatra, Malaya, Borneo, and Celebes.

Ecology. Common on trees throughout the Peninsula; most frequently encountered in mountain forests but also occurring on limestone hills and on bamboo in the lowlands.

20. Dischidia dolichantha Schltr. — Fig. 22.

D. dolichantha Schltr., Engl. Bot. Jahrb. 40, Beibl. 92 (24-I-1908) 8. — Type: Sumatra, Tudragiri, S Lalah, *Schlechter 13261* (B).
D. tubuliflora King & Gamble, J. As. Soc. Beng. 74, 2 (20-XI-1908) 592. — Type: Malaya, Perak, *Scortechini 465b* (K).

Stem glabrous. *Roots* nodal and adventitious, spreading. *Leaves* flat or lenticular-lanceolate, 2–3 × 1 cm, glabrous; apex acute. *Inflorescence* 1–5 flowered on erect peduncle 0.3–1 cm long; raceme simple; pedicels *c.* 3 mm long, glabrous. *Corolla tube c.* 12 × 3 mm with reflexed lobes 3–4 mm long, often with a swelling 2/3 up from the base, pale pink or white; lobes pubescent; throat closed by a ring of hairs at the swelling; no corolline corona. *Corona appendages* stalked, with a broad obtuse apex and 2 reflexed lobes; stigma long connate; gynostegium long pedicellate below the corona. *Caudicles* triangular, *c.* 2 × as long as the corpuscle; pollinia narrow, as long as the caudicles. *Folicle c.* 5 × 0.3 cm, terete, pendent.

Distribution. Sumatra, Malaya, and Borneo.

Ecology. Rare on trees in mountain forests of Pahang and Perak.

21. Dischidia acutifolia Maingay ex Hooker *f.*

For synonomy see under the subspecies.

Stem glabrous. *Roots* nodal and adventitious, spreading. *Leaves* flat, ovate or elliptical, 3 – 8 × 0.4 – 3.5 cm, glabrous; apex acute. *Inflorescence* 1 – 5 flowered on erect peduncle 1 – 3 cm long; raceme simple; pedicels *c.* 1 mm long, glabrous. *Corolla tube c.* 2.5 × 2 mm with partially reflexed lobes *c.* 1 mm long, yellow with pink lobes, inside with a ring of hairs at the base of the lobes; no corolline corona. *Corona appendages* stalked with a reniform apex; gynostegium pedicellate. *Caudicles* narrowly triangular, *c.* 1.3 × as long as the corpuscle. *Follicle* 3.5 – 6 × 0.2 – 0.3 cm, terete, pale green to pale yellow, pendent.

Distribution. Thailand, Sumatra, Malaya, Java, Philippines, and Celebes.

KEY TO THE SUBSPECIES

1a. Leaves 5 – 8 × 2 – 3 cm . . . . . **a.** subsp. **acutifolia.**
b. Leaves 3 – 5 × 0.4 – 0.8 cm . . . . . **b.** subsp. **klossii.**

a. subsp. **acutifolia.** — **Fig. 23.**

D. acutifolia Maingay ex Hooker *f.*, Fl. Brit. Ind. 4 (1883) 51. — Type: Malaya, Malacca, *Maingay K. D. 1122* (K).
D. zollingeri Schltr., Engl. Bot. Jahrb. 40, Beibl. 92 (1908) 11. — Type: Java, *Zollinger 2490* (B).
D. brachystele Schltr., Fedde Rep. 13 (1915) 555. — Type: Philippines, Luzon, Bataan, Lamao R., *Merrill s.n.* (B).
D. hoyoides Schltr., Beih. Bot. Centralbl. 34, 2 (1916) 9. — Type: Celebes, Toli-Toli, *Schlechter 20695* (B).
D. pedunculata Schltr., Beih. Bot. Centralbl. 34, 2 (1916) 10. — Type: Sumatra, Tambangan, *Schlechter 15884* (B).

Leaves ovate or elliptical, 5 – 8 × 2 – 3.5 cm. Follicle *c.* 6 × 0.3 cm.

Distribution. Thailand, Sumatra, Malaya, Java, Borneo, Philippines, and Celebes.
Ecology. Common on trees and bamboo in the lowlands throughout the Peninsula; occurring only in the understory and not in the crowns of the trees.

b. subsp. **klossii** (Ridl.) Rintz, *comb. nov.* — **Fig. 23.**

D. lancifolia Ridl., J. F. M. S. Mus. 10 (1920) 102, *non* Merrill, 1918; — *D. klossii* (Ridl.) Kerr in Craib, Fl. Siam. En. 3 (1951) 46. — Type: Thailand, Mamoh, *Kloss 6721* (K).

Leaves elliptical, 3 – 5 × 0.4 – 0.8 cm. Follicle *c.* 3.5 × 0.2 cm.

Distribution. Peninsular Thailand and Malaya.
Ecology. Occasional on trees and bamboo in the lowlands; seen only in Selangor, but probably elsewhere; occurring only in the understory.

22. Dischidia fruticulosa Ridl. — **Fig. 24.**

D. fruticulosa Ridl., J. Str. Br. R. As. Soc. 79 (1918) 96. — Type: Malaya, Perak, Gunong Kerbau, *Robinson s.n.* (K).

Stem glabrous. *Roots* nodal and adventitious, spreading. *Leaves* flat-elliptical, 5 – 7 × 2 – 3 cm, glabrous, borne both alternately or oppositely on the same plant; apex acute. *Inflorescence* 1 – 5 flowered on erect peduncle 0.5 – 2 cm long; raceme simple; pedicels *c.* 2 mm long, glabrous. *Corolla tube c.* 3 × 2.5 mm long with erect lobes *c.* 1 mm long, pale yellow or white, with a deep red throat and lobes; inside of lobes with short hairs, throat with a ring of short hairs; no corolline corona. *Corona appendages* stalked, with a sagittate apex; gynostegium pedicellate. *Caudicles* narrowly triangular, *c.* 2/3 as long as the corpuscle. *Follicle c.* 6 × 0.4 cm, terete, pale green or red, pendent.

Distribution. Malaya.

Ecology. Occasional on trees in hill forests; at Pandang Jeriau, Frazer's Hill at *c.* 800 m and along the trail to Gunong Tahan at *c.* 500 m.

23. Dischidia superba Rintz.

D. superba Rintz, Blumea 25 (1979) 229, fig. 2 — Type: Malaya, Selangor, Sungai Langat, *Rintz 71* (L).

Stem glabrous. *Roots* nodal and adventitious, spreading. *Leaves* flat-obovate or elliptical, 5 – 6 × 3 cm, glabrous, borne alternately or oppositely on the same plant; apex acute. *Inflorescence* 1 – 5 flowered on erect peduncle *c.* 0.3 cm long; raceme simple; pedicels *c.* 2 mm long, glabrous. *Corolla tube* c. 4 × 4 mm with reflexed lobes *c.* 3 mm long; base of tube 5-angled, cream to white; inside of lobes pubescent, throat closed by a ring of patent white hairs; corolline corona of 5 lobes just below the ring of hairs. *Corona appendage* short-stalked with the apex broadly saddle-shaped; stigma with a bulbous apex. Caudicles narrow, *c.* 1/4 as long as the corpuscle. *Follicle c.* 7 × 1 cm, triangular in x-section, golden yellow, pendent.

Distribution. Malaya.

Ecology. Endemic and local on trees in the lowlands and hills of Kelantan, Pahang and Selangor; probably elsewhere.

DOUBTFUL SPECIES

1. **Dischidia pubescens** Ridl., J. Str. Br. R. As. Soc. 57 (1910) 71. — Type: Malaya, Perak, Temengoh Woods, Ridley (n.v.).

I could not find any herbarium material of this plant, but I did find a living specimen in Taman Negara, Pahang which fits the description vegetatively. I grew it but could not get it to bloom.

ACKNOWLEDGEMENTS

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EXPLANATION OF FIGURES 3 – 24

Fig. 3. *Dischidia cochleata* Bl. – a. Habit. – b. flower. – c. flower with part of the corolla cut away. – d. gynostegium from above. – e. gynostegium with 2 corona appendages removed. – f. gynostegium with the corona appendages removed – g. flower in median sectional view. – h. twin-pollinium. (after a living specimen).

Fig. 4. *Dischidia astephana* Scort. ex King & Gamble. – a. Habit. – b. flower. – c. flower with part of the corolla cut away. – d. corolla with part cut away. – e. gynostegium from above. – f. flower in median sectional view. – g. twin-pollinium. (after Rintz 31).

Fig. 5. *Dischidia imbricata* (Bl.) Decne. – a. Habit. – b. flower. – c. flower with part of the corolla cut away. – d. flower in median sectional view. – e. twin-pollinium. (after Rintz 132).

Fig. 6. *Dischidia major* (Vahl) Merr. – a. Habit. – b. fruit. – c. flower. – d. flower with part of the corolla cut away. – e. gynostegium from above. – f. gynostegium with the corona appendages removed. – g. flower in median sectional view. – h. twin-pollinium. (after a living specimen).

Fig. 7. *Dischidia singaporensis* Ridl. – a. Habit. – b. flower. – c. flower with part of the corolla cut away. – d. corona appendage. – e. gynostegium in median sectional view. – f. twin-pollinium. (after Ridley s.n.).

Fig. 8. *Dischidia rhodantha* Ridl. – a. Habit. – b. flower. – c. flower with part of the corolla cut away. – d. gynostegium from above. – e. gynostegium with the corona appendages removed. – f. corona appendage in ventral view. – g. calyx. – h. flower in median sectional view. – i. twin-pollinium. (from a living specimen).

Fig. 9. *Dischidia punctata* (Bl.) Decne. – a. Habit. – b. flower. – c. flower with part of the corolla cut away. – d. gynostegium. – e. gynostegium with the corona appendages removed. – f. flower in median sectional view. – g. twin-pollinium. (after Rintz 21).

Fig. 10. *Dischidia hirsuta* (Bl.) Decne. – a. Habit. – b. flower. – c. flower with part of the corolla cut away. – d. gynostegium from above. – e. gynostegium with 2 corona appendages removed. – f. flower in median sectional view. – g. twin-pollinium. (after Rintz 110).

Fig. 11. *Dischidia albiflora* Griff. – a. Habit. – b. flower. – c. flower with part of the corolla cut away. – d. gynostegium from above. – e. flower in median sectional view. – f. twin-pollinium. (after a living specimen).

Fig. 12. *Dischidia parvifolia* Ridl. – a. Habit. – b. flower. – c. flower with part of the corolla cut away. – d. gynostegium. – e. gynostegium from above. – f. flower in median sectional view. – g. twin-pollinium. (after Rintz 30).

Fig. 13. *Dischidia subulata* ssp. *subulata* – a. Habit. – b. flower. – c. flower with part of the corolla cut away. – d. gynostegium from above. – e. flower in median sectional view. – f. twin-pollinium (after Rintz 7).

Fig. 14. *Dischidia subulata* ssp. *angustata* Rintz. – a. Habit. – b. flower. – c. flower with part of the corolla cut away. – d. gynostegium from above. – e. gynostegium – f. flower in median sectional view. – g. twin-pollinium (after Chew 873).

Fig. 15. *Dischidia longepedunculata* Ridl. – a. Habit. – b. flower. – c. flower with part of the corolla cut away. – d. flower in median sectional view. – e. twin-pollinium. (after Ridley 15927).

Fig. 16. *Dischidia complex* Griff. – a. Habit. – b. pitcher leaf in x-section. – c. flower. – d. flower with part of the corolla cut away. – e. flower in median sectional view. – f. twin-pollinium. (after Amdjah 67).

Fig. 17. *Dischidia bengalensis* Colebr. – a. Habit. – b. flower. – c. flower with part of the corolla cut away. – d. gynostegium from above. – e. flower in median sectional view. – f. twin-pollinium. (after Rintz 45).

Fig. 18. *Dischidia nummularia* R. Br. – a. Habit. – b. flower. – c. flower with part of the corolla cut away. – d. gynostegium from above. – e. flower in median sectional view. – f. twin-pollinium. (after Rintz 66).

Fig. 19. *Dischidia tomentella* Ridl. – a. Habit. – b. flower. – c. flower with part of the corolla cut away. – d. gynostegium. – e. gynostegium in median sectional view. – f. twin-pollinium. (after Ridley 15225).

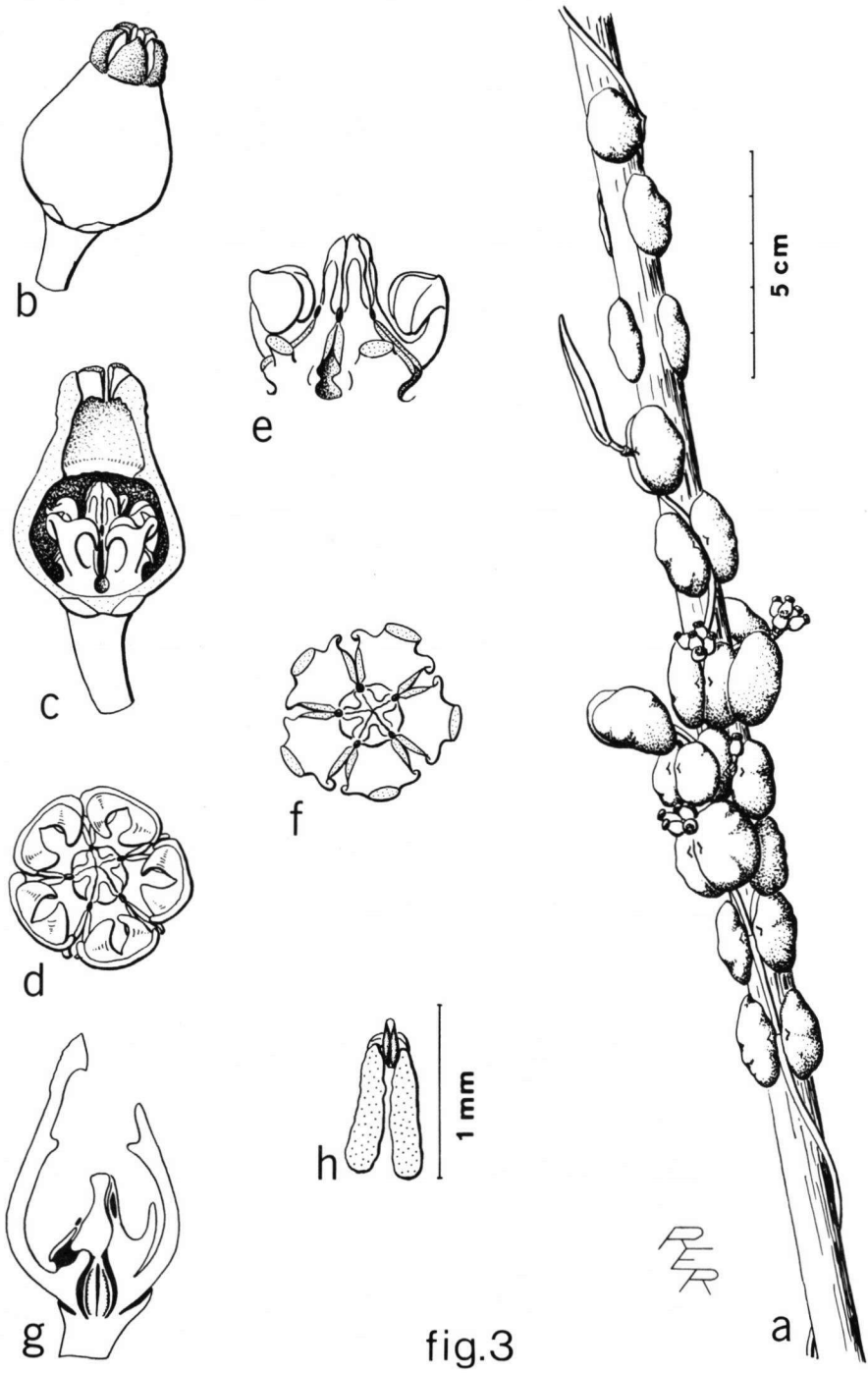
Fig. 20. *Dischidia scortechinii* King & Gamble. – a. Habit. – b. flower; – c. flower with part of the corolla cut away. – d. gynostegium from above. – e. flower in median sectional view. – f. twin-pollinium. (after Rintz 104).

Fig. 21. *Dischidia albida* Griff. – a. Habit. – b. flower. – c. flower with part of the corolla cut away. – d. gynostegium from above. – e. gynostegium with the corona appendages removed. – f. flower in median sectional view. – g. twin-pollinium. (after Rintz 113).

Fig. 22. *Dischidia dolichantha* Schltr. – a. Habit. – b. flower with part of the corolla cut away – c. gynostegium. – d. gynostegium in median sectional view. – e. twin-pollinium. (after Jacobs 5061).

Fig. 23. *Dischidia acutifolia* ssp. *acutifolia* Maingay ex Hook. f. (a – f) and ssp. *klossii* (Ridl.) Rintz (a'). – a & a'. Habit. – b. flower. – c. flower with part of the corolla cut away. – d. gynostegium from above. – e. flower in median sectional view. – f. twin-pollinium. (a – f. Rintz 19. – a'. Rintz 20).

Fig. 24. *Dischidia fruticulosa* Ridl. – a. Habit. – b. flower. – c. flower with part of the corolla cut away. – d. gynostegium. – e. flower in median sectional view. – f. twin-pollinium. (after Rintz 79).



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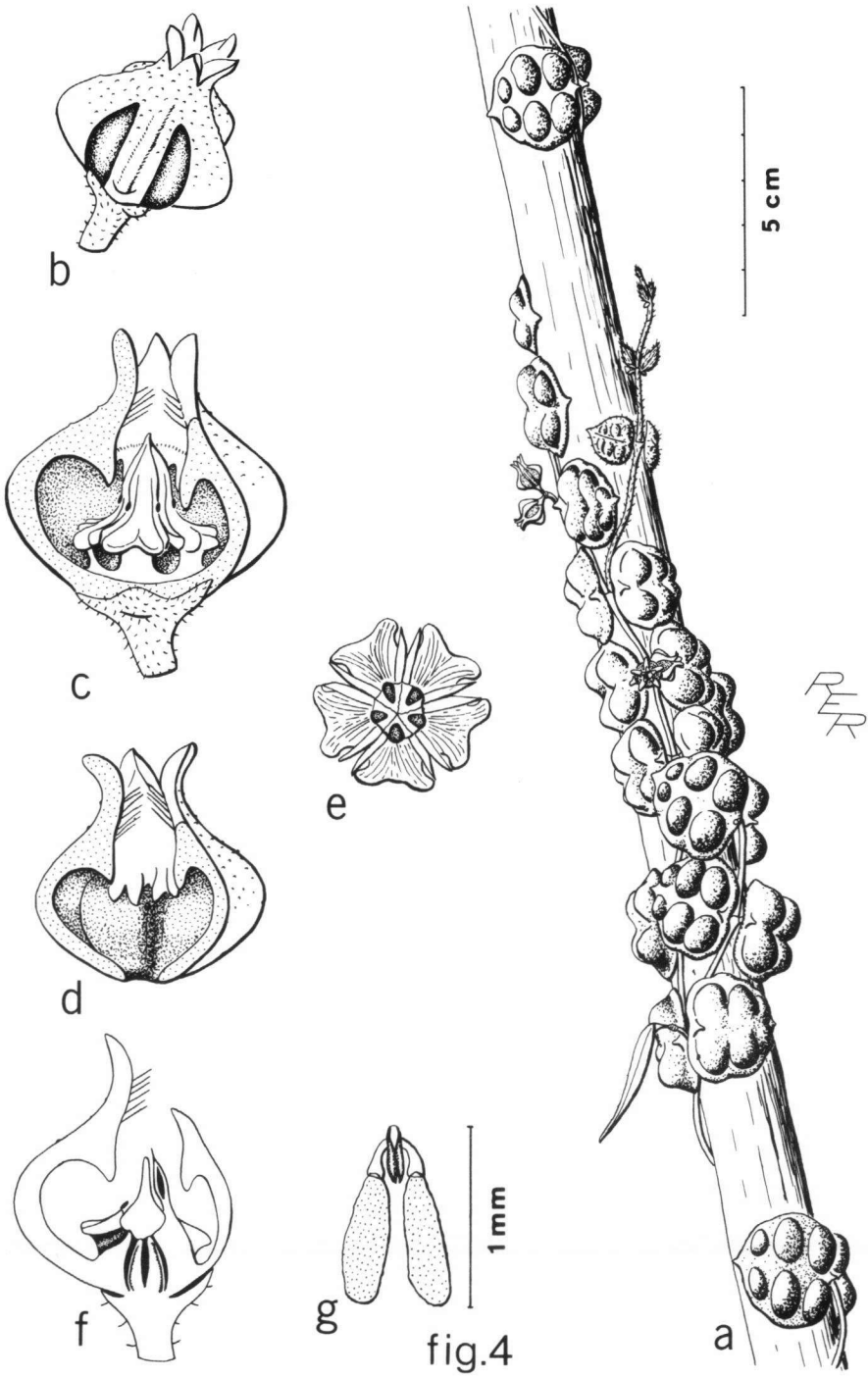

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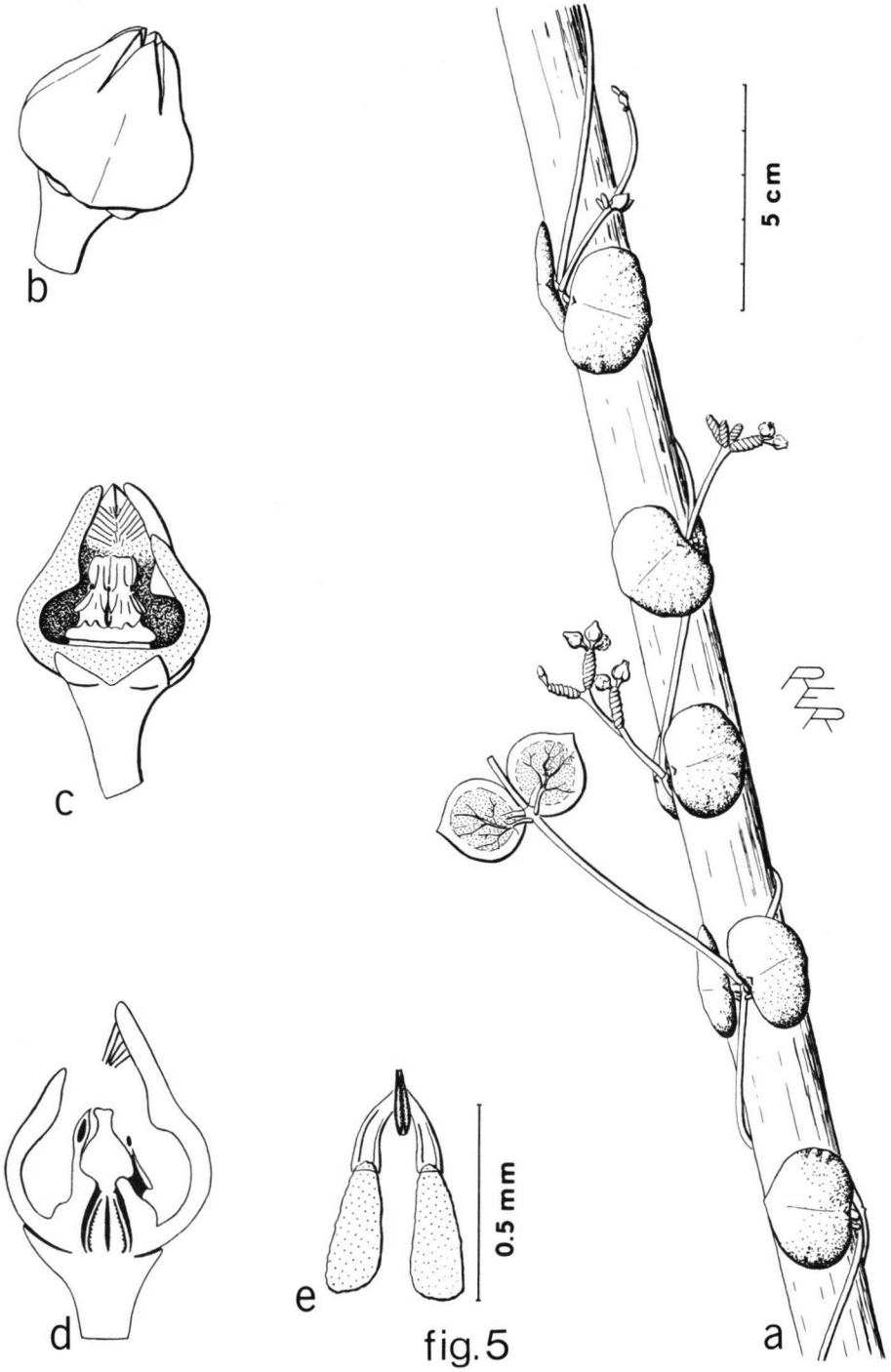

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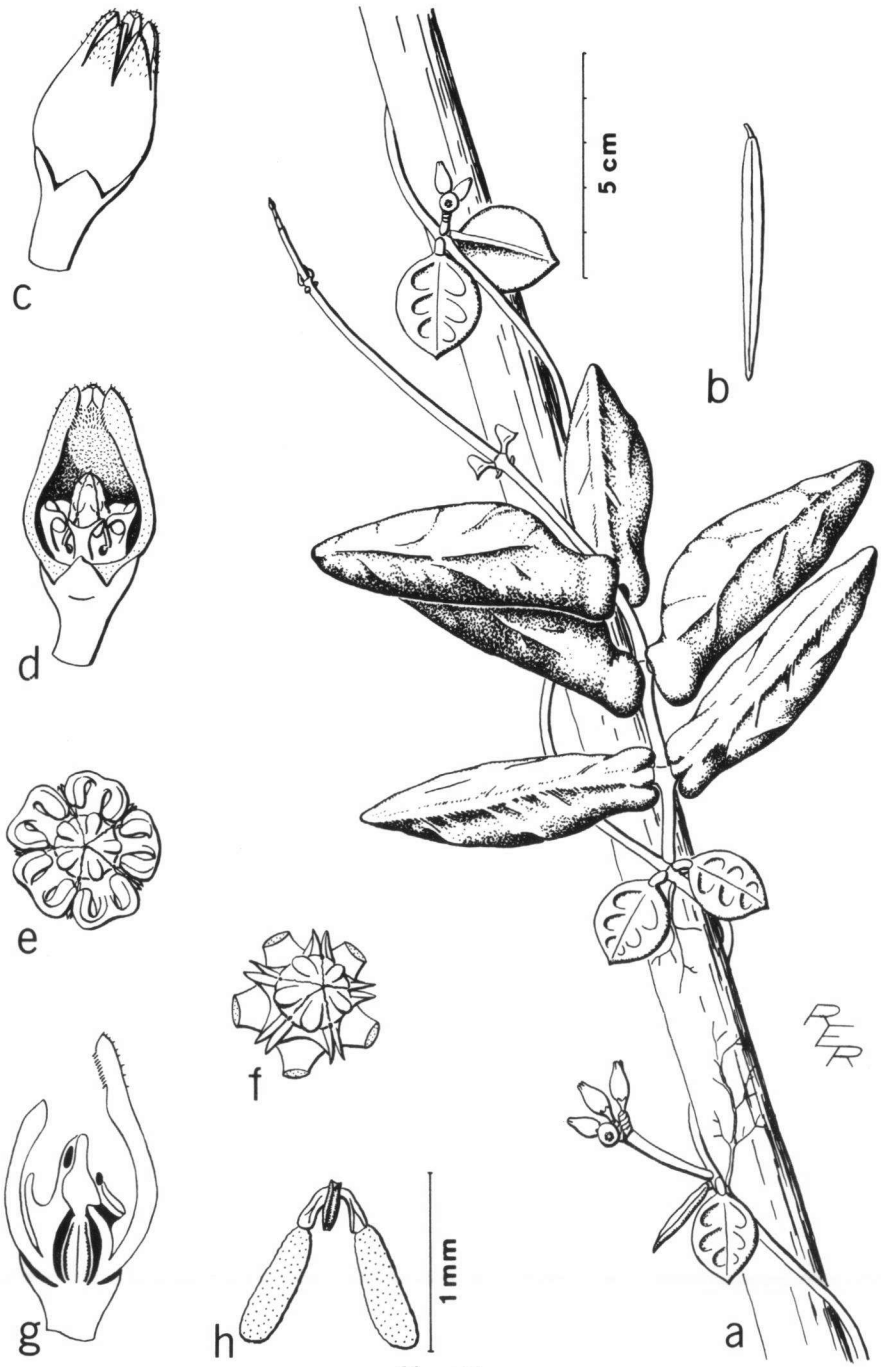

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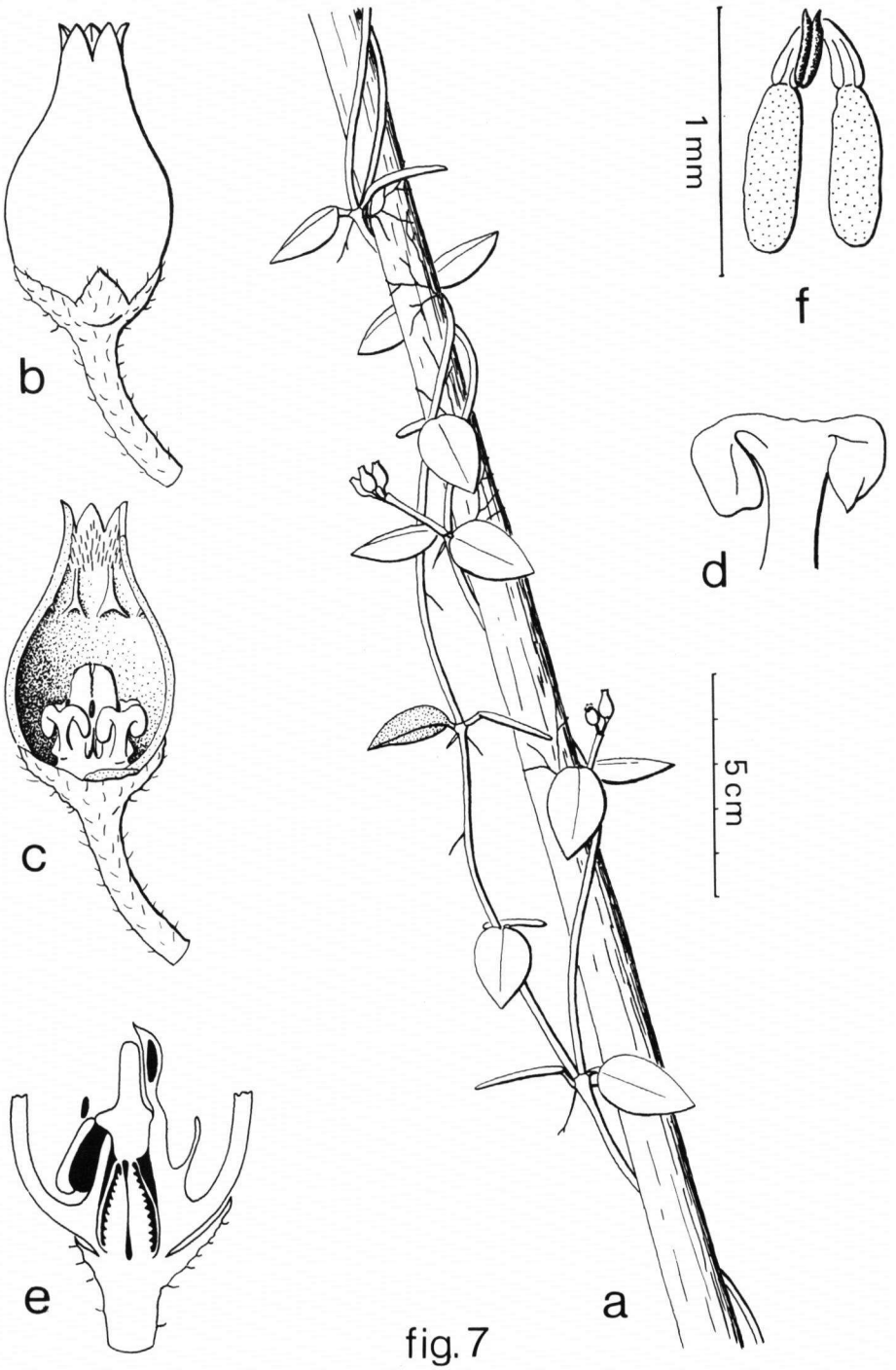

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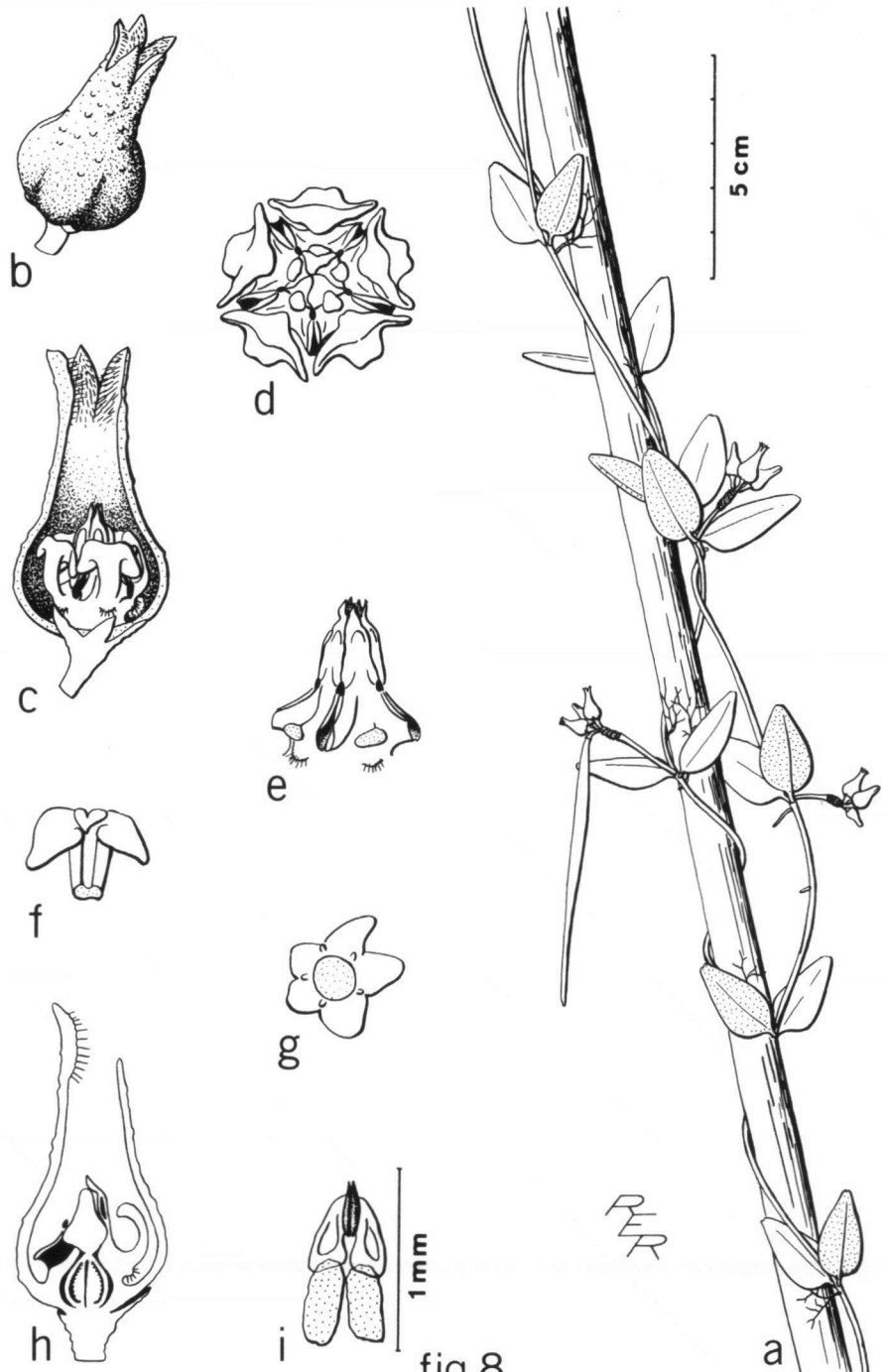

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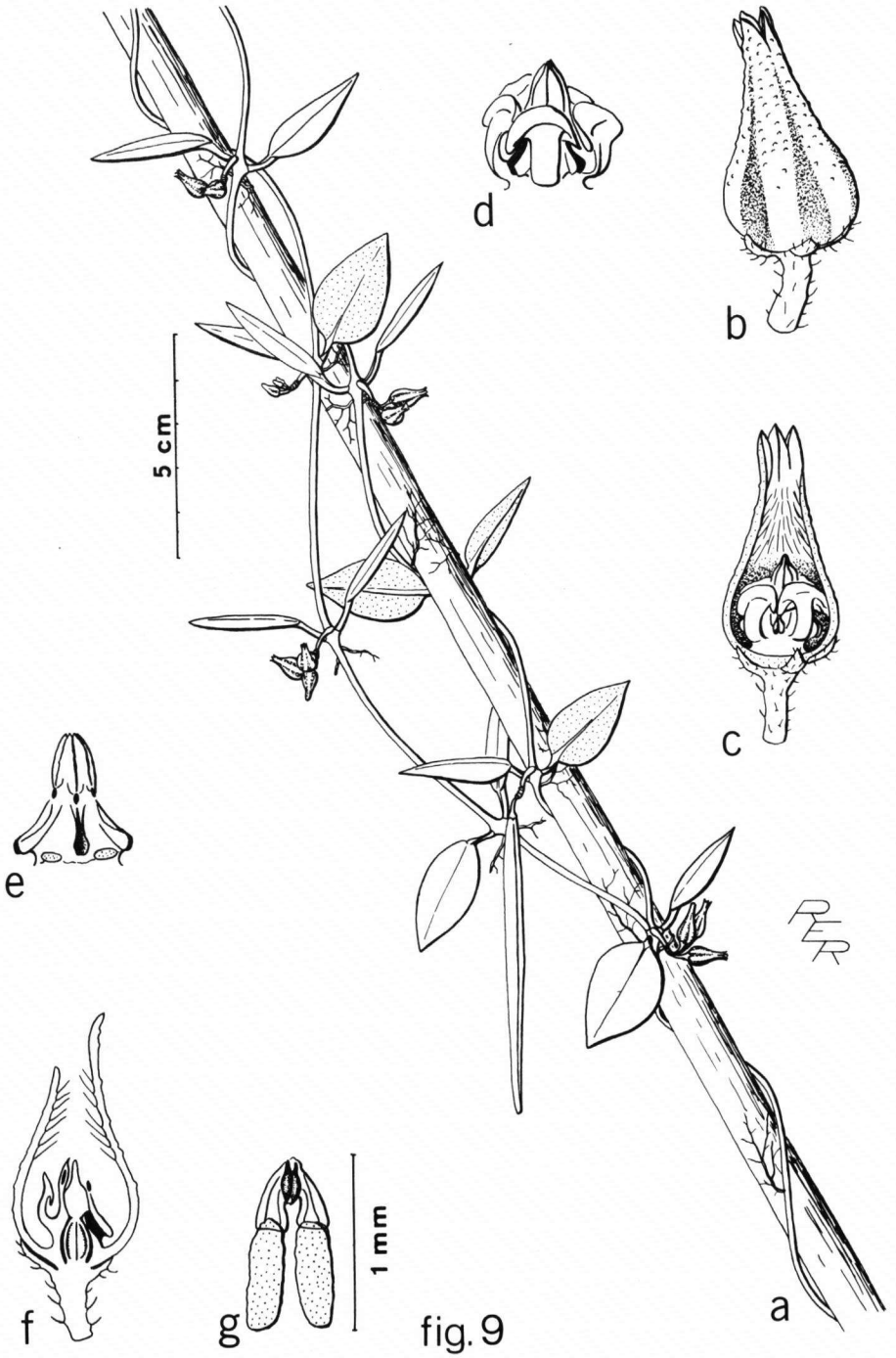

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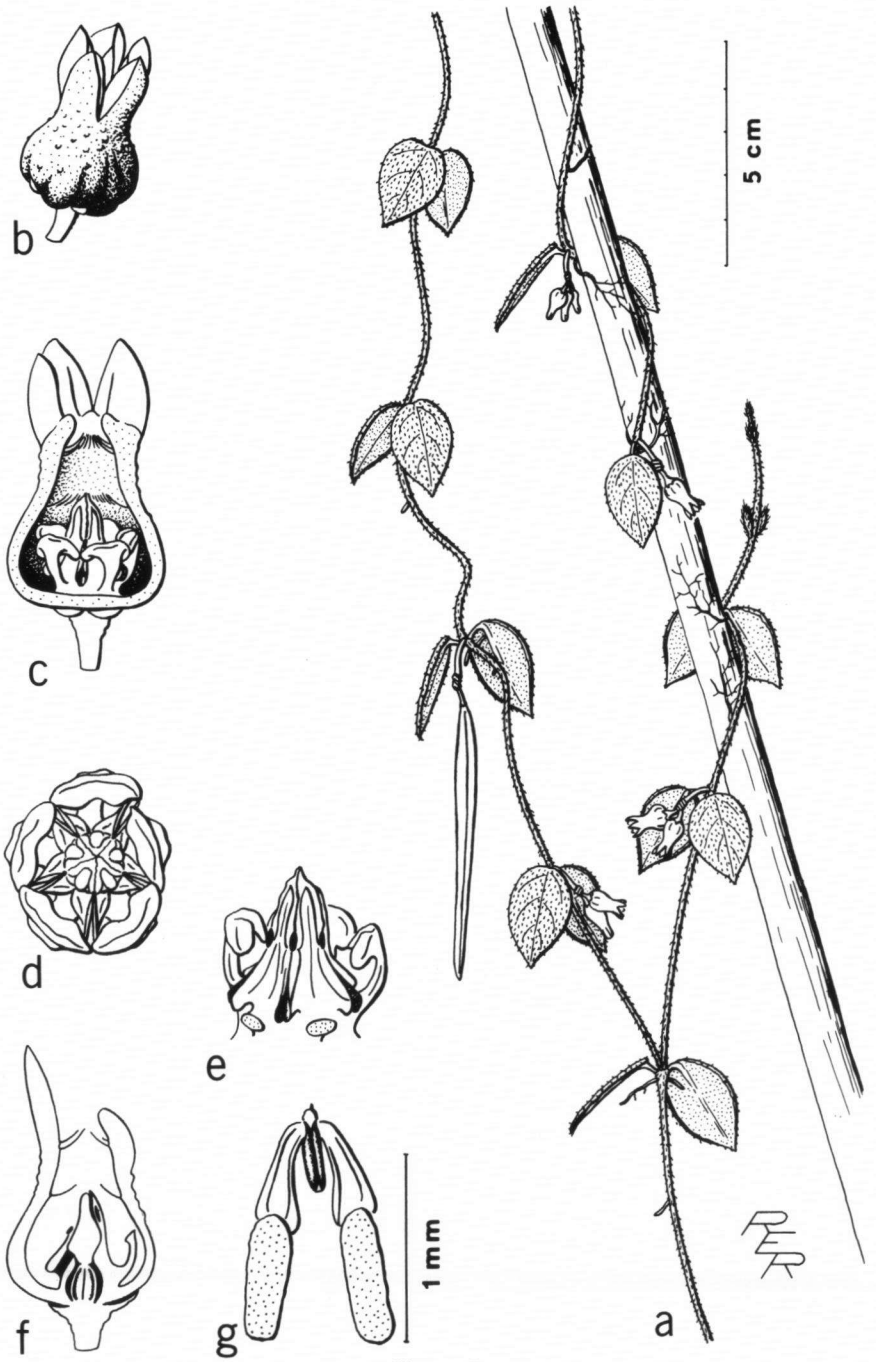

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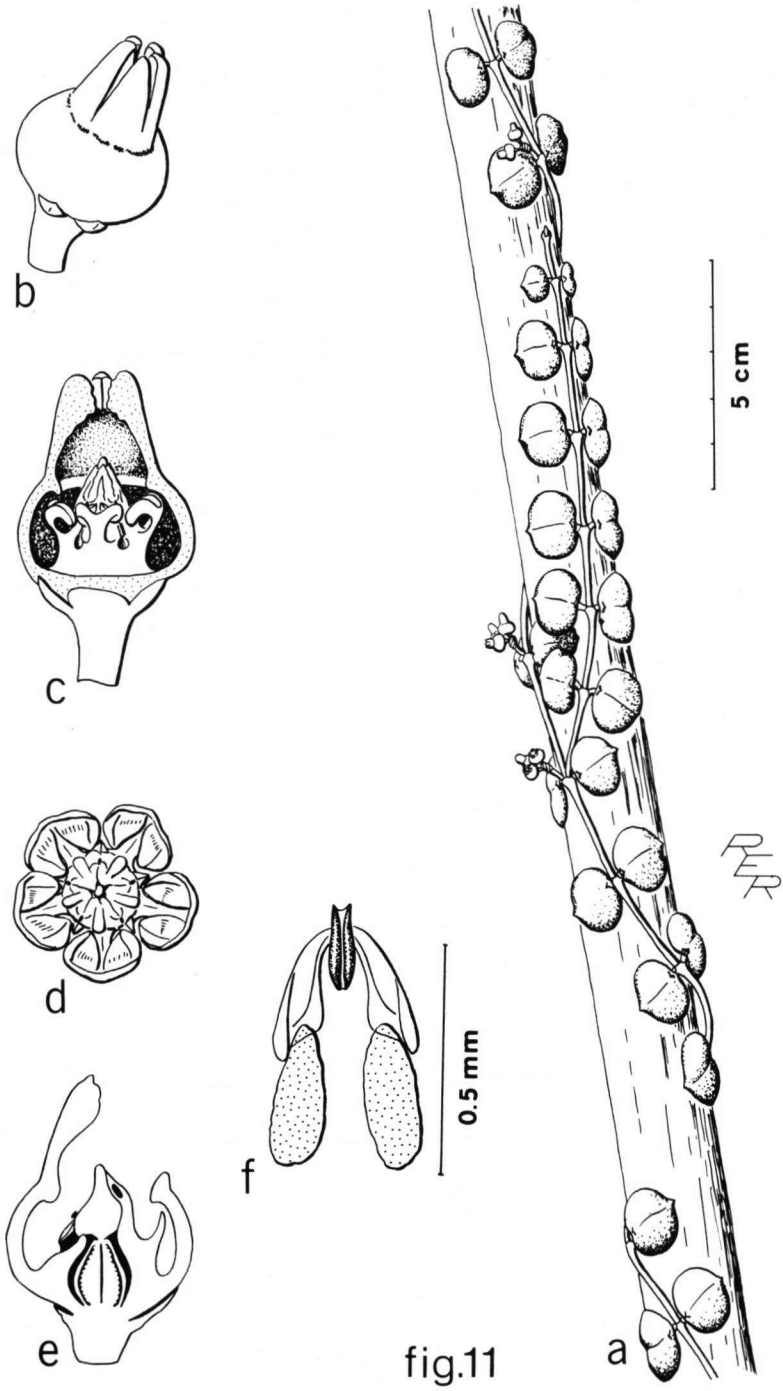

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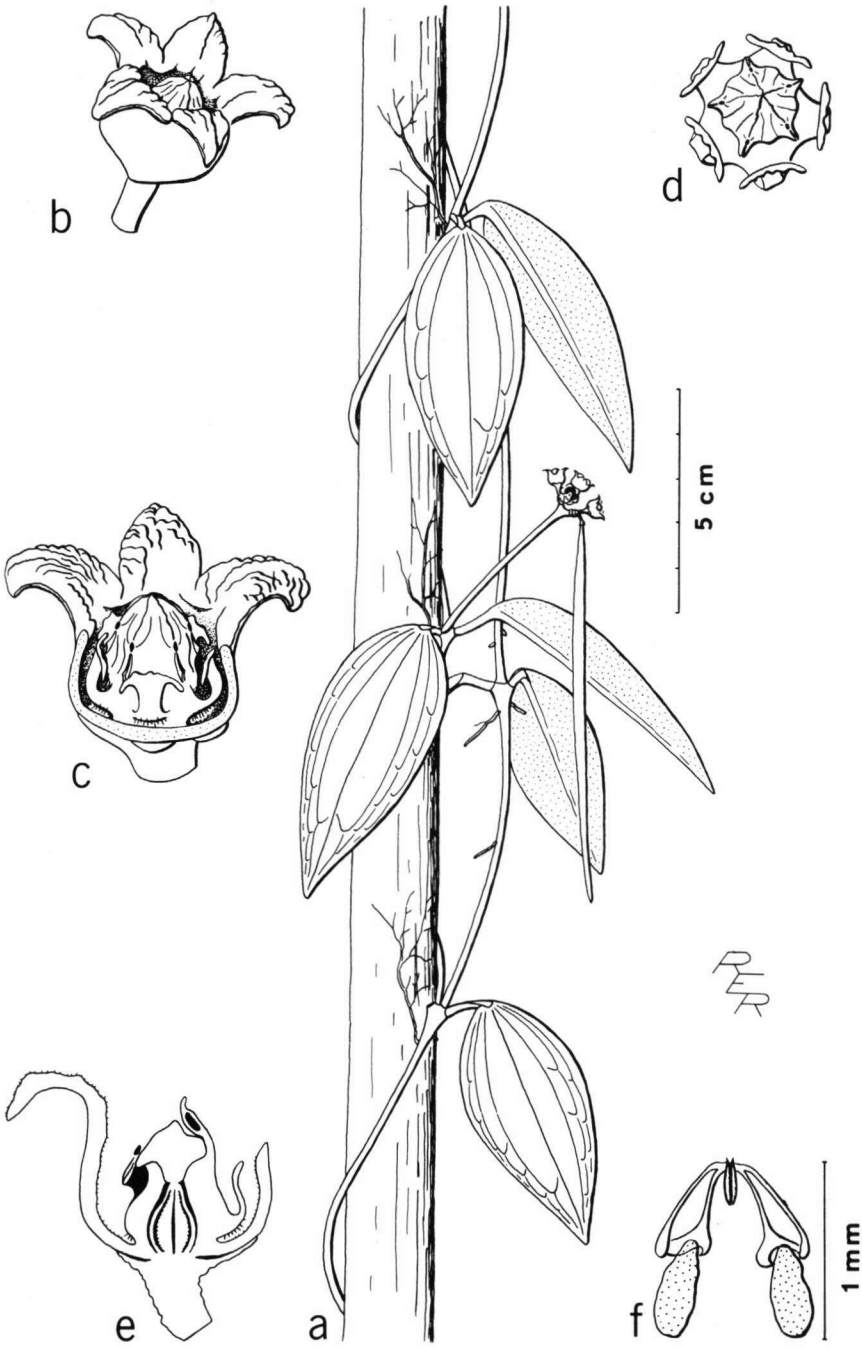
fig.12



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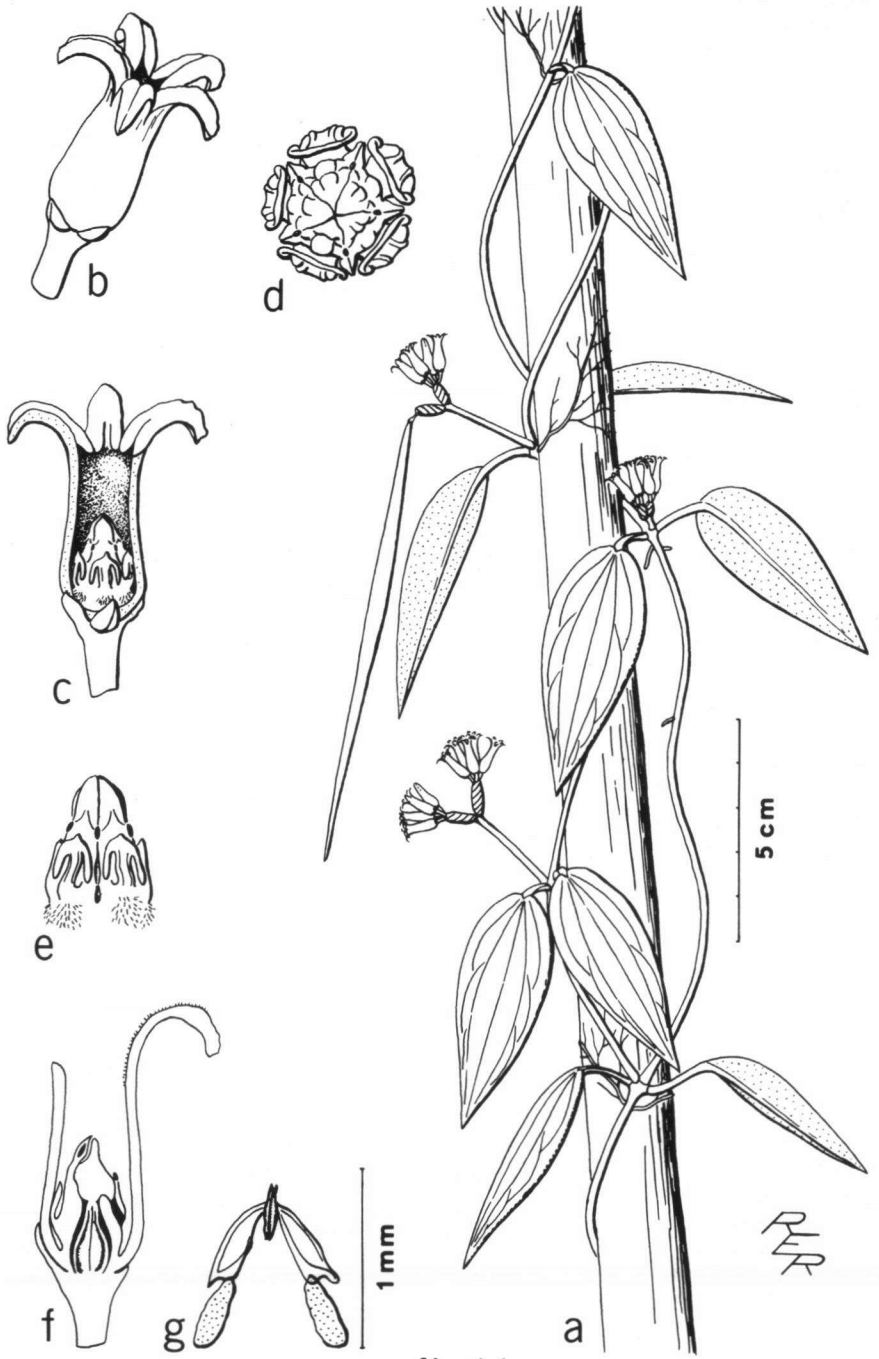

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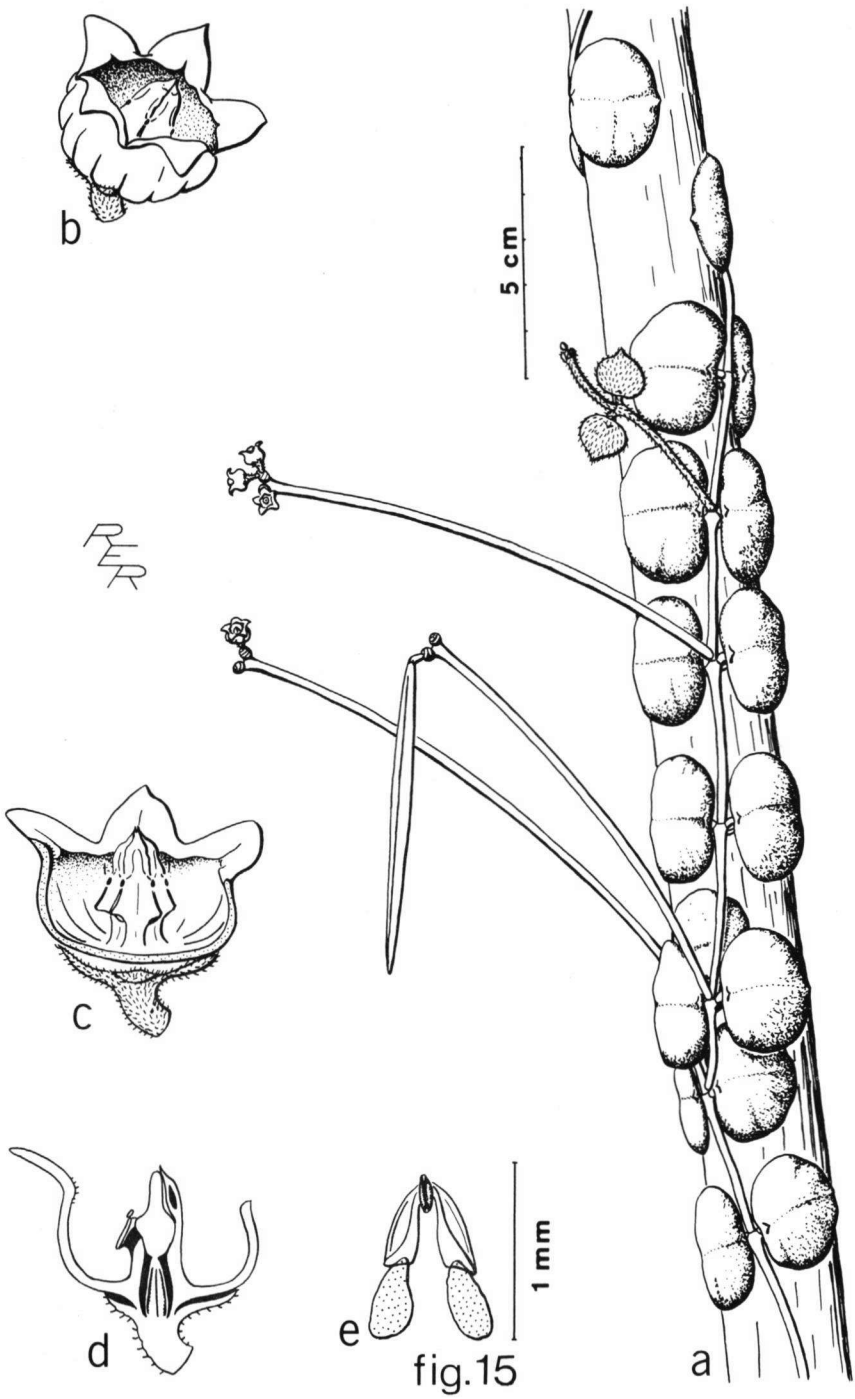

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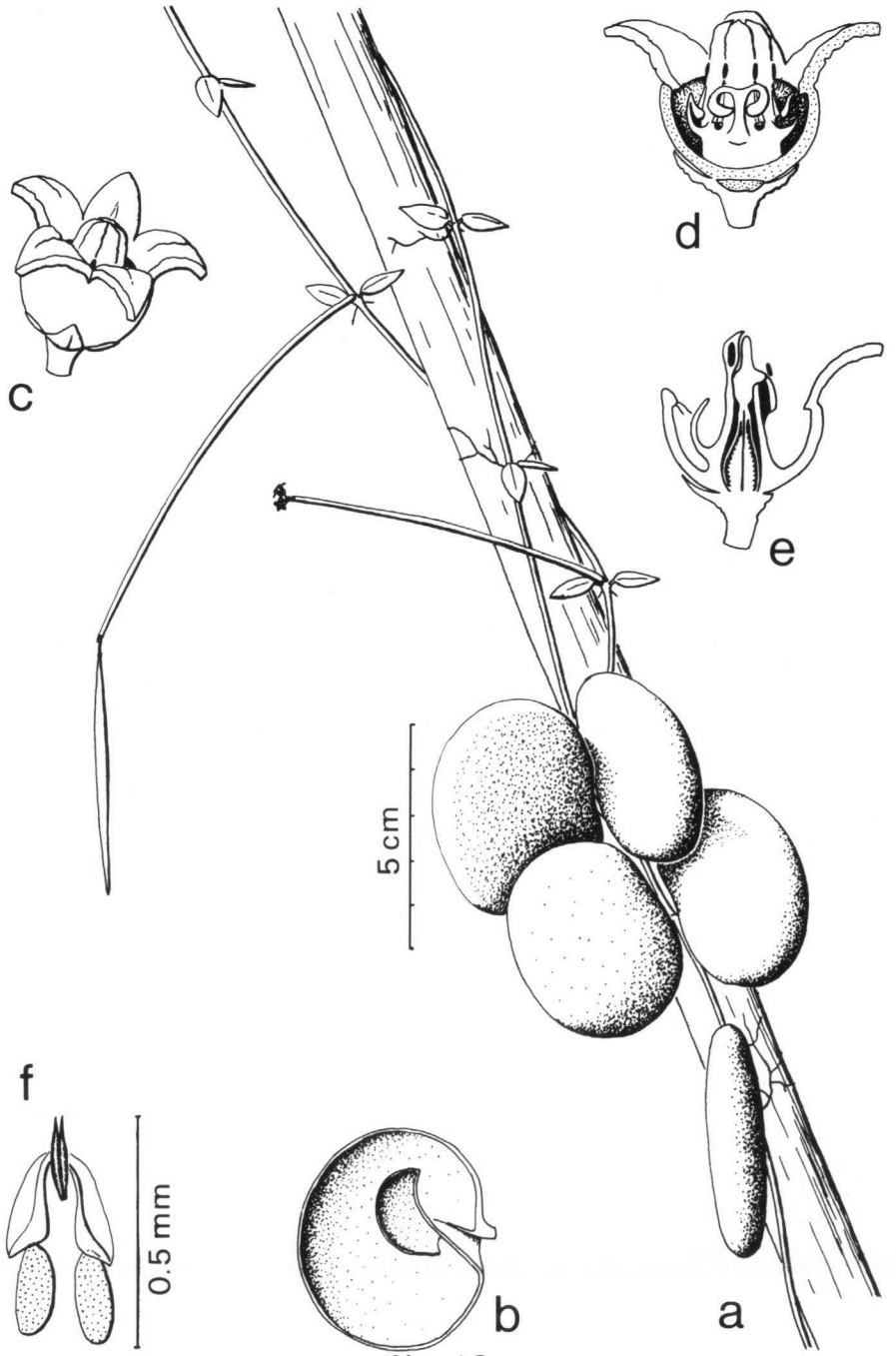

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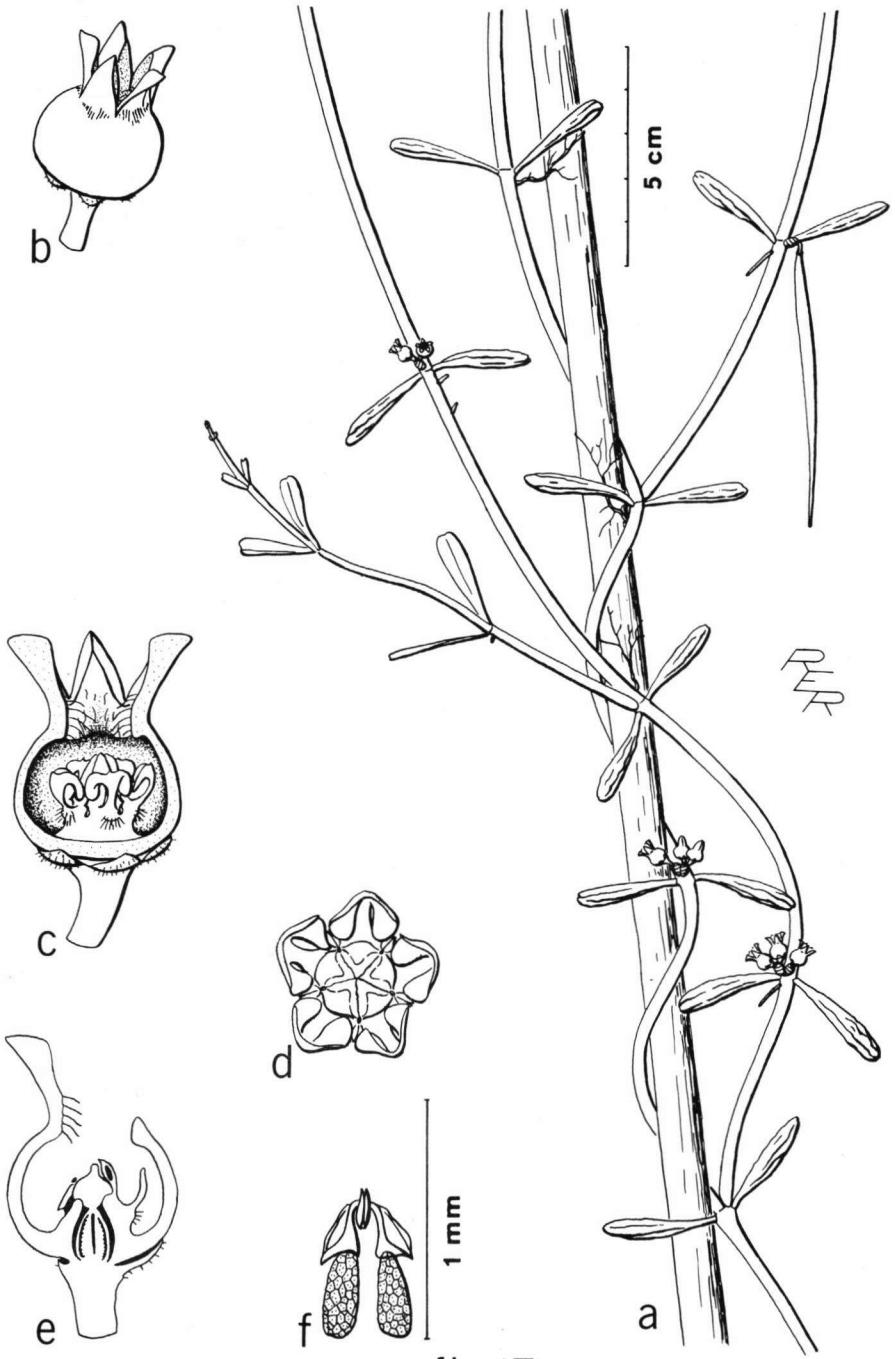

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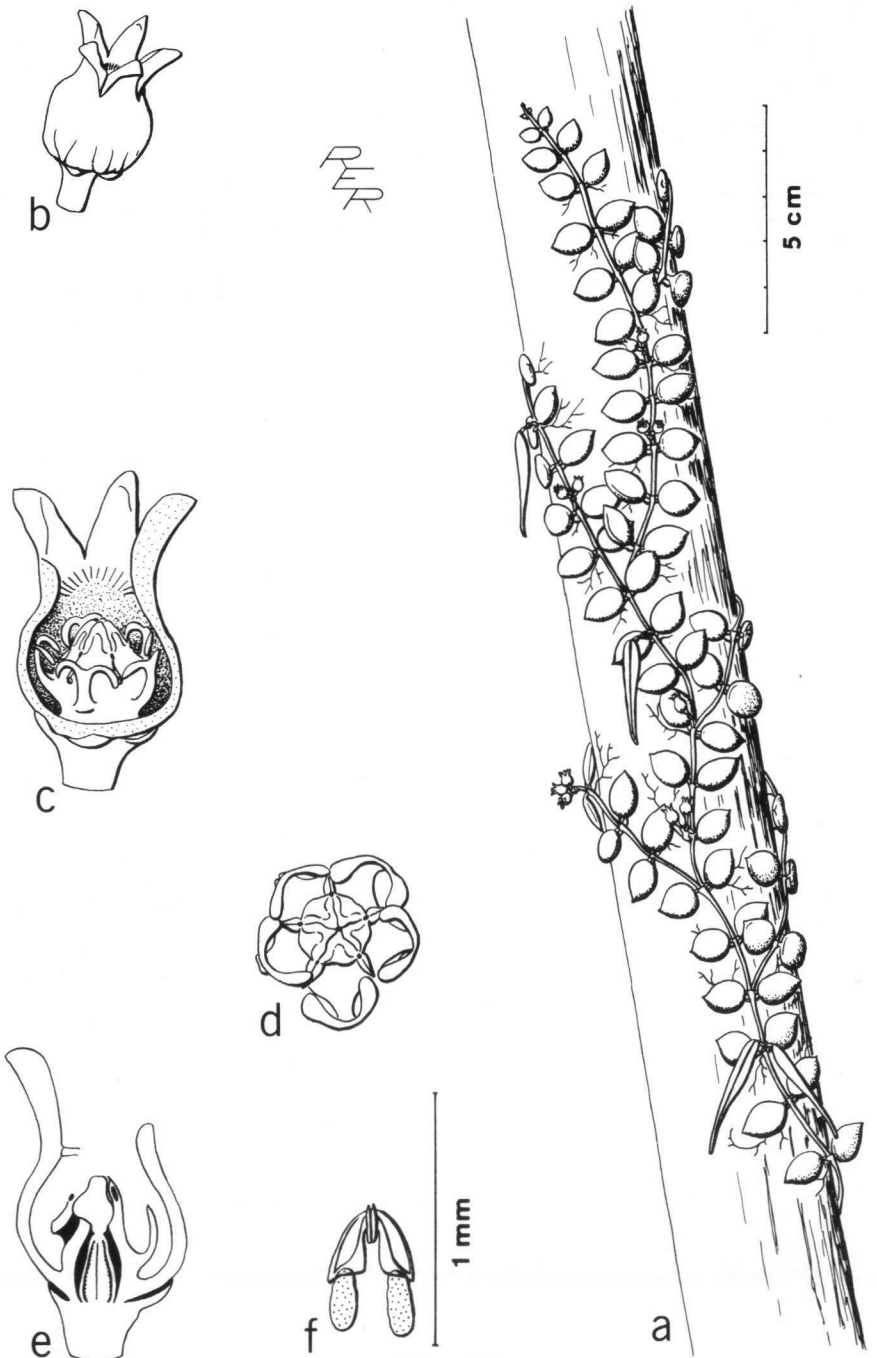

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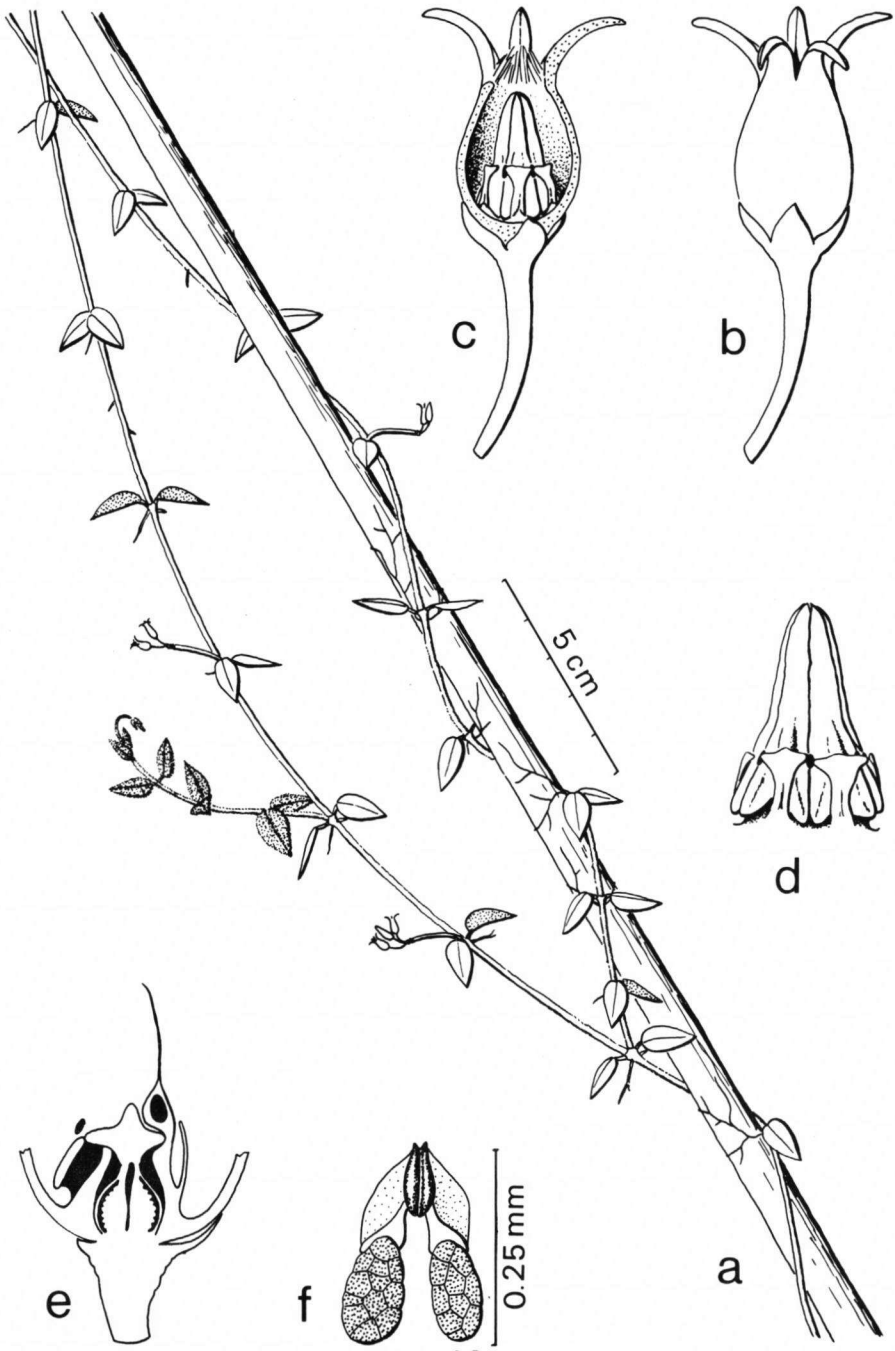

fig.19

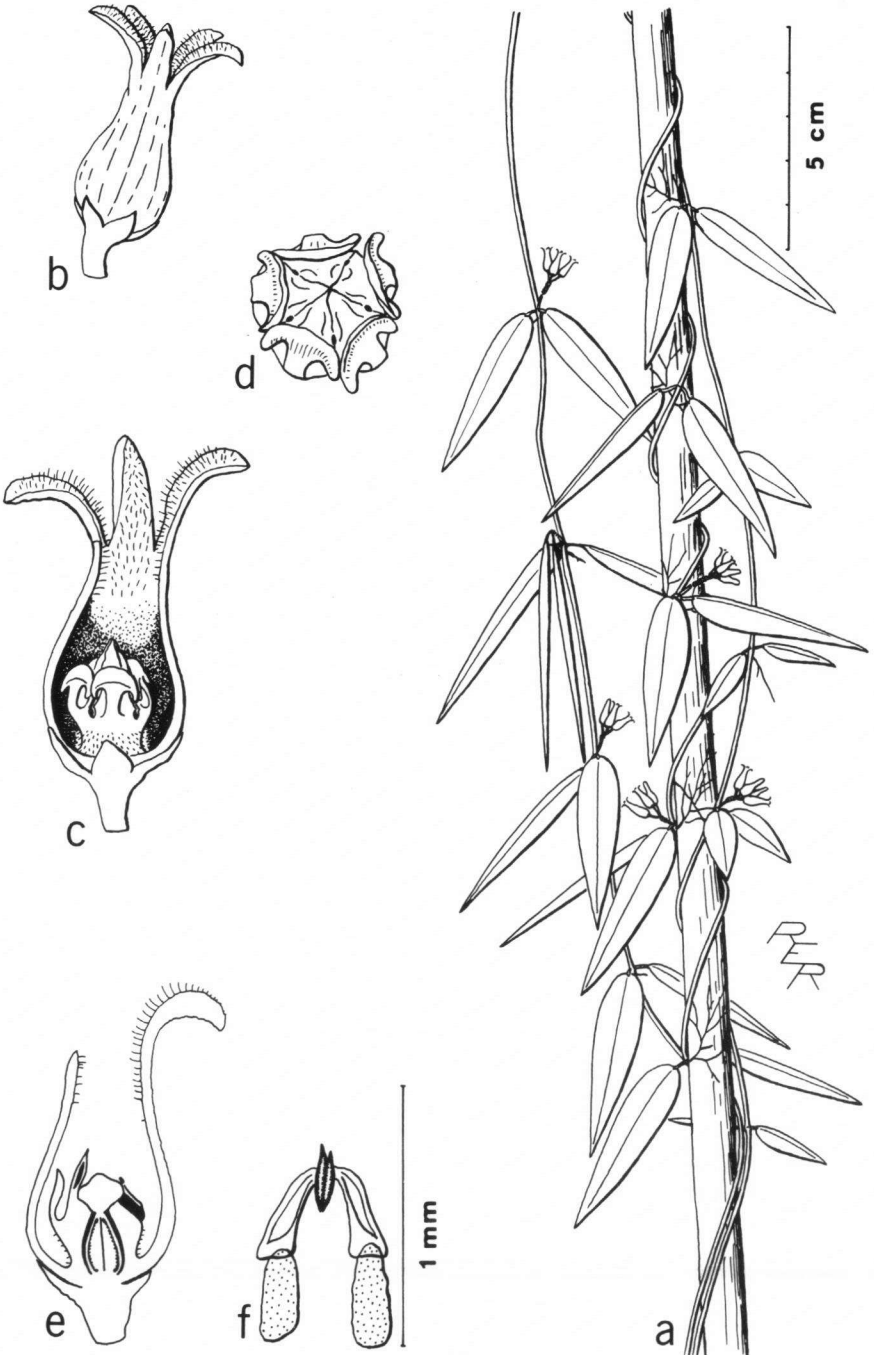

fig.20

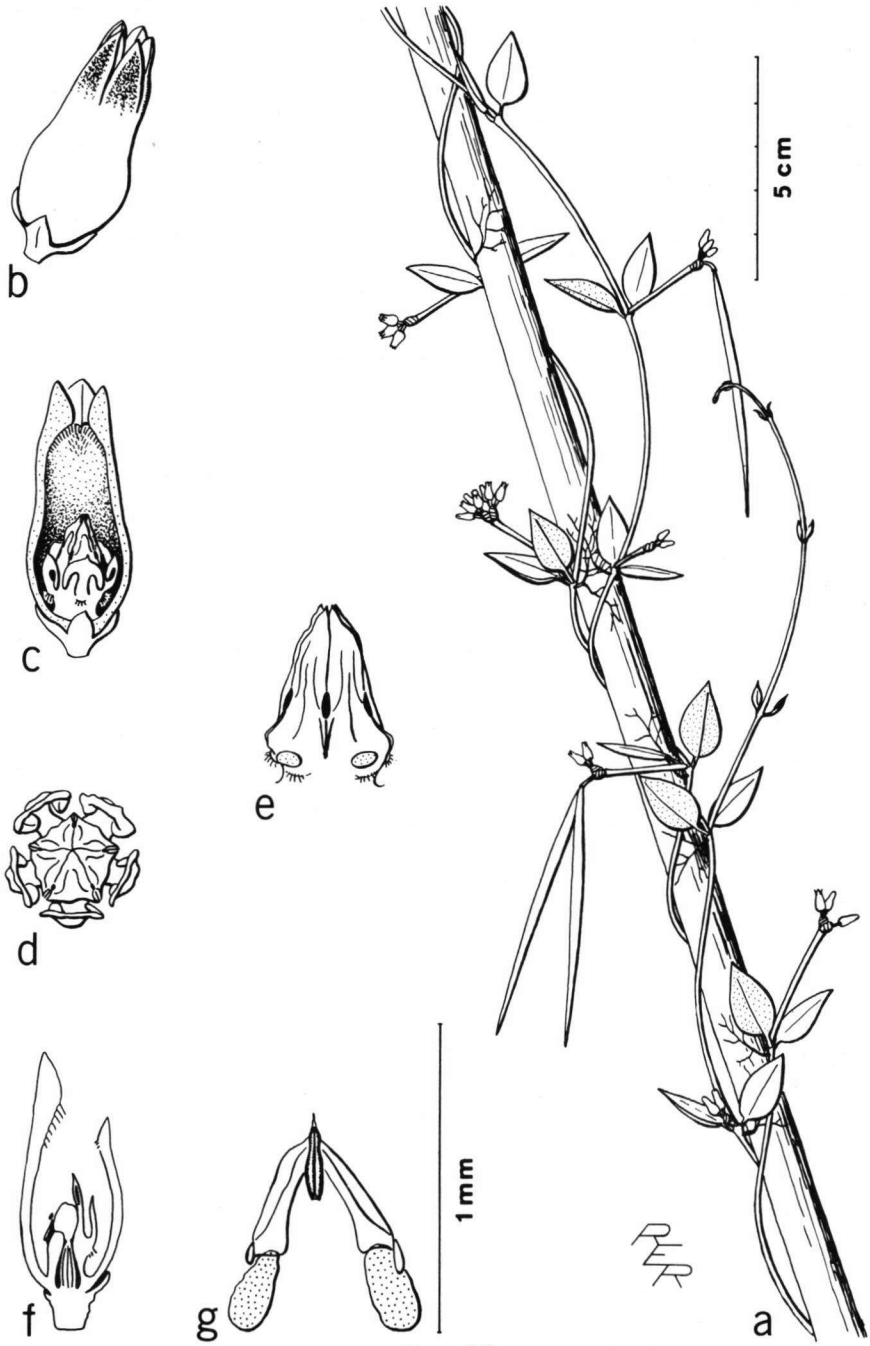

fig.21

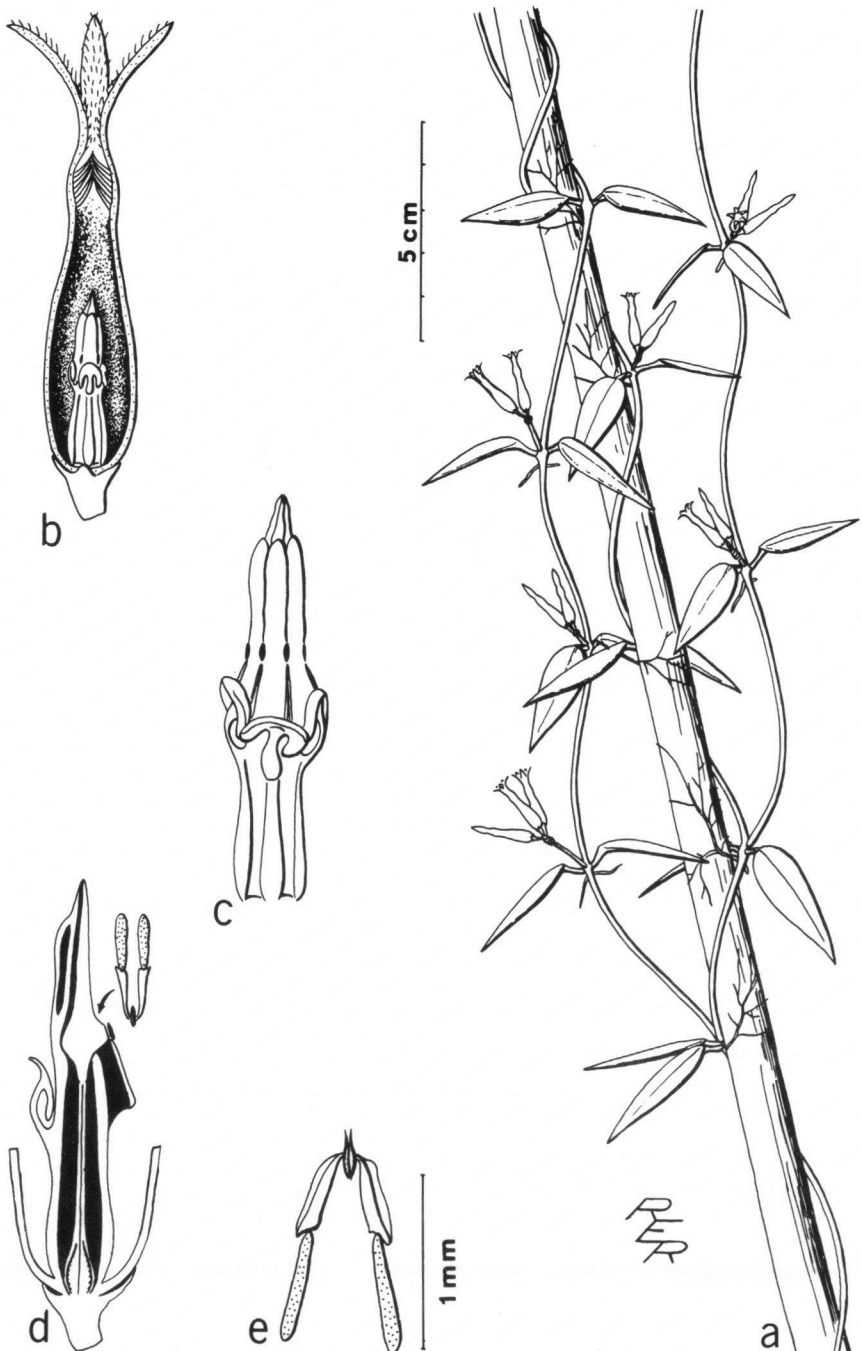

fig.22

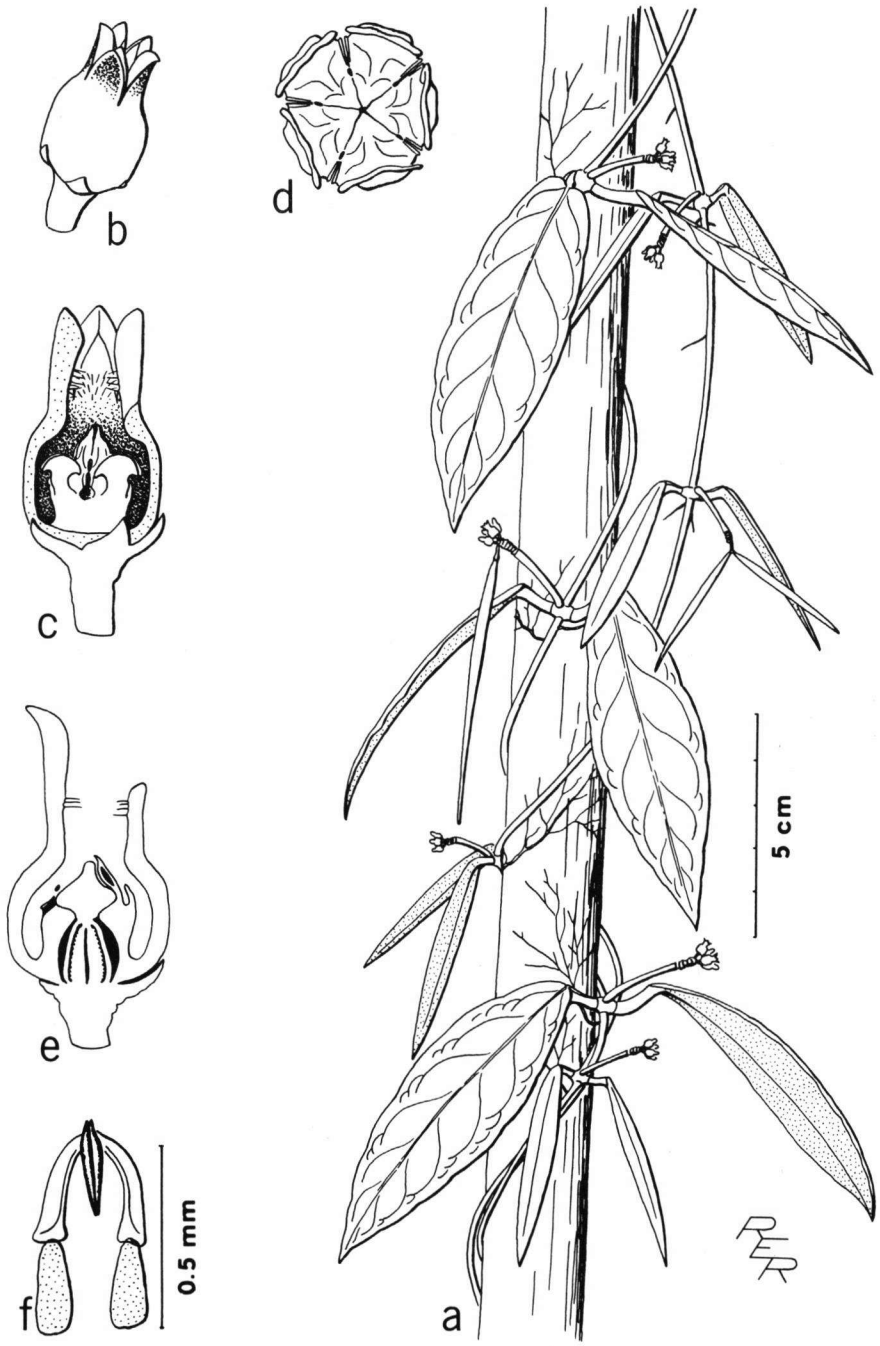

fig. 23

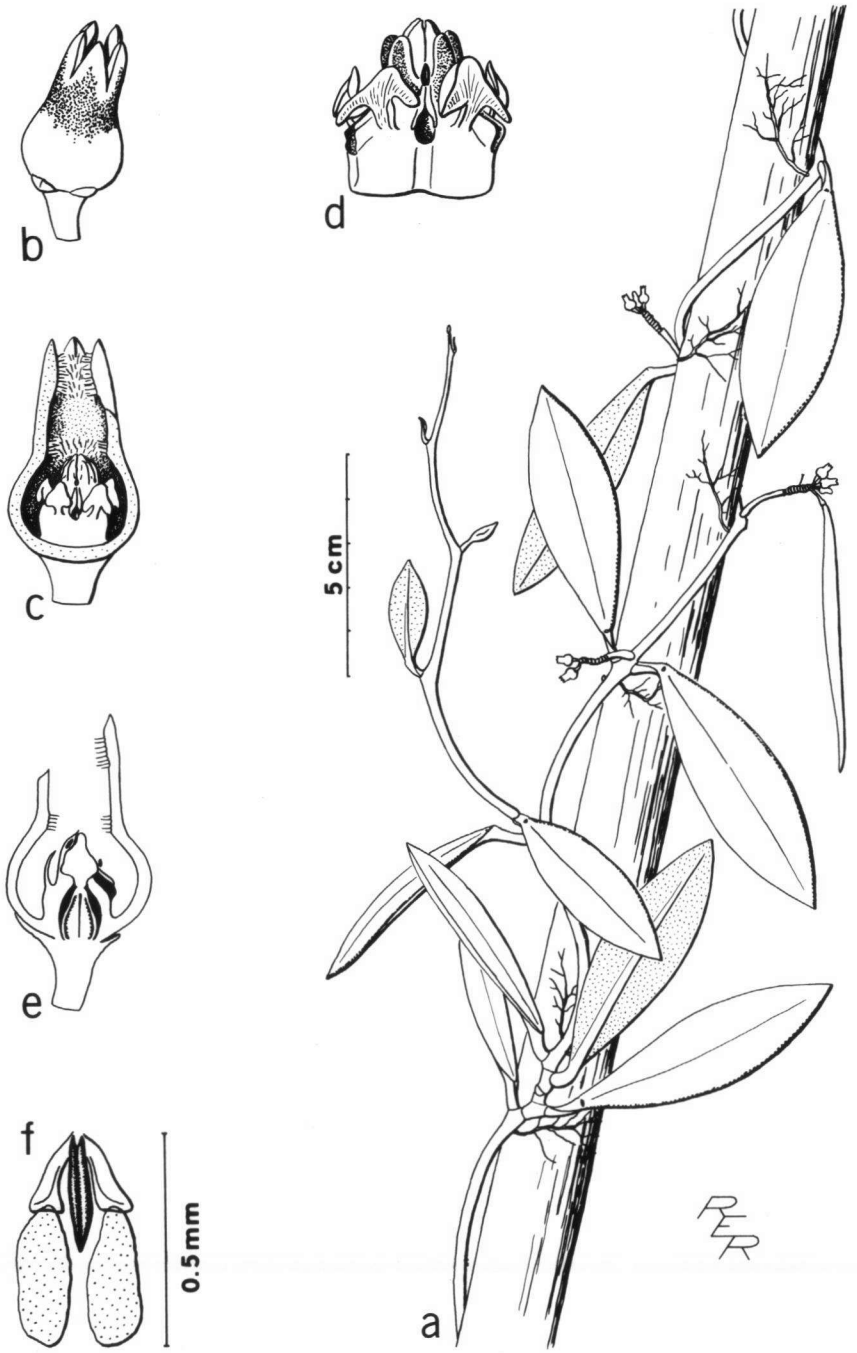

fig. 24