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A REVIEW OF BORNEAN ZINGIBERACEAE: III (HEDYCHIEAE)

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ABSTRACT. The Bornean members of subfam. *Zingiberoideae* tribe *Hedychieae* (*Hedychium*, *Camptandra*, *Scaphochlamys*, *Haplochorema*, *Kaempferia* and *Boesenbergia*) are reviewed and keys to genera and species are given. Six new species are proposed: *Scaphochlamys argentea*, *Haplochorema pauciflora*, *H. magnum*, *Boesenbergia flavoalbum*, *B. aurantiaca* and *B. stenophylla*; also two new varieties: *Haplochorema pauciflorum* var. *robustum* and *Boesenbergia pulchella* var. *attenuata*.

With the notable exception of *Boesenbergia*, the tribe *Hedychieae* is poorly represented in Borneo with only six native genera. The others are *Camptandra*, *Kaempferia*, *Haplochorema*, *Scaphochlamys* and *Hedychium*. In all but *Hedychium*, which has a well-developed 'frond-like' leafy shoot, they are short stemmed plants, sometimes of creeping habit, sometimes erect, the shoots with one to many leaves. In the species dealt with below the inflorescence is terminal; only in a few extra-Bornean *Kaempferia* are radical inflorescences produced.

KEY TO THE GENERA

1. Inflorescence with a (usually) single large bract which encloses the cincinnus; anther truly versatile ..... 2. *Camptandra*
\+ Inflorescence with few to many bracts, each subtending one–many flowers; anther never truly versatile 2
2. Stem well-developed, frond-like; inflorescence narrowly cylindric with closely imbricating bracts; sometimes epiphytic ..... 1. *Hedychium*
\+ Stem short, plants often appearing stemless and tufted or shoots single-leaved; inflorescence never as above 3
3. Bracts subtending 2–several flowers (in the Bornean species); the first bracteole lying directly opposite the bract; anther-thecae free at the base 3. *Scaphochlamys*
\+ Bracts each subtending a single flower; the bracteole lying at a right angle to the bract; anther-thecae wholly adnate to the filament 4

4. Bracts spirally arranged; flowers at the base the first to open; flowers held flat, lavender with a yellow eye ..... 4. *Kaempferia*
+ Bracts distichously arranged; flowers at the top opening first; if flowers held flat then white with a yellow-green eye 5
5. Flowers held flat, white with a yellow-green eye; shoots usually single leaved ..... 5. *Haplochorema*
+ Flowers usually with a saccate labellum, never flat; shoots single to many leaved ..... 6. *Boesenbergia*

1. Hedychium König in Retz., Obs. Bot. 3:73 (1783).

Hedychium is primarily a Himalayan genus but several species occur in Malaysia and Indonesia. It is well distinguished by the many-flowered terminal inflorescence, narrow petals, bilobed labellum and often long linear filament. The bracteoles are tubular, an infrequent occurrence in the tribe *Hedychieae*. In the Bornean species the broad bracts are closely imbricate, those of more temperate areas are usually narrower and remote. About 40 species are recognized, 2 are native in Borneo.

KEY TO THE SPECIES

1. Bracts lightly pubescent; limb of the labellum more or less orbicular; stamen not long exserted ..... 1. *H. muluense*
+ Bracts densely hairy, ferrugineous, limb of the labellum oblong cuneate; stamen long exserted ..... 2. *H. cylindricum*

1. H. muluense R. M. Smith in Bot. J. Linn. Soc. 85:57, fig. 14 (1982).
Type: Cult. RBG Edinb., ix 1979, C12762, originally collected from Sarawak; 4th Division, G. Mulu National Park, Gua Payau, *Kerby* 232, living material only (holo. E).
Other material examined:
SARAWAK: G. Mulu National Park, Gua Payau, growing on pile of vegetable debris left by flood on alluvial flat in rain forest, 100 m, outer and inner perianth pale green, labellum and lateral staminodes creamy-white, stamen orange, 19 ix 1977, *Argent & Kerby* 801 (E); *ibidem*, limestone slopes on far side of cave, fruit orange within, seed red, 9 vi 1975, *Burtt* 8219 (E).
SABAH: Kinabalu, Dallas, 3000 ft, flowers cream spotted brown, 9 viii 1931, *J. & M. S. Clemens* 26045 (BM); *ibidem*, flowers yellow with red stamen, 27 x 1931, *J. & M. S. Clemens* 26804A (BM); *ibidem*, Tenompok trail, 4000 ft, flowers yellow with pink stamen, 21 x 1931, *J. & M. S. Clemens* 26804 (BM); Tambunan distr., Crocker Range, Sinsuran Rd, c.3200 ft, 16 vi 1986, *Lamb* 228/86 (E).
KALIMANTAN: between Long Bawan and Panado, c.3°52′N 115°42′E, 1000 m, hill forest on sandstone, along stream, underside of leaves purple, fruit valves bright red-orange, 17 vii 1981, *Geesink* 9085 (L).

The location of a plant of *H. muluense* growing epiphytically and photographed by Mrs Sheila Collenette (Sabah; Crocker range, Kimanis/ Keningau rd) was previously given erroneously as Sarawak (Smith, op. cit. p. 59).

2. H. cylindricum Ridley in J. Asiat. Soc. Mal. 1:98 (1923).
Type: Sumatra, Berastagi woods, *Ridley* s.n. (K).
Syn.: *H. mjobergii* Merr. in Sarawak Mus. J. 3:519 (1928). Type: Sarawak, 4th Division, Mt Murud, *Mjoberg* 121 (n.v.).
Bornean material examined:
SARAWAK: 4th Division, Mt Murud, 19–2000 ft, x 1924, *Mjoberg* 118 (UC); Bakelan to Mt Murud, stream below camp IV, flowers white, green at base, dehisced fruits orange within, 4 x 1967, *Burtt & Martin* B5382 (E); 7th Division, S Hose Mts, E of B. Sanpandai, c.4500 ft, camp V, epiphyte, fruits orange inside, 3 iv 1980, *Burtt* 12783 (E).
SABAH: near top of pass Kimanis to Keningau rd, c.1300 m, terrestrial herb at edge of bulldozed mossy submontane forest, flowers white, inner perianth greenish, column pale pink, 27 iii 1980, *Argent* 1567 (E); Kinabalu Park, oak forest, infructescence orange red, c.5200 ft, 24 iii 1982, *Sinclair* 176 (E); *ibidem*, Dallas, 3000 ft, showy orange and scarlet fruit, 9 viii 1931, *J. & M. S. Clemens* s.n. (BM); *ibidem*, Tenompok, hillside jungle, 5000 ft, flowers white, 12 ii 1932, *J. & M. S. Clemens* s.n. (BM); *ibidem*, lemon with white ends to petals, 1 ii 1932, *J. & M. S. Clemens* 28170 (BM); *ibidem*, Marai Parai, 5000 ft, flowers white, 23 iii 1933, *J. & M. S. Clemens* 32315 (BM); *ibidem*, Penaturan basin, nr Wusser falls, 4000 ft, 25 vii 1933, *J. & M. S. Clemens* 34147 (BM); *ibidem*, Kambarangah Rd, 5000 ft, near twin-bed cabins, flowers white, 16 vi 1986, *Smith & Phillipps* S19/86 (E).
KALIMANTAN: between Papadi and Pamilau, c.3°52′N 116°0′E, 800 m, hill forest sandstone, labellum white, stamen reddish, 5 viii 1981, *Geesink* 9235 (L).

H. cylindricum is the dominant ginger of Kinabalu Park, common along the forest trails, often by streamsides and in marshy ground. It may occur as an epiphyte. The dense adpressed ferrugineous indumentum of the bracts is very distinctive and the stamen is long exserted.

The type number of *H. mjobergii* has not been located at UC but the Mjoberg collection cited above, which is in fruit, and determined by Merrill as *H. mjobergii* indicates that this species is indeed *H. cylindricum*, the Bornean element of which matches the Sumatran type well. Merrill (*Enum. Born. Pl.*, 120, 1921) attributes a Bornean collection, *Beccari* 3558, to the closely allied but distinct *H. hasseltii* Bl. which was described from Java. Unfortunately, this specimen has not been found at either FI or K, but probably belongs to *H. cylindricum*.

2. Camptandra Ridley in J. Str. Br. Roy. Asiat. Soc. 32:103 (1899); Val. in Bull. Jard. Bot. Buitenz. sér. 2, 27:114 (1918).

Camptandra is a small genus (3–4 species) of low-growing slender stemmed herbs, occurring in the Malay Peninsula, Borneo and Sumatra. In flower, it is instantly recognized by the large single bract of the terminal inflorescence which encloses a several-flowered cincinnus. Identical bracts, but always with a lamina-like tip, are found in the distantly related *Caulokaempferia yunnanensis* (Gagnep.) R. M. Smith. Rarely, further bracts may develop. The slender-tubed flowers are accompanied by thin textured, non-tubular bracteoles, the lateral staminodes are large and rounded and the broad

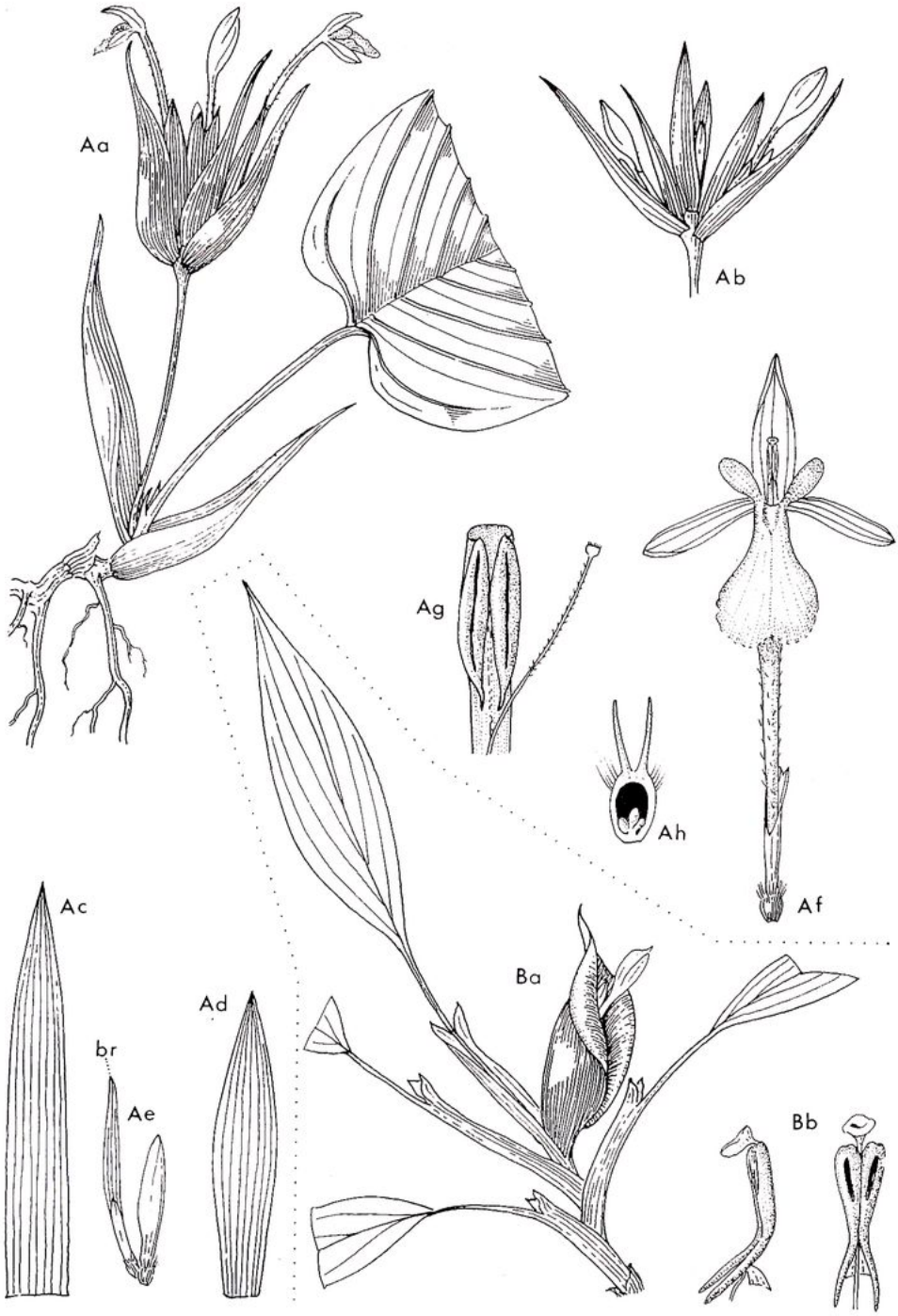

FIG. 1. A. *Scaphochlamys argentea*. a, habit ×1; b, young inflorescence spread out showing 3 two-flowered cincinni ×1; c, bract ×2; d, 1st bracteole ×2; e, 1st and 2nd buds with 2nd bracteole (br) ×2; f, flower ×1; g, stamen ×4; h, epigynous glands and ovary in L.S. ×4. (a, f, g, h from *Burtt & Woods* B 2700; b, c from *Clemens* 22215; all from dried material.) B. *Camptandra parvula* var *angustifolia*, a, habit ×1; b, versatile anther, from the side and front ×4 (from dried material of *Burtt & Woods* B 2507).

labellum is deeply bi-lobed. Flower colour is white or lilac, sometimes with yellow and/or, crimson markings at the base of the lip.

Camptandra belongs to that small group of *Hedychieae* with truly versatile anthers; the lower part of each theca is prolonged into a sterile appendage held at an obtuse angle to the fertile part. Similar anthers are found in *Curcuma* Roxb., *Cautleya* Hook. f., *Roscoea* J. E. Smith and *Paracautleya* R. M. Smith. The genus also lacks epigynous glands, at least as external structures; these glands are also occasionally absent in *Curcuma*. Probably only a single species occurs in Borneo.

Camptandra parvula Ridley var. **angustifolia** Ridley in J. Str. Br. Roy. Asiat. Soc. 32:105 (1899). Fig. 1B.

Type: Sarawak, 1st Division, near Mt Matang, growing on rock, flower white, 20 ii 1892, *Haviland* s.n. (K).

Syn.: *Kaempferia gracillima* K. Schum., Pflanzenr. Zing. 74 (1904). Type: Sarawak, 1st Division, Selebut, 300 ft, on rock, *Haviland* 448 (K).
Camptandra angustifolia (Ridley) Ridley in J. Str. Br. Roy. Asiat. Soc. 46:232 (1906).
C. gracillima (K. Schum.) Val. in Bull. Bot. Jard. Buitenz. sér. 2, 27:115 (1918).

Other material examined:

SARAWAK: 1st Division, Sungei China, Mt Matang, white translucent flower with yellow palate to labellum, 14 v 1962, *Burtt & Woods* B2507 (E); Bako National Park, Telok Delima, 200 ft, wet rocks in forest, to 8 inches tall, flowers white, 19 ix 1956, *Purseglove* 4992 (K, L); *ibidem*, Lintang path, Telok Asam, damp habitat on sandstone boulder, primary forest, flowers white except for yellowish corolla throat, 29 v 1970, *Chai & Wright* S29908 (SAR, E).

Typical *Camptandra parvula* is widespread in almost all parts of the Malay Peninsula. The Bornean variety is generally smaller in all parts, usually lower growing, the leaves with narrowed rather than rounded bases and longer petioles. The bracts tend to be broadly lanceolate acuminate rather than ovate acuminate and the white and yellow labellum apparently lacks the crimson markings found in *C. parvula*. *C. gracillima* is identical to *C. parvula* var. *angustifolia*; why K. Schumann, who saw material of *Camptandra* and accepted Ridley's genus, chose to describe this taxon in *Kaempferia* is inexplicable.

A collection from Mt Matang, *Bogner* 1399 (spirit material only, E) differs from the material cited above in the much thickened petioles, rounded leaf bases and 4-bracteate inflorescence, each bract subtending only a single flower. Unless further collections indicate that these features are constant, this plant is best regarded as an aberrant form of *C. parvula*.

3. Scaphochlamys Bak. in Hook. f., Fl. Brit. Ind. 6:252 (1892).

The Peninsular species of *Scaphochlamys* were misunderstood by both Ridley and Schumann, neither of whom took up Baker's genus. Holttum (*Gard. Bull. Sing.* 13: 82–86, 1950) described and discussed its salient features in some detail. He made particular note of the close affinity between

TABLE 1

Comparisons of inflorescence characters between *Scaphochlamys* and allied genera

	Arrangement	Mode	Flowers	1st Bracteole	Lip	Thecae
Scaphochlamys	Spiral	Base-apex	Usually in cincinni	Often more or less keeled, arising opposite bract	Bilobed or entire, never saccate	With very short, free, basal spurs
Kaempferia	Spiral	Base-apex	Single	Deeply split, arising opposite bract	Deeply bilobed, often flat	Spurs absent
Haplochorema	Distichous	Apex-base	Single	Boat-shaped or split, arising at right angle to bract	Bilobed or emarginate, flat	Spurs absent
Boesenbergia	Distichous	Apex-base	Single	Boat-shaped, arising at right angle to bract	Usually saccate, rarely bilobed, never flat	Spurs absent

Scaphochlamys and *Kaempferia*, and the differences between the inflorescences of these and *Haplochorema* and *Boesenbergia* (nos 5 & 6 below) are most conveniently set out in Table 1.

There are about 25 species of *Scaphochlamys* described, with the Malay Peninsula the main centre of distribution. Five, possibly six, are known from Borneo and at least one occurs in Sumatra.

KEY TO THE SPECIES

1. Shoots tufted, several-leaved; bracts remote, patent . . . 1. *S. polyphylla*
+ Shoots single-leaved; bracts congested, not patent 2
2. Creeping habit; petioles 3–6 cm 3
+ Erect habit; petioles 9–20 cm 4
3. Upper leaf surface with the main lateral veins conspicuously raised and silvery; lip yellow and white . . . . . 2. *S. argentea*
+ Upper leaf surface with all the lateral veins conspicuously raised, not silvery; lip bordered violet, yellow in centre . . . . . 3. *S. reticosa*
4. Lamina to 12 × 3·5 cm; lanceolate; inflorescence fragile 4. *S. petiolata*
+ Lamina to 25 × 13 cm; broadly elliptic; inflorescence robust . . 5. *S. sp.*

1. S. polyphylla (K. Schum.) Burtt & Smith in Notes RBG Edinb. 31:315 (1972).

Type: Sarawak, 1st Division, Lundu, *Beccari* 2324 (FI).

Syn.: *Haplochorema polyphyllum* K. Schum., Pflanzenr. Zing., 88 (1904).
Gastrochilus bractescens Ridley in J. Str. Br. Roy. Asiat. Soc. 54:57 (1910). Type: Sarawak, 1st Division, Lundu, *Foxworthy* 42 (SING).
G. laxiflorus Val. in Bull. Jard. Bot. Buitenz. sér. 2, 27:100 (1918). Type: Kalimantan, Mt Opi, *Teysmann* 10916 (L).
Boesenbergia bractescens (Ridley) Merr., Enum. Born. Pl., 122 (1921).
B. laxiflora (Val.) Loesen., Pflanzenfam. 2 Aufl. 15a:572 (1930).

Other material examined:
SARAWAK: 1st Division, Bako National Park, Telok Tajor, 100 ft, 17 v 1956, *Purseglove* 4949 (K).

S. polyphylla belongs to that group of *Scaphochlamys* which is characterized by a lax inflorescence bearing many remote, spreading bracts. It is closely related to several Peninsular species, notably *S. malaccana* Bak., *S. subbiloba* (Burk. ex Ridley) Holtt. and *S. rubromaculata* Holtt.; the latter may not be distinct from *S. polyphylla*.

2. Scaphochlamys argentea R. M. Smith, **species nova** *S. petiolatae* ob surculos unifoliatos et bracteas congestas similis sed omnibus partibus multo minoribus et venis elevatis argenteis in pagina foliorum superiore differt. Fig. 1A.

Herba repens, surculis unifoliatis inter se 2–3 cm distantibus e rhizomate emissis. *Folia* 6–10 × 3–4 cm; elliptica, subacuta, basi plerumque subcordata, glabra, supra venis primariis prominentibus argenteis notata, venis secundariis multo minus conspicuis; petiolus usque ad 5 cm longus; ligula c.5 mm, membranacea, biloba, acuminata. *Inflorescentiae* pedunculus c.2·5 cm longus, tenuis; bracteae 3–4, 1–3 cm longae, lanceolatae, dense congestae, utraeque flores 2 suffulcientes; bracteola prima bracteae longitudine fere aequalis, secunda brevior. Calyx c.8 mm, unilateraliter profunde fissus, minute tridentatus; corollae tubus 2·5 cm, leviter pubescens; lobi pallide virides, laterales 1 × 0·2–0·3 cm, dorsalis latior et acutior; staminodia lateralia 0·5 cm longa, obovata; labellum album medio nota pallide viridi-lutea praeditum, c.1 cm longa et 0·8 cm lata prope basin ad 0·2–0·3 cm angustata, apice probabiliter integro; filamentum brevissimum; antherae thecae usque ad 0·4 cm longae, parallelae, calcaribus brevibus liberis, connectivo truncato in cristam haud prolongato; stylus pubescens; stigma cupiforme, ciliato-marginatum; glandulae epigynae lineares; ovarium 2 mm, ad apicem pubescens, uniloculare; ovula pauca, basalia. *Fructus* ignotus.
Type: Sarawak, 1st Division, Sungei Lundu, nr foot of G. Perigi, very common on damp forest floor but few flowers, petals pale green, recurved, labellum white papillose with pale greenish yellow central mark, stamen white, 6 viii 1962, *Burtt & Woods* B2700 (holo. E).
Other material examined:
SARAWAK: 1st Division, Lundu, iv 1924, *Mjoberg* 229 (K); *ibidem*, Mt Gading, forest trail, white and yellow green, 11 x 1929, *J. & M. S. Clemens* 22215 (K).

As yet known only from the type locality, *S. argentea* may be distinguished by the raised silver veins of the upper leaf surface; this character is very conspicuous in dried material. The tightly congested, long pedunculate inflorescence consists of (probably) 3–4 two-flowered cincinni.

3. S. reticosa (Ridley) R. M. Smith, **comb. nov.**
Type: Cult. Singapore Botanic Gardens, originally from Sarawak; 1st Division, Bidi, 22 x 1904, *Ridley* s.n. (SING).

Syn.: *Gastrochilus reticosus* Ridley in J. Str. Br. Roy. Asiat. Soc. 44:195 (1905).
Boesenbergia reticosa (Ridley) Merr., Enum. Born. Pl. 122 (1921).
Other material examined:
SARAWAK: 1st Division, Bidi, limestone rocks, hort. Kew, 15 vii 1915 (K).

The type collection of *S. reticosa* consists of a single plant, the prominently raised lateral veins with close cross reticulations are exactly as described by Ridley. In the Kew specimen this venation is barely discernible, but the separately preserved flowers (two per bract) have retained the violet and yellow coloration of the bilobed labellum. Furthermore, short free basal spurs may also be observed on the anther-thecae.

4. S. petiolata (K. Schum.) R. M. Smith, **comb. nov.**
Type: Sarawak, 1st Division, Mt Singhi, 11 xii 1892, *Haviland* 2026 (K).
Syn.: *Haplochorema petiolatum* K. Schum., Pflanzenr. Zing. 90 (1904).

No recent material of *S. petiolata* has been seen. In general facies it resembles *S. concinna* (Bak.) Holtt. of peninsular Malaya with which it agrees in the erect, single-leaved shoots. However, *S. petiolata* lacks the cordate leaf bases of that species and the very much smaller inflorescence, which is borne on a peduncle of c.4 cm, is similar to that of *S. argentea*.

5. Scaphochlamys sp. aff. **S. breviscapa** Holtt.
SARAWAK: 1st Division, Penrissen Rd, limestone hill just short of Kampong Segu, lateral staminodes pale yellow, lip white at base with central yellow line, purple at edge of yellow and purple expanding onto whole of lobes, 26 v 1975, *Burtt* 8798 (E).

This collection probably represents an undescribed species, of which spirit material is needed; it is not possible to give detailed information on the inflorescence from the existing specimen.

The species is clearly closely allied to *S. breviscapa* Holtt., known only from the type locality (Malay Peninsula, Trengganau, *Corner* SFN 30021, K, E), but differs most notably in the arachnoid hairs of the lower leaf surface, longer peduncles, glabrous bracts and larger flowers.

Incompletely known species [*Scaphochlamys?*]:
Boesenbergia anomala (Hall. f.) Schlechter in Fedde Rep. 12:315 (1913).
Type: Cult. Bogor, originally from Kalimantan, Liang Gagang, *Hallier* s.n.—specimen lost.
Syn.: *Kaempferia anomala* Hall. f. in Bull. Herb. Boiss. 6:357, t. 9, f. 3 (1898).
Gastrochilus hallieri Ridley in J. Str. Br. Roy. Asiat. Soc. 32:109 (1899).—nom. illegit. Type as above.
G. anomalus (Hall. f.) K. Schum., Pflanzenr. Zing. 92 (1904); Val. in Bull. Jard. Bot. Buitenz. sér. 2, 27:104 (1918).

Of *Boesenbergia anomala*, as *Gastrochilus*, Valeton (op. cit.) stated that 'The specimen grown in the Hortus Bog. has been lost and no herbarium [material] appears to exist.' Hallier's description is of little use in deciding the correct generic position for this species; his figure shows a single-leaved

shoot (the description reads leaves 1–2), the small inflorescence emerging from a bladeless sheath. The labellum is not saccate and is bilobed. Ridley, who presumably saw the Bogor material, renamed the species because he did not consider it to be anomalous in the genus. However, Ridley's conception of *Boesenbergia* included many species now transferred to *Scaphochlamys* (which genus he did not recognize) and it is significant that in his listing of the species of *Boesenbergia* (as *Gastrochilus*) then known to him (*J. Roy. Asiat. Soc.* 32:109, 1899) *B. anomala* is placed in a group which includes four species now known to be *Scaphochlamys*. Ridley himself considered *B. anomala* to be close to his *Gastrochilus reticosus*, here transferred to *Scaphochlamys* (no. 3 above).

4. Haplochorema K. Schum. in Bot. Jahrb. 27:331 (1899) & Pflanzenr. Zing. 88 (1904).

Schumann described six species in *Haplochorema*, of these, two have been transferred to *Boesenbergia*, and two to *Scaphochlamys* (see under excluded species below). The generic position of *H. extensum* has not yet been resolved. There remains *H. uniflorum*, shown by Valeton (*Bull. Jard. Bot. Buitenz.* sér. 2:116, 1918) to be conspecific with *Kaempferia decus-sylvae* Hall. f.

Haplochorema was founded on account of the unilocular ovary, with, according to Schumann, basally affixed ovules; but, as has been noted by Valeton, and confirmed by examination of recent collections of *H. decus-sylvae*, the ovary may also be trilocular or incompletely so; in all cases the remnants of partitioning can be seen. Such ovaries are also found in *Boesenbergia* (see Burtt & Smith in *Trans. Bot. Soc. Edinb.* 39:507, 1964) and in *Scaphochlamys*; and, probably, in *Kaempferia*.

The flowers of *H. decus-sylvae* are similar to many *Kaempferia*; that is, the labellum and lateral staminodes are held flat; when this is associated with a deeply lobed lip, the flowers have a markedly quadrate appearance never found in *Boesenbergia* or *Scaphochlamys*. There is also a prominent, strongly reflexed anther-crest. In *H. decus-sylvae* the few-flowered inflorescence has distichous bracts and opens from the top downwards, whereas in *Kaempferia* the bracts are spirally arranged on a very short axis and the flowers open from the base upwards. In this character, *Haplochorema* agrees with *Boesenbergia*. The choice is to amend *Boesenbergia* to include species with quadrate flowers, or to retain *Haplochorema*, to which can now be added two further species and a variety. For the time being, I propose to accept *Haplochorema*.

KEY TO THE SPECIES

1. Leaves 20–30 × 10–14 cm; petioles much thickened; inflorescence of at least 10 flowers ..... 3. *H. magnum*
+ Leaves 4–16 × 3–9 cm; petioles thickened or slender; inflorescence 2–5-flowered 2
2. Leaves with silver variegation above; petioles thickened ..... 1. *H. decus-sylvae*
+ Leaves plain green above; petioles slender ..... 2. *H. pauciflorum*

1. H. decus-sylvae (Hall. f.) Val. in Bull. Jard. Bot. Buitenz. sér. 2, 27:116 (1918).

Syntypes: Kalimantan, Liang Gagang, *Hallier f.* s.n.; between Mandai and Kapuas, *Hallier f.* s.n. (omnes n.v.).

Syn.: *Kaempferia decus-sylvae* Hall. f. in Ann. Jard. Bot. Buitenz. 13:321 t. 27, f. 4 (1896).

Haplochorema uniflorum K. Schum. in Bot. Jahrb. 27:232 t. 4, f. C–F (1899) & in Pflanzenr. Zing. 90, f. 12, B, C, D, E (1904). Type: Sarawak, 2nd Division, Batang Lupar, Tieng Ladschin, *Beccari* 3219 (K).

The following material may belong here:

SARAWAK: 1st Division, Mt Matang, 24 v 1906, *Ridley* s.n. (K); 3rd Division, Bukit Raya, Kapit distr., leaves dark green with silver splashes above, deep purple below, corolla white, labellum two-lobed with a yellow spot and two red lines towards throat, 4 iv 1969, *G. Smith* S28219 (K, SAR); 4th Division, G. Mulu National Park, leaves blue green tinted with white stripes, flowers white, lip flat with yellow spots, 26 vi 1963, *Anderson* 4093 (SAR).

H. decus-sylvae may be distinguished from other *Haplochorema* by the variegated leaves. The Bukit Raya plant has red lines in the throat, similar markings were noted by Ridley (*J. Str. Br. Roy. Asiat. Soc.* 46:233, 1906), but not by Hallier or Valeton.

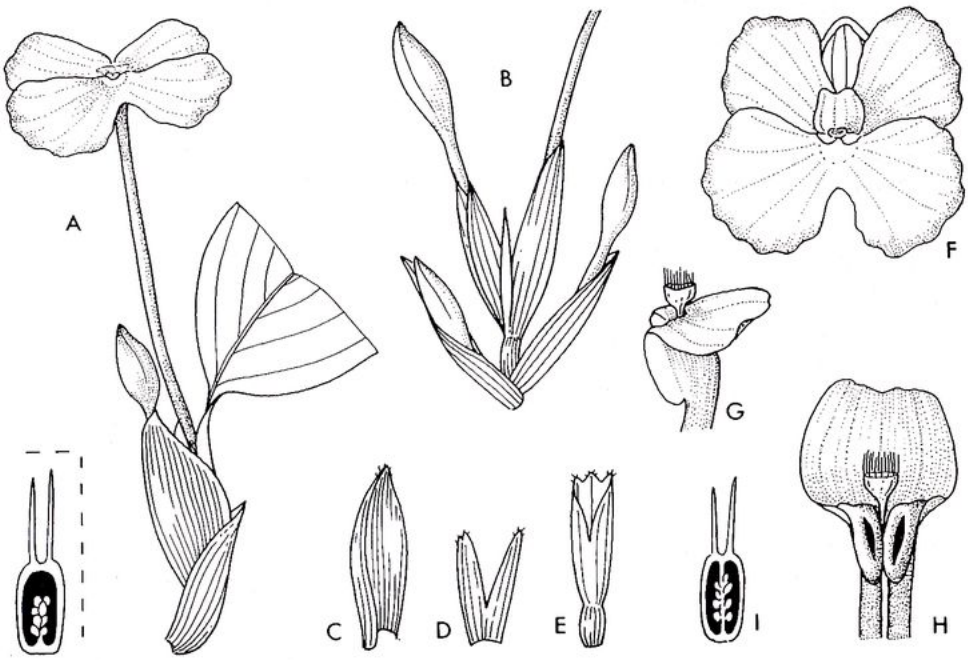

FIG. 2. *Haplochorema pauciflorum*. A, habit ×1; B, inflorescence, removed from sheaths and spread out ×1; C, bract ×1; D, bracteole ×1; E, calyx and ovary ×1; F, flower from above ×1; G, stamen, lateral view ×3; H, stamen, front view, crest raised up ×3; I, ovary in L.S. ×2. (From living material of *Burtt & Martin* B 4775.) Inset shows ovary in L.S. of *H. pauciflorum* var. *bullata* (from *Burtt & Martin* B 4927).

2. Haplochorema pauciflorum R. M. Smith, **species nova** *H. decus-sylvae* ob inflorescentiam paucifloram et surculos plerumque unifoliatos similis, sed foliis haud variegatis et petiolis tenuioribus differt. Fig. 2.

Herba ad 12 cm, interdum valde repens. Surculi unifoliati (raro bifoliati). *Folia* petiolis tenuibus 2–5 cm longis; lamina 5–8 × 2·5–4 cm, ovata, apice acuta vel obtusa, basi plus minusve rotundata, glabra; ligula c.2 mm, biloba, membranacea; vagina glabra. *Inflorescentia* 3–4-flora, plus minusve sessilis, intra vaginam folii oriens et cum ea vaginis duabus 6 cm longis elaminatis circumdata; bracteae distichae, 2–2·5 cm longae, cymbiformes; bracteolae paulo breviores, demum profunde fissae. *Flores* albi, deorsum emergentes; calyx c.1 cm, unilateraliter breviter fissus; corollae tubus ad 5 cm longus, tenuis; petala 1–1·3 cm longa, dorsale lateralibus latius; labellum album, puncta luteo-viridi in fauce ornatum, 2 × 2·3 cm, bilobum, planum, horizontale. Stamen c.1 cm longum; filamentum 1 mm; thecae 4 mm rimis dehiscentes; crista 5 mm, valde reflexa, integra. Stylus glaber; stigma ciliato-marginatum. Glandulae epigynae lineares, c.5 mm longae. Ovarium glabrum, incomplete triloculare. *Fructus* ignotus.

Type: Sarawak, 3rd Division, Melinau Community forest near Nanga Tunoh, white flowers of *Kaempferia elegans* shape, yellow green mark in centre, 3 viii 1967, *Burtt & Martin* B4775, cult. RBG Edinb., vii 1969, C6737 (holo. E).

Other material seen:

SARAWAK: 7th Division, Belaga distr., S. Jellini near junction with S. Nawai, Linau-Balui divide, forest floor, flat white flower, small smooth green leaf, 31 viii 1978, *Burtt* 11379 (E), S Hose mts, B. Salong, forest floor, creeping, leaves borne singly, flat kaempferoid flower, white with yellow mark at bottom, 28 iii 1980, *Burtt* 12716 (E); *ibidem*, S. Melinau, similar to B12716 but less strongly creeping, 19 iv 1980, *Burtt* 12920 (E).

The plants from B. Salong and S. Melinau differ from the type in their markedly creeping habit, the leaf shoots arising at intervals of up to 5 cm.

2a. Haplochorema pauciflorum var. **bullatum** R. M. Smith, **var. nov.** a var. *paucifloro* foliis majoribus bullatis infra arachnoideo-pubescentibus et labello integro vel paulo emarginato differt.

Type: Sarawak, 3rd Division, Hose Mts, gorge of S. Simpurai, leaf bullate, flower of the *Kaempferia elegans* type, pure white with a green eye, large anther crest, 14 viii 1967, *Burtt & Martin* B4921, cult. RBG Edinb., iii 1968, (holo. E).

Other material seen:

SARAWAK: 7th Division, Belaga distr., below B. Dema, c.2700 ft, bare ground near stream, leaves dull matt green above, reddish below, somewhat rippled, pure white flower of 4 flat lobes, large white anther-crest, yellowish anther, 27 viii 1978, *Burtt* 11321 (E).

The wild collection of *H. pauciflorum* var. *bullatum* shows an entire labellum, that of the cultivated plant is shortly emarginate. In all other respects the inflorescence is identical to that of the species. The ovate bullate leaves measure 9–12 × 5–7 cm and the variety lacks the creeping habit found in some collections of *H. pauciflorum*.

3. Haplochorema magnum R. M. Smith, **species nova** ob folia viridia haud variegata *H. paucifloro* similis, sed foliis multo majoribus et inflorescentia multiflora distincta.

Herba erecta ad 35 cm. Surculi unifoliati. *Folia* petiolis 5–10 cm incrassatis decurrentibus; lamina 19–30 × 10–15 cm, ovata vel ovato-lanceolata, acuta, infra parce pilosa; ligula c.3–4 mm, biloba, rotundata(?); vagina glabra. *Inflorescentia* breviter pedunculata, intra vagina folii oriens et cum ea vaginis duabus elaminatis circumdatis. *Flores* albi. Bracteae distichae, 2–2·5 cm longae; bracteolae paulo breviores. Calyx c.1 cm, parce pubescens, plus minusve trilobus; corollae tubus ad 5 cm, tenuis; petala?; labellum et staminodia lateralia horizontaliter disposita (fide coll.). Stamen 1 cm; filamentum brevissimum; anthera rimis dehiscens; crista 5 mm longa, integra. Stigma ciliatum. Glandulae epigynae lineares, 5 mm longae. *Fructus* ignotus.

Type: Sarawak, 7th Division, B. Dema to S. Brearan, leaf like B11319 (*Boesenbergia*) but flower white 4-partite, centre of lip with yellow patch, inflorescence opening downwards, 28 viii 1978, *Burtt* 11345 (holo. E).

Despite the absence of spirit material and the imperfections of the dried flowers, the collector's note indicates that this species belongs to *Haplochlorema*, and every effort should be made to re-collect the plant and acquire material in alcohol. Vegetatively *H. magnum* is very distinct from other members of the genus; the single-leaved shoots are large bladed and the petioles much thickened. The inflorescence is at least 10-flowered.

Imperfectly known species:

Haplochorema extensum K. Schum. in Bot. Jahrb. 27:333 (1899) & Pflanzenr. Zing. 91 (1904).

Type: Sarawak, 2nd Division, Prov. Batang Lupar, Gunung Tiang Ladschin, iv 1867, *Beccari* 3218 (FI).

H. extensum is a single leaved plant, not unlike *Scaphochlamys argentea* in general facies. The type specimen lacks mature flowers and the arrangement of the bracts on the very short axis cannot be elucidated.

Excluded species:

Haplochorema gracilipes K. Schum. = **Boesenbergia gracilipes** (K. Schum.) R. M. Smith

H. oligospermum K. Schum. = **B. oligosperma** (K. Schum.) R. M. Smith

H. petiolatum K. Schum. = **Scaphochlamys petiolata** (K. Schum.) R. M. Smith.

H. polyphyllum K. Schum. = **S. polyphylla** (K. Schum.) R. M. Smith.

5. Kaempferia L., Sp. Pl. 1:2 (1753).

1. K. atrovirens N. E. Br. in Illustr. Hort. 31:143, t. 610 (1886).

Type: Borneo, without precise locality, received via the Compagnie Continental d'Horticulture, Gand, Belgium, vii 1886 (K).

Other material seen:

BORNEO: without precise locality, cult. Fairchild Tropical Garden, Miami, Florida, *Gillis* 11050 (FTG).

K. atrovirens is very close to, and perhaps not distinct from, *K. pulchra* Ridley (*J. Str. Br. Roy. Asiat. Soc.* 32:107, 1899) described from lower Thailand and Langkawi Island in the northern Malay Peninsula. It may perhaps be distinguished on the larger flowers and broader staminodes and lobes of the labellum; good spirit collections will have to be examined before any formal synonomy is made. Both species have a yellow-white 'eye' to the otherwise uniformly coloured lavender labellum and staminodes and both display a much elongated, narrow reflexed anther-crest. The number of leaves varies, but is commonly two or three. *K. atrovirens* is an erect herb, *K. pulchra* was described as having the leaves flat on the ground, but Holttum (*Gard. Bull. Sing.* 13: 122, 1950) has pointed out that under certain conditions, the leaves become more erect in habit and may develop longer petioles. This is borne out by plants in cultivation at Edinburgh. The leaves of *K. pulchra* are often lightly variegated with grey-green above, this has not been recorded in *K. atrovirens*.

Holttum (op. cit. p. 123) has suggested that *K. elegans* Wall. may not be distinct from *K. pulchra*. This species was described from Tenasserim and is said to occur in Thailand and on Langkawi. However, Wallich's plate (*Wall. Pl. Asiat. Rar.* 1:27, t. 27, 1830) shows that the labellum and lateral staminodes of *K. elegans* are pure lavender and lack a yellow-white 'eye' and that the anther-crest is almost as wide as it is long. A collection from Langkawi in cultivation at Edinburgh and hitherto referred to *K. elegans* (*Burtt & Woods* B1771) has an elongated crest and yellow in the centre of the flower and clearly belongs to the *K. atrovirens/pulchra* complex.

6. Boesenbergia O. Kuntze, Rev. Gen. 2:685 (1891).

Boesenbergia is a clearly defined genus distinguished by two-ranked rather than spirally arranged bracts; this arrangement is commonly referred to as distichous, but is not strictly so since the bracts overlap on one face of the axis but not on the other. Each bract subtends a single boat-shaped bracteole and flower, and the sequence of flower opening, from apex to base, is otherwise known only in the closely allied *Haplochorema* and the more distantly related, mainly Sino-Himalayan *Caulokaempferia*. In most *Boesenbergia* the labellum is strongly saccate and more or less entire, but in *B. flavorubra* it is not markedly saccate and shows some bilobing; it is not, however, held flat, as in *Haplochorema*. Boesenbergias are small herbs of the forest floor, creeping or erect in habit, the inflorescence arising from the leaf sheath of a single-bladed shoot or from the uppermost sheath of a tuft of leaves. In the vegetative state, *Boesenbergia* resembles *Haplochorema* and *Scaphochlamys* and, like these genera, several species have prettily variegated leaves. The genus is widely distributed in Indo-Malaysia with a few species occurring in Java and Sumatra.

The following account is presented in the full knowledge that it has many imperfections and it is clear that much more field work is needed with careful observations on the following points:

1. *Anther dehiscence*

An important character, commented on by Valeton (*Bull. Jard. Bot. Buitenz.* sér. 2, 27:84, 1918), is that in some species the thecae dehisce by terminal pores rather than longitudinal slits. These pores do in fact continue

as slits down the inner face of each theca and are not true pores as may be found in, for example, the Ericaceae, but in species of *Boesenbergia* possessing this character pollen is shed only from the top of the anther. It is virtually impossible to distinguish this condition in dried herbarium material. Pores are known to exist in *B. grandifolia*, *B. grandis*, *B. stenophylla*, *B. apiculata* and in the modern collections placed with *B. parva* and *B. gracilipes*. The mode of dehiscence is unknown in *B. ornata* and *B. hirta*.

2. *Fruit*

Holttum's detailed description of *Boesenbergia* (*Gard. Bull. Sing.* 13:106, 1950) tells us that the fruit is thin-walled and ellipsoid, but in fact capsules have rarely been collected; the author has seen but one Bornean example—a young fruit of *B. grandis*, and attempts at self-fertilisation with the few species which have been in cultivation at Edinburgh during the past few years have met with no success.

3. *Variegation*

In the following key it has been necessary to use leaf variegation as an aid to identification, but this character may not prove to be wholly reliable. *B. aurantiaca*, in cultivation at Edinburgh (under shady conditions), showed some light yellow variegation on the otherwise dark glossy green leaves, but the collectors of the wild plant state that, in its original habitat, i.e. growing in conditions of little light intensity, this variegation was much more striking.

4. *Leaf-shoots*

It has been unavoidable to use 'shoots single-leaved' as against 'shoots 2—several-leaved' in the ensuing key but much more needs to be known of the possible variation in habit within a species particularly with regard to fertile and sterile shoots. This is further discussed under *B. grandifolia* (no. 8 below). Also, normally single-leaved species may, under pot conditions, produce additional leaves.

Finally, of Bornean Zingiberaceae only *Amomum* currently includes more species than *Boesenbergia*. Nineteen are enumerated below, there are undoubtedly more and it is significant that in the intensively collected Gunung Mulu National Park in the 4th Division of Sarawak no less than 12 of these 19 species occur.

KEY TO THE SPECIES

1. Creeping herbs; shoots normally single-leaved; inflorescence more or less sessile; anther dehiscing by slits 2
\+ Erect herbs; shoots with one to many leaves; inflorescence sessile or long pedunculate; anther dehiscing by slits or pores 6
2. Leaves more or less round, obtuse or obscurely emarginate at apex ..... 1. *B. orbiculata*
\+ Leaves elliptic or lanceolate, acute at apex 3
3. Leaves plain green 4
\+ Leaves variegated 5
4. Corolla tube pubescent outside; flowers yellow and white; labellum entire ..... 2. *B. flavoalba*

\+ Corolla tube glabrous outside; flowers yellow and white, red at throat; labellum bilobed ..... 3. *B. flavorubra*

5. Petioles under 0·5 cm; lamina 4–8 × 1·5–2 cm, mid green with a broad silver band on either side of the midrib on upper surface ..... 4. *B. kerbyi*

\+ Petioles 2–3 cm; lamina 7–12 × 2·5–7 cm, dark green with a band of lighter green up the midrib, variegation sometimes extending to the main lateral veins ..... 5. *B. variegata*

6. Leaves 30–60 × 12–30 cm; anthers dehiscing by pores; petioles much thickened, winged 7

\+ Leaves not exceeding 25 × 8 cm; anthers dehiscing by pores or slits; petioles never much thickened, if winged then anthers dehiscing by slits 8

7. Fertile shoots single-leaved (fide Valeton, *Bull. Jard. Bot. Buitenz.*, sér. 2, 27:98, 1918); lateral staminodes lanceolate, much shorter than the petals; calyx lobes not aristate ..... 8. *B. grandifolia*

\+ Fertile shoots several-leaved; lateral staminodes spathulate, more or less equal in length to the petals; calyx lobes aristate ..... 9. *B. grandis*

8. Leaf shoots single-leaved 9

\+ Leaf shoots 2–several-leaved 10

9. Leaves cordate at the base, long caudate at the apex ... 6. *B. cordata*

\+ Leaves attenuate to rounded at the base, apex acute .. 7. *B. gracilipes*

10. Inflorescence long exserted from the leaf sheaths when fully grown, spindle-shaped; flowers red and white ..... 10. *B. pulchella*

\+ Inflorescence never long exserted or spindle-shaped; flower colours various 11

11. Leaves linear, arrangement of blades strongly flabellate ..... 11. *B. burttiana*

\+ Leaves elliptic, lanceolate or, rarely linear-lanceolate, arrangement of blades never flabellate 12

12. Leaves variegated; anthers dehiscing by slits (unknown in B. *ornata*). 13

\+ Leaves plain green; anthers dehiscing by pores (unknown in *B. hirta*). 15

13. Leaves bullate, dark green around main veins and almost silvery on raised areas; flowers white, yellow and red .... 12. *B. hutchinsoniana*

\+ Leaves smooth with a silver or yellow cloud along the mid-rib; flowers yellow-orange 14

14. Leaves with a silver cloud; flowers yellow, labellum orange spotted ..... 13. *B. ornata*

\+ Leaves with a bright yellow-green cloud; flowers orange, darker at base of labellum ..... 14. *B. aurantiaca*

15. Flowers red and white; inflorescence pubescent; bracts conspicuously cuspidate ..... 15. *B. hirta*

\+ Flowers variously coloured, never red and white; inflorescence rarely pubescent; bracts acuminate or acute, never cuspidate 16

16. Lip violet-brown with a yellow or white centre; anther-crest bifid ..... 16. *B. apiculata*

\+ Lip orange-yellow, plain yellow or yellow and white, sometimes with red in throat; anther-crest entire 17

17. Flowers yellow-orange; leaves drying darkish-brown ..... 17. *B. oligosperma*

+ Flowers white and yellow, sometimes red in throat; leaves green or grey-green when dry 18

18. Leaves to 10 × 2·5 cm; corolla tube pubescent outside; labellum red at base ..... 18. *B. parva*

+ Leaves to 25 × 3·5 cm; corolla tube glabrous; labellum without red at base ..... 19. *B. stenophylla*

1. B. orbiculata R. M. Smith in Bot. J. Linn. Soc. 85:54, fig. 12A (1982). Type: Sarawak, 4th Division, G. Mulu National Park, Melinau gorge, 4–500 ft, wet alluvial forest floor, creeping, flowers creamy white, centre of lip yellow with red mark at base, 14 vi 1975, *Burtt* 8275 (holo. E).
Other material examined:
SARAWAK: 4th Division, G. Mulu National Park, ascent to G. Mulu, flower white, yellow in centre with red in throat, 13 vi 1962, *Burtt & Woods* B2064 (E); *ibidem*, near S. Melinau, creeping on floor of alluvial rain forest, c.100 m, flower white with yellow stripe on labellum and red eye, 12 iv 1978, *Argent & Coppins* 959 (E, SAR); *ibidem*, alluvial forest, small ginger with long purple rhizome, flower white with yellow line and two red spots in throat, 17 iv 1978, *Kiew* 286 (E); *ibidem*, Gua Payau, c.100 m, creeping in alluvial rainforest, common, bracts translucent white speckled purple, labellum white except central area which is yellow passing to a red eye, 19 xi 1977, *Argent & Kerby* 804 (E); *ibidem*, on eastern bank of Tapin in mixed dipterocarp forest, on sandstone or shales, flower cream-white, crimson centre, 28 iii 1978, *Jermy* s.n. (E); *ibidem*, camp 3 to base camp, iv 1978, *Argent et al* 1146a (E); *ibidem*, Nanga Birau, S. Melinau, tributary of Tutoh, clay alluvium on side of fast flowing river, limestone influence, small creeping herb, corolla white with red dot in centre, 25 ix 1971, *Anderson* S30729 (E, SAR); 5th Division, Long Semadoh to Long Ugong, flower white, middle of labellum yellow, base red, 20 ix 1967, *Burtt & Martin* B5164 (E); Kelabit Highlands, Bario, 1000 m, sandstone on sharp ridges, 23 iii 1970, *Noteboom & Chai* 1708 (SAR); Mt Merapok, 1800 ft, flower light green, 5 iv 1927, *Native collector* s.n. (UC316037).

B. orbiculata is easily recognized by the almost round leaves which are slightly cordate at the base and the strongly creeping habit. The flowers of the depauperate inflorescence open singly; there is a short, reflexed anther crest and the dehiscence is by slits.

2. Boesenbergia flavoalba R. M. Smith, **species nova** *B. variegatae* similis ob corollae tubum pubescentem et antherae cristam prominentem sed foliis minoribus viridibus non-variegatis et fauce corollae haud rubro-notato differt.

Herba repens. Surculi unifoliati inter se proxime orientes; petiolus ad 2 cm longus; lamina 4–9 × 1·5–2·5 cm, elliptica, apice acuta, glabra; ligula ad 1 cm, acuminata, glabra; vagina glabra. *Inflorescentia* brevipedunculata, usque 6-flora, intra vagina folii oriens et vagina elaminata circumdata; bracteae distichae 1·5–2·5 cm longae, cymbiformes, basin versus pubescentes, florem singulum subtendentes; bracteolae breviores. Calyx 5 mm, trilobus; corolla alba; tubus c.2·5 cm longus, extra et intus circumfaucem pubescens; lobi 6–8 mm longi, lanceolati, acuti, dorsalis lateralibus latior;

labellum fauce luteo, c.1 × 0·8 cm, vix saccatum, integrum; staminodia lateralia 6 mm longa, lanceolata; filamentum 2–3 mm longum; antherae thecae aequales, rimis dehiscentes; connectivum in cristam prominentem 2 mm longam prolongatum; stigma glabrum; glandulae epigynae aciculares, c.3 mm. Ovarium c.2 mm, pubescens, partim uniloculare. *Fructus* ignotus.
Type: Sarawak, 4th Division, Gunung Mulu National Park, ascent to G. Mulu, white flowers yellow in throat, forest floor, 13 vi 1962, *Burtt & Woods* B2072 (holo E).
Other material examined:
SABAH: Pensingian distr., c.5 miles S of Nabawan, Keningau Road, 1600 ft, edge of *Dacrydium* forest in leaf litter, white flowers, yellow blotch on lip, ix 1979, *Collenette* 63/79 (E); Nabawan, podsolic forest, in shade, sandy soil, plain green leaves, white flowers, yellow labellum, 16 vi 1986, *Lamb* 231/86 (E).

Some sparse pubescence occurs on the lower leaf surface in *Lamb* 231/86, otherwise the Sabah collections match the type of *B. flavoalba* well.

3. B. flavorubra R. M. Smith in Bot. J. Linn. Soc. 85:48, fig. 12B (1982).
Type: Sarawak, 4th Division, G. Mulu National Park, G. Api, c.3000 ft, flower white except for yellow patch in centre of lip, broad bright red bar in throat, 12 vi 1975, *Burtt* 8245 (holo. E).
Other material examined:
SARAWAK: 4th Division, G. Mulu National Park, G. Api, NE flank, steep slopes of limestone mountain, 3499 ft, small creeping herb, corolla white with yellow and red markings on lower lip, 2 x 1971, *Anderson* S30945 (E, SAR); *ibidem*, around limestone boulders in lower montane forest and on cliff, 6 ix 1970, *Lehmann* S29444 (SAR); *ibidem* 800–1000 m, below pinnacle camp, lower montane forest on limestone, flowers cream with reddish tinged labellum, 24 ii 1978, *Nielsen* 500 (AAU); *ibidem*, cultivated material only, RBG Edinb. from *Kerby* 94 (E); *ibidem*, base of Pantu ridge, flowers white, labellum yellow with red throat, 23 iv 1978, *Kiew* 390 (E); Melinau gorge, SW of camp, flowers white with yellow patch in middle of labellum and red mark at base, 26 vi 1962, *Burtt & Woods* B2308 (E); 1st Division, Bau distr., S end G. Doya, straggly growth, white with yellow in centre of lip, pink patch at base, 23 v 1975, *Burtt* 8186 (E).
SABAH: Nabawan, Pensingian, c.14–1500′, cult. A. Lamb, Tenom Orchid Centre, flowers white, yellow and red, lip bilobed, 11 vi 1986, *R. M. Smith* 7/86 (E).

B. flavorubra is distinguished from the preceding species by the glabrous corolla tube and bi-lobed, non-saccate labellum. The lateral staminodes are large for the genus and exceed the dorsal petal in length; there is a prominent anther-crest. The plant in cultivation at Tenom was pot grown and produced several shoots with two, rather than a single leaf.

4. B. kerbyi R. M. Smith in Bot. J. Linn. Soc. 85:52, fig. 11B (1982).
Type: Sarawak, 4th division, G. Mulu National Park, G. Mulu, 500m, lowland dipterocarp forest, flowers yellow and white, cult. RBG Edinb. 13 v 1981 from *Kerby* 214 (living material only) C13881 (holo. E).

Other material examined:
SARAWAK: 4th Division, G. Mulu National Park, S. Langsat, 165 m, forest floor on lowland mixed dipterocarp forest, 17 i 1978, *Hansen* 52 (C); *ibidem*, flowers white, v 1978, *Kiew* 567 (E).

B. kerbyi is a variegated species with broad silver bands to the left and right of the midrib, the leaf shoots are single-bladed, the small elliptic lamina measuring 4–8 × 1·5–2 cm.

5. B. variegata R. M. Smith in Bot. J. Linn. Soc. 85:52, fig. 8A (1982).
Type: Sarawak, 4th Division, G. Mulu National Park, camp 5, alluvial plain W of camp and S of S. Melinau, 150 m, flower white with a yellow and red spot, 25 x 1978, *Hansen* 115 (holo. C).
Other material seen:
SARAWAK: 4th Division, G. Mulu National Park, Melinau gorge, c.500 ft, wet leafy forest floor, dark green leaf with light bar up midrib, flower cream, lip deep yellow centrally, red in bowl, 14 vi 1975, *Burtt* 8264 (E); *ibidem*, NE flank of G. Api, base of limestone mountain, scree slope with limestone boulders and clay soil, primary forest, 400 ft, small creeping herb, corolla white with yellow and red markings on lower lip, leaves variegated, 4 x 1971, *Anderson* S31781 (SAR, E).
SABAH: Batu Ponggol, Batang Urum, 12–1400 ft, on limestone, leaves bullate, red below, green and yellow variegated above; flowers white and yellow, red at base of lip; cult. A. Lamb, Tenom Orchid Centre, 11 vi 1986, *R. M. Smith* 6/86 (E).

The singly produced leaves of *B. variegata* are slightly bullate and marked by a band of light green up the midrib, the variegation sometimes extending to the lateral veins. The inflorescence is densely pubescent and bears up to 10 flowers.

A collection from Belaga distr. in the 7th Division, *Burtt* 11307, may belong here, but no mention is made of any red coloration at the base of the labellum.

6. B. cordata R. M. Smith in Bot. J. Linn. Soc. 85:46, fig. 11A (1982).
Type: Sarawak, 4th Division, G. Mulu National Park, SW Benarat, common on ledges at foot of limestone cliff, pale cream flower, centre of lip deep yellow, bowl marked red, 13 vi 1975, *Burtt* 8258 (holo. E).
Other material seen:
SARAWAK: 4th Division, G. Mulu National Park, Benarat cliffs, S flank facing Melinau, shaded limestone rocks, flowers white, almost translucent, middle of labellum yellow, rose in throat, 24 vi 1962, *Burtt & Woods* B2273 (E); *ibidem*, Melinau gorge camp, common below cliffs on limestone rocks, pale flower with deeper yellow centre to lip and red bar in bowl, 11 vi 1975, *Burtt* 8232 (E); *ibidem*, G. Api, Ulu S. Melinau, Tutoh, lower flanks of limestone mountain, primary forest, corolla white, lower lip pink, 27 ix 1971, *Anderson* S30786 (SAR, E); Melinau gorge, 90 m, alluvial forest, flowers cream, yellowish-red, 27 ii 1978, *Nielsen* 524 (AAU).

Within its restricted distribution *B. cordata* is a common species easily recognized by the heart-shaped, long caudate leaves and long pendunculate few-flowered inflorescence. The single-leaved shoots are held erect.

7. B. gracilipes (K. Schum.) R. M. Smith in Bot. J. Linn. Soc. 85:43 (1982).
Type: Sarawak, 1st Division, G. Wah, xi 1866, *Beccari* 2839 (K).
Syn.: *Haplochorema gracilipes* K. Schum. in Bot. Jahrb. 27:332 (1899) & Pflanzenr. Zing. 90 (1904).
The following material may belong here:
SARAWAK: 4th Division, Gunung Mulu National Park, nr Tarikan, erect shoots with 1 leaf, flower cream, centre of lip yellow, bowl red, 14 iv 1975, *Burtt* 8281 (E); 5th Division, G. Merapok, flowers white with yellow tip, *Native collector* sn, (UC 316011).
SABAH: Crocker Range above Kallang Falls, by stream, 1500 ft, primary forest; flowers white and yellow with some purple streaks, ii 1985, *Lamb* 6/85 (E); Tenom Orchid Centre, Cult. A. Lamb, 11 vi 1986, *R. M. Smith* 8/86 (E).
KALIMANTAN: between Long Bawan and Panado, evergreen forest along streamlet on granite hill, G. Paris, lip yellow with white margin, stamen white, 6 vii 1981, *Geesink* 8934 (L).

The above collections are quite variable in petiole length; from 1–4 cm in the Sabah plants and up to 8 cm (and closer to the type) in those from Sarawak and Kalimantan. The elliptic rather than cordate leaves and the shortly pedunculate inflorescence well distinguish *B. gracilipes* from the similarly erect *B. cordata*.

8. B. grandiflora (Val.) Merr., Enum. Born. Pl. 122 (1921).
Type: Borneo, without precise locality, *Nieuwenhuis* s.n., cult. Bogor (n.v.).
Syn.: *Gastrochilus grandifolius* Val., Ic. Bog. 4:241, t. 377 (1914) & in Bull. Jard. Bot. Buitenz. sér. 2, 27:98 (1918).
The following material may belong here:
SARAWAK: 4th Division, Lambir hills, flowers white, deep yellow in centre of lip with somewhat paler line running to base with pinky red line, 6 vii 1962, *Burtt & Woods* B2430 (E).

This collection fits Valeton's description and figure reasonably well, but differs in the much smaller lamina (26 × 10 cm) of the single-leaved shoot, in the corolla tube being pubescent on the outside and in the pubescent ovary.

Valeton has observed (op. cit., p. 98, 1918) that, in cultivation at Bogor, *B. grandifolia* produced tufted sterile shoots with up to 5 blades, whereas the inflorescence was always accompanied by a single leaved shoot. Whether this pattern is repeated in the wild is not known.

B. grandifolia is closely allied to *B. grandis* (no. 9 below) with which it agrees in the thick, winged petioles, many-flowered inflorescence, porous dehiscence and prominent anther-crest. *B. grandis* is distinguished by the 3–5-leaved fertile shoots, larger flowers, aristate calyx lobes, and broad spathulate lateral staminodes which more or less equal the petals in length.

9. B. grandis R. M. Smith in Bot. J. Linn. Soc. 85:49, fig. 13 (1982).
Type: Sarawak, 4th Division, G. Mulu National Park, Gua Payau, on ground at foot of limestone cliff in shade of rain forest, c.100 m, clump forming, flowers white except labellum which is yellow in expanded portion, red within, 19 xi 1977, *Argent & Kerby* 794 (holo. E).

Other material seen:
SARAWAK: G. Mulu National Park, nr Gua Payau, clumps among limestone rocks, flowers whitish except pale yellow lip, deep yellow in centre, marked red in bowl, 4–6 leaves per flowering shoot, 9 vi 1975, *Burtt* 8217 (E); *ibidem*, around camp 2, mixed dipterocarp lowland forest on shales and clays, plant with 3–4 leaves on low (20 cm) stem, flowers white, 3 viii 1978, *Jermy* 14279 (E); *ibidem*, c.600 m, on hillside N of Long Tapin, in mixed dipterocarp forest near low ridge top, epiphyte, flower white with yellow guide line, another flower with red guide line, 13 iii 1978, *Jermy* 13854 (E).

A collection from the 3rd Division, Hose Mts, confluence between B. Nibong and B. Sanpandai (*Burtt & Martin* B4900) is problematic. In its tufted habit and very large leaves (70 × 20 cm), it agrees with *B. grandis* but the smaller flowers and non-aristate calyx bring it closer to *B. grandifolia*. A great deal has yet to be learned of variation in habit within species of *Boesenbergia*; this can only be done in the field.

10. B. pulchella (Ridley) Merr., Enum. Born. Pl. 122 (1921). Fig. 3.
Type: Sarawak, 1st Division, Bidi, Jambusan Caves, ix 1905, *Ridley* s.n. (K).
Syn.: *Gastrochilus pulchellus* Ridley in J. Str. Br. Roy. Asiat. Soc. 46:234 (1906).
Other material examined:
SABAH: G. Lumarku, nr Sipitang, Mengalom to Milligan path, c.600 m, rain forest, flower white with red distal part to labellum and red spots leading to red eye, 20 iii 1980, *Argent & Lamb* 1439 (E); Danum valley, stream bank between W10 and W5 at N5, 180 m, primary rain forest, stems to 2–3 blades, calyx white, corolla tube and lobes white, lateral staminodes white, lip white with red blotches along middle section to edge, red spreading along frontal edges, stamen white, 5 ix 1985, *Newman* 80 (E).
SARAWAK: 1st Division, Penrissen rd, limestone hill just short of Kampong Segu, clay slope at edge of forest and secondary growth, labellum densely marked red on rim, spotted in bowl, 26 v 1975, *Burtt* 8193 (E); 4th Division, G. Mulu National Park, Gua Payau, c.100 m, limestone lowland forest, cliff face and detritus, flower crimson mottled, 31 vii 1978, *Jermy* 14239 (E, BM); *ibidem*, on ground in shade of alluvial rain forest, c.100 m, flowers white except labellum with central vertical stripe of red spots and outer half red except for translucent white edge, 19 xi 1977, *Argent & Kerby* 791 (E); *ibidem*, 19 xi 1977, *Argent & Kerby* 807 (E); *ibidem*, wet ground in forest below limestone, pale flowers except blood red margin to lip which links either to red central bar in bowl or to generally red bowl, 9 vi 1975, *Burtt* 8218 (E); *ibidem*, alluvial soil at base of limestone hill, corolla white with red lip, 7 x 1971, *Anderson* S31829 (E); *ibidem*, Benarat, below B. Buda, c.1000 ft, on limestone rocks in forest, red margined lip with pale central patch, heavily marked red in bowl, 14 vi 1975, *Burtt* 8266 (E); 5th Division, Merapok, 1200 ft, *Native collector* s.n. (UC 315949); 7th Division, Belaga distr., camp site below B. Dema, 2700 ft, shady stream gully, flower white except for red tip to labellum and red marks in bowl, 28 viii 1978, *Burtt* 11344 (E).
KALIMANTAN: Berau nr Tandjungredep, xi 1963, *Kostermanns* 21739 (L).

FIG. 3. *Boesenbergia pulchella*. A, habit $\times\frac{2}{3}$; B, bract $\times 2$; C, bracteole $\times 2$; D, calyx $\times 2$; E, flower from the front $\times 2$; F, corolla in L.S. showing lateral staminodes, stamen and dorsal petal $\times 2$; G, corolla in L.S. showing labellum and lateral petals $\times 2$; H, stamen and upper part of corolla tube $\times 4$; I, ovary in TS $\times 3$. (A from dried material of *Argent & Kerby* 791, B—I from spirit material of *Burtt* 11344.)

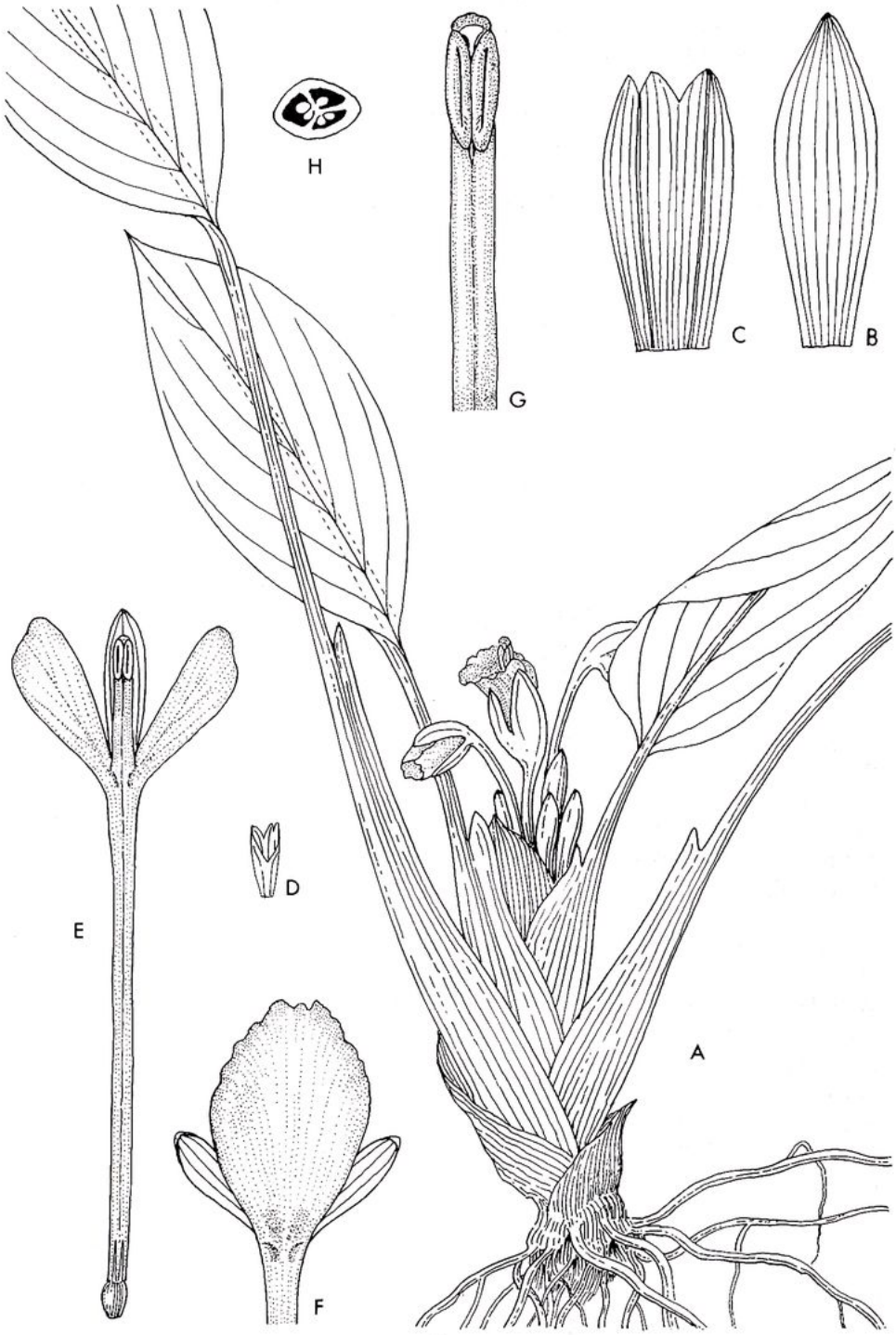

FIG. 4. *Boesenbergia aurantiaca*. A, habit $\times\frac{2}{3}$; B, bract $\times 1$; C, bracteole $\times 1$; D, calyx $\times 1$; E, corolla in L.S. showing stamen, lateral staminodes and dorsal petal $\times 1$; F, labellum and lateral petals $\times 1$; G, stamen $\times 3$; H, ovary in T.S. $\times 3$. (From *Argent & Ratter* San 108235, living material.)

The leaves of the type specimen of *B. pulchella* show only a tendency towards cordate bases; this is also true of the plant from Kalimantan. In all the other material examined truly cordate bases are evident on almost all leaves.

B. pulchella is otherwise easily recognized by the many-flowered, narrowly lanceolate inflorescence, which becomes much exserted from the leaf sheaths when fully grown, and by the strongly saccate, red and white labellum. It is closely allied to *B. pulcherrima* (Wall.) O. Kuntze, described from Burma and with a distribution extending southwards to Penang, but differs in its much smaller stature and petiolate leaves. The peninsular *B. prainiana* (Bak.) Schlecht. has a similar inflorescence but in this species the leaf bases are cuneate to rounded and the shoots single-leaved. In *B. pulchella* the shoots are commonly 4–6 bladed.

10a. Boesenbergia pulchella var. **attenuata** R. M. Smith, **var. nov.** a var. pulchella basibus foliorum attenuatis, laminis decurrentibus et ligulis longioribus differt.
Type: Sabah, Sepilok Forest Reserve, lowland forest in swampy places, flower white, lip white with red margin and line of reddish dots, 22 iii 1967, *Stone* 6743 (KLU).
Other material seen:
SABAH: near Sandakan and Tawao, flower white except for the deep red throat and rim of the inflated lip, x 1922–iii 1923, *Elmer* 20790 (UC); *ibidem*, lower lip saccate and deep red, upper and outer segments white, x–xii 1921, *Elmer* 20322 (UC).

The Elmer specimens are commented on by Merrill (*Univ. Calif. Publ. Bot.* 25:29 (1929)), who identified the plant as a *Boesenbergia* but did not suggest an alliance with *B. pulchella*. In habit, inflorescence shape and flower colour, var. *attenuata* is identical to the species, but the attenuate leaf bases, decurrent onto the petioles, are strikingly different. The narrowly lanceolate bilobed ligule is up to 2·5 cm long.

11. B. burttiana R. M. Smith in Bot. J. Linn. Soc. 85:42, fig. 10 (1982).
Type: Sarawak, 4th Division, G. Mulu National Park, S. Tarikan to S. Medalam, c.350 ft, leaves forming fans, flowers white yellow in centre of lip and pink below yellow, 20 vi 1975, *Burtt* 8325 (holo. E).
Other material examined:
SARAWAK: 4th Division, Lambir National Park, S. Liam Libau, locally common, pale green fans, sterile, 22 ix 1978, *Burtt* 11582 (E); 5th Division, Ulu Medamit, Limbang, 200 m, on yellow sandy clay, Iban name 'Jerangau Mirah', 11 x 1972, *Wright & Othman* S32306 (SAR).

The fan-like arrangement of the linear blades of the many-leaved shoots of *B. burttiana* is immediately recognizable in the field and is usually preserved in the dry state.

12. B. hutchinsoniana Burtt & Smith in Trans. Bot. Soc. Edinb. 39:510 (1964).
Type: Sarawak, 4th Division, G. Mulu National Park, Melinau gorge pathway, c.750 m, between G. Api and G. Benarat, limestone, leaves two shades

of green, wavy bullate, flowers white; lip yellow in middle, reddish purple in throat, 23 vi 1962, *Burtt & Woods* B2235, cult. in RBG Edinb. (holo. E). Other material examined:
SARAWAK: 4th Division, G. Mulu National Park, c.6000 ft, below G. Api, amongst limestone rocks, also seen at 3000 ft on G. Api, pale flower with deep yellow centre to lip and in bowl, bullately rippled leaf, 14 vi 1975, *Burtt* 8271 (E).

B. hutchinsoniana is known only from Gunong Mulu National Park. It is generally of a tufted habit, with 2–5 leaves but single-leaved shoots can occur. The lamina is strongly bullate, much more so than in the single-leaved *B. variegata*, variegated dark green around the main veins with silvery patches on the raised areas and is lightly pubescent below.

13. B. ornata (N. E. Br.) R. M. Smith in Notes RBG Edinb. 38:19 (1980). Type: Borneo, without precise locality, coll. *Teuscher* for the Compagnie d'Horticulture à Gand, cultivated material only (K).
Syn.: *Kaempferia ornata* N. E. Br. in Illustr. Hortic. 31:159, t. 537 (1884).
Gastrochilus ornatus (N. E. Br.) Val. in Bull. Jard. Bot. Buitenz., sér. 2, 27:89 (1918).

No further material of *B. ornata* has been seen. It is a yellow-flowered species, with an orange-spotted labellum and beautifully variegated silver-green leaves. It is probably closest to *B. aurantiaca*.

14. B. aurantiaca R. M. Smith, **species nova**, floribus aurantiacis et habitu caespitoso *B. ornatae* similis sed foliis fusco-viridibus et pallide luteo-viridibus et ligula multo breviore distincta. Fig. 4.

Herba erecta. Surculi foliati caespitosi, foliis 4–5. *Folia* petiolis 2–8 cm; lamina 5–12 × 3–5 cm, elliptica, apice breviter acuminato, glabra, fusco-viridis, secus costam laete et vivide luteo-viridi-variegata; ligula 3–5 mm, biloba; vagina glabra. *Inflorescentia* in surculo foliato terminalis, plus minusve sessilis, multiflora; bracteae distichae ad 5 × 0·5 cm, cymbiformes, glabrae, uniflorae; bracteolae bracteis minores flores aurantiaci; calyx 5–6 mm longus, 2–3-lobus; corolla tubus ad 7 cm longus (in plantis cultis brevior), lobi 1·5–1·8 cm longi, dorsalis latior; labellum c.2 × 2 cm, saccatum, plus minusve integrum; staminodia lateralia 1·3–1·5 × 0·4–0·6 cm, spatulata. Stamen ad 1·5 cm longum; filamentis c.1 cm; antherae thecae c.0·5 cm, parallelae, rimis dehiscentes, connectivo in cristam 1 mm longam prolongato; stylus glaber; stigma glabrum. Glandulae epigynae 2–3 mm, lineares. Ovarium 2–3 mm, triloculare, placentatione axili. Capsula ignota. Type: Sabah, Danum Valley, 100–250 m, mixed dipterocarp forest, in deep shade, iv 1985, *Argent & Ratter* San 108235, cult. RBG Edinb., viii 1985 (holo. E).

This beautiful species seems most closely allied to the little known *B. ornata* but lacks the silvery variegated leaves and very long ligules of that species. The bright, unmarked orange flowers of *B. aurantiaca* are well set off by the dark lustrous green leaves which bear a bright light yellow-green 'cloud' down the midrib on the upper surface; sheaths and petioles are mottled with flecks of red. In cultivation the flowers have produced much shorter corolla tubes.

The discovery of *B. aurantiaca* hints at the botanical potential of the Danum Valley, an area which, in the coming years seems likely to be as thoroughly explored botanically as the G. Mulu Park in Sarawak.

15. B. hirta (Ridley) Merr., Enum. Born. Pl. 122 (1921).
Type: Sarawak, 2nd Division, Bukit Tiang Laju, flowers white, lip with some red centrally, *Hewitt* 20 (SING).
Syn.: *Gastrochilus hirtus* Ridley in J. Str. Br. Roy. Asiat. Soc. 54:57 (1909).
Other material examined:
SARAWAK: without precise locality, white lip with red centrally, xi 1906, *Hewitt* series 470 (SING).

No recent collections of *B. hirta* have been seen. The flowering shoots are 2–3-leaved, the obovate lamina is 15–20 × 5 cm, the entire inflorescence pubescent and bears long cuspidate bracts.

16. B. apiculata (Val.) Loesen., Pflanzenfam. Aufl. 2, 15A:571 (1930).
Type: Kalimantan; Amai Ambit, 1080 m, *Hallier* 31768 (n.v.).
Syn.: *Gastrochilus apiculatus* Val. in Bull. Jard. Bot. Buitenz. sér. 2, 27:95, f. 11 (1918).

No material of *B. apiculatum* has been seen. It is described as a tufted, several-leaved plant, the blades measuring 15–16 × 4·5–6 cm. The inflorescence is many-flowered and the anther dehiscence porous; there is a short bifid crest. The affinity may lie with *B. grandis/grandifolia*. The lip is described as having a white or yellow central bar in the lower part, bordered by a violet cloud.

17. B. oligosperma (K. Schum.) R. M. Smith in Notes RBG Edinb. 38:19 (1980). Fig. 5A.
Type: Sarawak, 2nd Division, Batang Lupar, Marop, iv 1864, *Beccari* 3307 (K).
Syn.: *Haplochorema oligosperma* K. Schum., Pflanzenr. Zing. 90 (1904).
Other material examined:
SARAWAK: 1st Division, nr Kuching, received K, xi 1891, *Haviland* 449 (K); Lundu distr., Kampong Keranji, flowers light yellow, lip somewhat darker, 16 viii 1962, *Burtt & Woods* B2885 (E); 3rd Division, Hose Mts, base camp, 23 viii 1967, *Burtt & Martin* B5135, cultivated material only, flowers bright orange, fld RBG Edinb., 22 v 1969 (E).

Although the field note to B2885 refers to light yellow flowers, in cultivation (May 1964) the plant produced flowers of a distinctly orange hue, characteristic of *B. oligosperma*. The species has tufted shoots of up to 7 or 8 lanceolate acute leaves, the lamina measuring up to 13 × 3·5 cm. The inflorescence has probably up to 6–7 flowers and the anther-thecae dehisce by pores. There is a well-formed entire anther-crest similar to that found in other pore-dehiscing species. It is perhaps most closely allied to *B. parva* (no. 18 below).

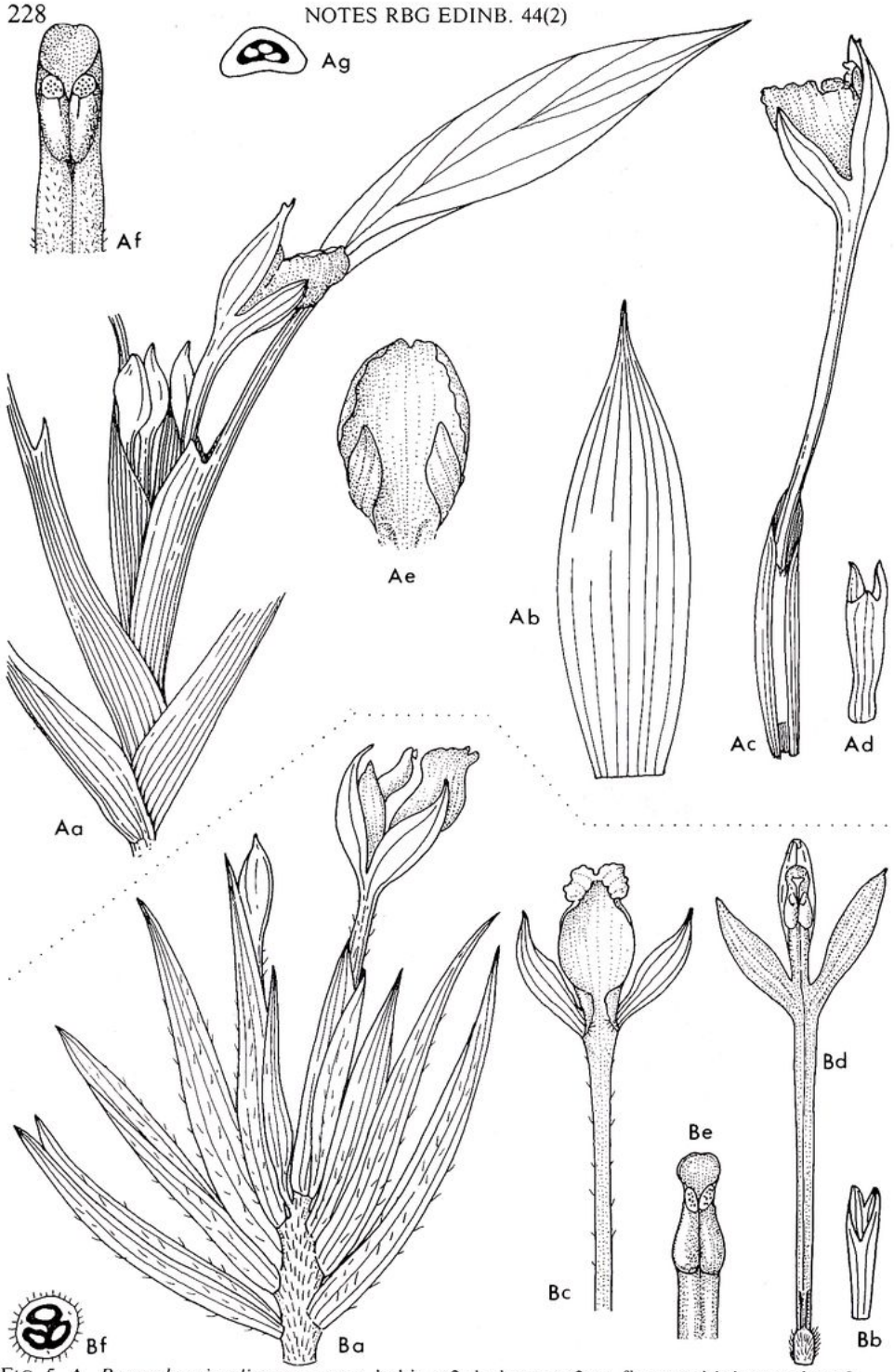

FIG. 5. A, *Boesenbergia oligosperma*: a, habit ×2; b, bract ×2; c, flower with bracteole ×2; d, calyx ×2; e, labellum and lateral staminodes ×2; f, stamen (style and stigma removed) ×3; g, ovary in T.S. ×4. (From living material of *Burtt & Martin* B 5135). B. *Boesenbergia parva*; a, inflorescence ×2; b, calyx ×2; c, L.S. of corolla showing labellum and lateral petals ×2; d, L.S. of corolla showing lateral staminodes, stamen and dorsal petal ×2; e, stamen (style and stigma removed) ×4; f, ovary in T.S. ×4 (from spirit material of *Burtt & Martin* B 4706).

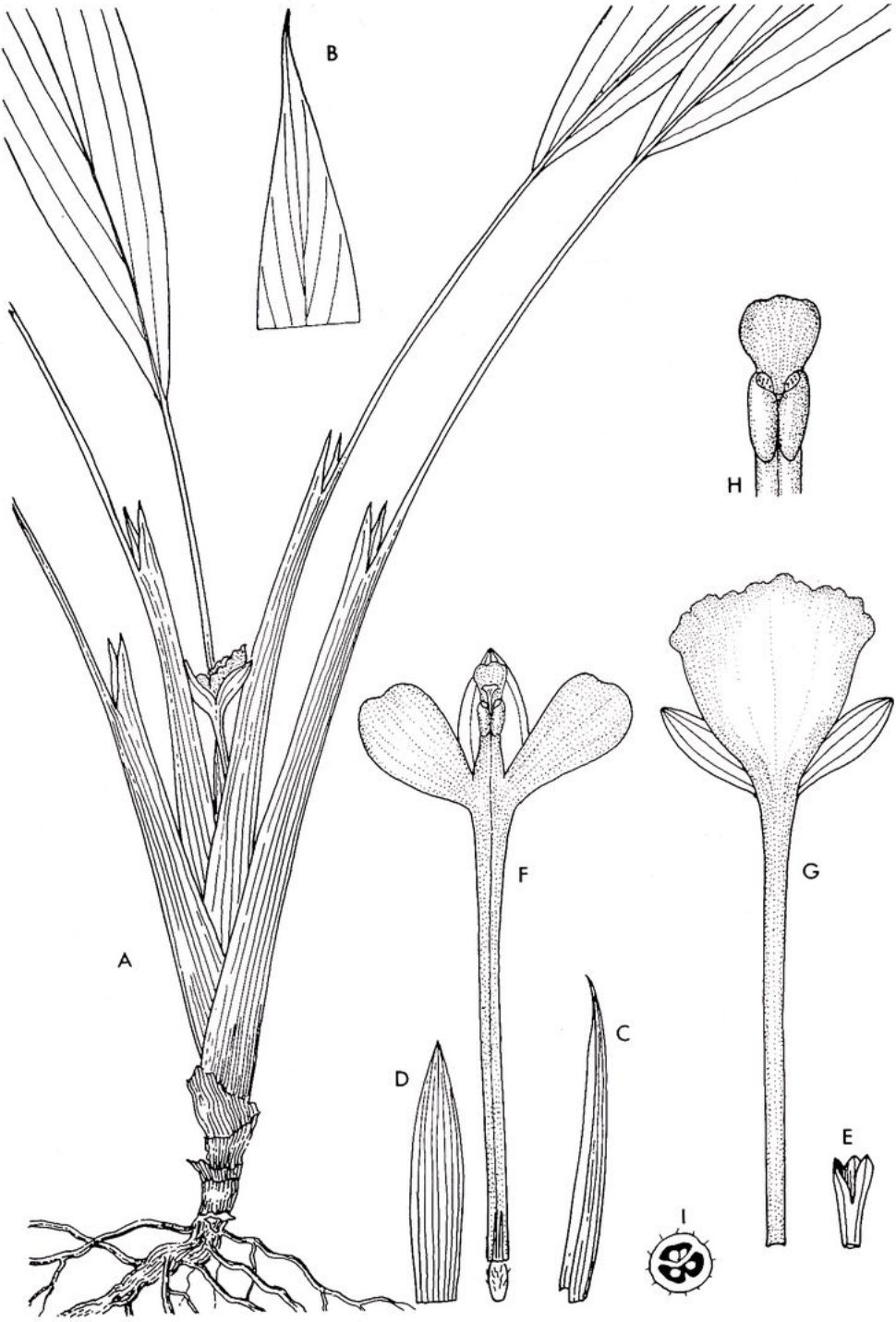

FIG. 6. *Boesenbergia stenophylla*. A, habit $\times\frac{2}{3}$; B, apical part of lamina $\times\frac{2}{3}$; C, bract $\times 1$; D, bracteole $\times 1$; E, calyx $\times 1$; F, L.S. of corolla showing lateral staminodes, stamen and dorsal petal $\times 1$; G, L.S. of corolla showing labellum and lateral petals $\times 1$; H, stamen (style and stigma removed) $\times 2$; I, ovary in T.S. $\times 3$. (A, B from dried material of *Hansen* 1081, C—I from living material of *Argent* 18/85.)

18. B. parva (Ridley) Merr., Enum. Born. P1. 122 (1921).
Type: Cult. Singapore, v 1904, originally from Sarawak, 1st Division, Bidi, *Ridley* s.n. (SING). Fig. 5B.
Syn.: *Gastrochilus parvus* Ridley in J. Str. Br. Roy. Asiat. Soc. 44: 195 (1905).
The following material may belong here:
SARAWAK: 1st Division, Matang rd, white, lip crimson at base, central yellow bar, 3 i 1915, *Ridley* s.n. (K); Mt Matang, i 1915, *Ridley* s.n. (K); *ibidem*, cultivated material only, RBG Edinb., iv 1968, from *Burtt & Martin* B5416 (E); Semengoh Forest Reserve, translucent white flower with yellow at centre of lip and red laterally in throat, 13 vii 1962, *Burtt & Woods* B2489 (E); *ibidem*, on banks in forest, heavy clay soil, white translucent flower with yellow bar in middle of lip and red patches on either side near its base, 23 vii 1967, *Burtt & Martin* 4706 (E); 4th Division, Lambir National Park, Sungai Liam Libau, flower white except for yellow centre of lip, 18 ix 1978, *Burtt* 11510 (E).

The type of *B. parva* consists of a single leaf and a single flower. However, the original description states that the species is of tufted habit, with leaves up to 10 × 2·5 cm, a central inflorescence, a white yellow and pink labellum and fleshy almost obovate crest. These characters accord well with the material cited above. It is not possible to tell if the anther of the type specimen has porous dehiscence; but this character is present in the more recent material examined. *B. parva* is most nearly related to *B. oligosperma* but differs in the smaller size, leaf shape and pubescent corolla tube. The leaves are usually conspicuously gland dotted. The Lambir collection apparently lacks any reddish marking in the throat of the lip, otherwise it cannot be separated from the other exsiccatae.

19. B. stenophylla R. M. Smith, **species nova** habitu caespitoso, antheris poro dehiscentibus et valde cristatis *B. oligospermati* similis, sed foliis anguste lanceolatis et petiolis multo longioribus recedit. Fig. 6.

Herba erecta. Surculi foliati caespitosi, laminas 4 gerentes; petioli (3–) 7–8 cm longi; lamina (7–) 12–20 × 1·5–3 cm, anguste lanceolata, breviter acuminata, ad basin attenuata, plus minusve glabra. *Inflorescentia* e medio surculi foliati, pauciflora, plus minusve sessilis; bracteae distichae, 4–4.5 cm longae, cymbiformes, florum unicum subtendentes; bracteolae paulo breviores, cymbiformes; calyx c.1·5 cm longus, late trilobus; corolla pallide lutea, tubo c.6 cm longo tenui, lobis 1·5 cm longis lanceolatis dorsali latiore acuto; labellum pallide flavum 2·5 × 2 cm, vix saccatum, plus minusve integrum; staminodia lateralia 2 cm longa, spatulata; filamentum 0·8–1 cm; thecae 0·5 cm, poro dehiscentes; connectivum in cristam 0·5 cm longam integram prolongatum; stigma ciliato-marginatum; glandulae epigynae 6 mm, aciculares; ovarium 0·4 mm, parce pubescens, incomplete triloculare. *Fructus* ignotus.
Type: Sabah, Long Pasia, 1000–1700 m, kerangas and submontane forest, x 1985, *Argent* 18/85, cult. RBG Edinb. 851917, v 1986 (holo. E).
Other material examined:
SARAWAK: 2nd Division, Lingga, G. Lesung, 650 m, ridge top in hill dipterocarp forest, on litter over humus layer, all floral parts pale yellow,

1 xii 1981, *Hansen* 1081 (C, E); 4th Division, G. Mulu National Park, G. Mulu, c.4500 ft, white flowers with yellow patch on lip, 15 iv 1962, *Burtt & Woods* B2107 (E); *ibidem*, Melinau gorge pathway, flower white with translucent veins and yellow band down centre of lip, 22 vi 1962, *Burtt & Woods* B2219 (E); *ibidem*, Hulu Air Jernin, on shady bank in shaley ridge under high forest, c.900 m, flower white with yellow mark on lip, 6 iv 1978, *Argent et al.* 910 (E); *ibidem*, Baram distr., nr camp on NW ridge of G. Tamacu, 1200 m on ridge view summit, flowers white with translucent guides and yellow mark in centre of labellum, 6 v 1978, *Argent & Coppins* 1168 (E).

B. stenophylla is distinguished by the narrowly lanceolate usually long petiolate leaves, which are rather unequal at the base, and by the prominent (5 mm) anther-crest and porous dehiscence. The Mulu plants have been previously referred to *B.* sp. aff. *burttiana* (Smith in *Bot. J. Linn. Soc.* 85:44, 1982). There it was noted that the leaf-shoots lack the conspicuous fan-like arrangement of *B. burttiana* and are also fewer bladed. Although it is not possible to be certain of the mode of dehiscence in these plants (which lack spirit material) these collections are, in general facies, identical with the type of *B. stenophylla*.

Two collections from the Bario district in the 4th Division of Sarawak, *Lamb* AL SAR 231/85 (E) and *Pearce* 634 (E), closely approach *B. stenophylla* but differ in the shining striate leaf sheaths and (probably) more numerously flowered inflorescence.

Boesenbergia sp. (aff. *B. stenophylla*)
Sarawak; 1st Division, G. Manok, Padawan distr., not uncommon on clayey slopes with bamboo etc., but only 2 in flower. Flowers white, translucent except for yellow centre to labellum, 13 v 1975, *Burtt* 8127 (E).

This collection is of similar habit to *B. stenophylla* and the anther dehiscence is probably porous. It differs in the broader leaves and shorter ligules. The material is insufficient to allow accurate observation of floral detail.

Incompletely known species:
Gastrochilus latilabrus Val. in Bull. Inst. Buitenz. sér. 2, 27:99 (1918).
Type: Kalimantan, Selebulan, Teputing, *Nieuwenhuis* 872 (n.v.).

This single-leaved species is described as having a *Kaempferia*-like lip, i.e. deeply bilobed, and a broad, recurved anther-crest. It probably belongs to either *Kaempferia* or *Haplochorema*.

Boesenbergia striata (Val.) Loesen., Pflanzenfam. Aufl. 2, 15A: 571 (1930).
Type: Kalimantan, Singkadjang nr Sintang, *Teysmann* 10992 (L).
Syn.: *Gastrochilus striatus* Val. in Bull. Jard. Bot. Buitenz. sér. 2, 27:97 (1918).

Valeton saw only a single and much damaged flower of *B. striata* and details of lip and staminodes are lacking. No colour notes are given. It is a small-leaved, tufted species with shining, ribbed sheaths.

Excluded species:

Boesenbergia anomala (Hall. f.) Schlecht. = ?**Scaphochlamys** (see p. 210) (syn. *Gastrochilus hallieri* Ridley)

B. bractescens (Ridl.) Merr. = **Scaphochlamys polyphylla** (K. Schum.) Burtt & Smith

B. laxiflora (Val.) Loesen. = **Scaphochlamys polyphylla** (K. Schum.) Burtt & Smith

B. reticosa (Ridley) Merr. = **Scaphochlamys reticosa** (Ridley) R. M. Smith

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