Gardens' Bulletin Singapore **53** *(2001) 191–239.*

The Genus *Etlingera* (Zingiberaceae) in Peninsular Malaysia Including a New Species

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Abstract

Etlingera pieeae Khaw from the Temenggor Forest Reserve in Perak, Peninsular Malaysia, is described as a new species. Including this new species, there are 12 *Etlingera* species in Peninsular Malaysia for which a key and descriptions are provided.

Introduction

Etlingera species are recognized by the presence of an involucre of large, sterile bracts, elongate and tubular bracteoles (Fig. 1), flowers with a distinct tube formed by the bases of the labellum and the filament above the attachment of the corolla lobes (Fig. 2), and the labellum inrolling as the flower withers (Burtt and Smith, 1986).

The first comprehensive systematic account of Peninsular Malaysian species now included in *Etlingera* was given in the classic monograph of Holttum (1950). His detailed account included four *Phaeomeria* species and six *Achasma* species, now all considered as species of *Etlingera* (Table 1).

Holttum (1950) credited Valeton for recognizing that *Phaeomeria* is closely related to *Achasma.* The two major characters that Holttum (1950) used to distinguish between these two genera were the peduncle (long and erect in *Phaeomeria*, short and usually subterranean in *Achasma*) and the labellum (short in *Phaeomeria* and elongate in *Achasma*).

Subsequently, Burtt and Smith (1986) united the two genera *Achasma* and *Nicolaia* Horan., which replaced *Phaeomeria*, an invalid name (Burtt and Smith, 1986) with a third, *Geanthus* Valeton, to form a composite genus, *Etlingera* Giseke. (*Geanthus* is not found in Peninsular Malaysia). In uniting the three into a single composite genus, Burtt and Smith (1986) maintained that the two characters conventionally used to divide *Achasma*, *Geanthus* and *Phaeomeria* into distinct genera were inadequate. In addition, they observed that the anther is held at an angle to the filament in *Achasma*, whereas it is erect in *Geanthus* and *Phaeomeria*.

Table 1. *Etlingera* species in Peninsular Malaysia, including the names used by Holttum.

Etlingera species	Name in Holttum (1950)
E. elatior	*Phaeomeria speciosa*
E. maingayi	*P. maingayi*
E. fulgens	*P. fulgens*
E. venusta	*P. venusta*
E. pauciflora	*Achasma pauciflorum*
E. punicea	*A. macrocheilos*
E. subterranea	*A. subterraneum*
E. metriocheilos	*A. sphaerocephalum*
E. triorgyalis	*A. triorgyale*
E. littoralis	*A. megalocheilos*
E. corneri	
E. pieeae	

Further to Holttum's enumeration of the species, while making an inventory of gingers of the Temenggor Forest Reserve, Perak, Peninsular Malaysia, in 1994 and 1995, two unnamed species of *Etlingera* were collected (Khaw, 2000). One, *E. corneri* J. Mood & H. Ibrahim, was recently described (Mood & Ibrahim 2000); the other, *E. pieeae* Khaw, is described here.

The new species, *E. pieeae,* is particularly interesting as it is in some respects intermediate between Holttum's *Phaeomeria* and *Achasma*. In Peninsular Malaysia, the two are easily recognized based on inflorescence characters (the flower head of the *Phaeomeria* group being either cup-shaped on a long, aerial stalk or in the *Achasma* group sub-cylindric on a short, subterranean stalk). However, the inflorescences of *E. pieeae* do not have the typical appearance of either group. Instead, because its sterile bracts are not broad but oblanceolate, spreading slightly and loosely imbricating at the bases, a wide cup-like or a narrow sub-cylinder of sterile bracts is not obvious. In this aspect, its inflorescence resembles that of *E. pauciflora* (formerly a species of *Achasma*), which has the typical subterranean inflorescence. In addition, *E. pieeae* is intermediate between the two groups in the flower head having a relatively long peduncle. The result is that the distal part of its peduncle together with the flower head are aerial, a character of the *Phaeomeria* group. These features, coupled with flowers with a long labellum, (a character of *Achasma*) make it distinct from other *Eltingera* species in Peninsular Malaysia. The fact that it is intermediate between the two groups adds support for uniting *Phaeomeria*

and *Achasma* into a single genus.

Illustrated accounts of Peninsular Malaysian *Etlingera* were given by Weber (1995), Larsen *et al.* (1999) and Lim (2000).

The attractive and colourful inflorescences and infructescences of *Etlingera* species are of horticultural potential. In Peninsular Malaysia, only *kantan*, *E. elatior* (Jack) R.M. Smith, is grown as an ornamental and commercially for culinary purposes. The rest are not widely cultivated horticulturally or for the cut-flower trade, although they are gaining popularity in subtropical Australia and U.S.A..

Materials and Methods

This account is based on the examination of the living specimens. Field observations on the morphology of the living plants and the development of the inflorescence and infructescence were made for all the *Etlingera* species, except for *E. subterranea* and the fruits of *E. littoralis*, for which material was not available. In addition, observations were made of plants cultivated from rhizomes and seed collected from the field. Material fixed in Copenhagen mixture, colour photographs, as well as dried specimens were prepared for study. Observations of fresh materials, unless otherwise stated, form the basis of the characters used in the key and the descriptions of the species. Drawings of dissected *Etlingera* flowers follow the style of Burtt and Smith (1986). Herbarium material from the *Etlingera* collections at KEP, KLU and SING were examined. Types not seen are indicated (*s.v.*). Photographs of the type specimen of *E. venusta* at K were made by Dr Saw Leng Guan.

Compared with Holttum's account, several additional characters have proved useful in identifying the species, such as the production of stilt roots, number of flowers, the aspect of the flower head in lateral view, shape of the basal lobes of the labellum, the form of the epigynous glands and the scent of the crushed leaf sheaths. Examination of the minute epigynous glands that Holttum (1950) called stylodes (nectary glands) reveals that there are two main types in *Etlingera* (Fig. 3), the one with a rounded or irregular apex is found in the *Phaeomeria* group of species, the other type with a narrowed apex with the sole exception of *E. metriocheilos* is found in the *Achasma* group.

The description of the fruit of *E. metriocheilos* in the present work differs from that of Holttum. He described the fruit as smooth based on the examination of a single specimen (*Ridley s.n.* Maxwell's Hill, June 1893), whereas examination of living material shows the fruits to be ridged longitudinally, each ridge with a shoulder-like apical mound, covered with

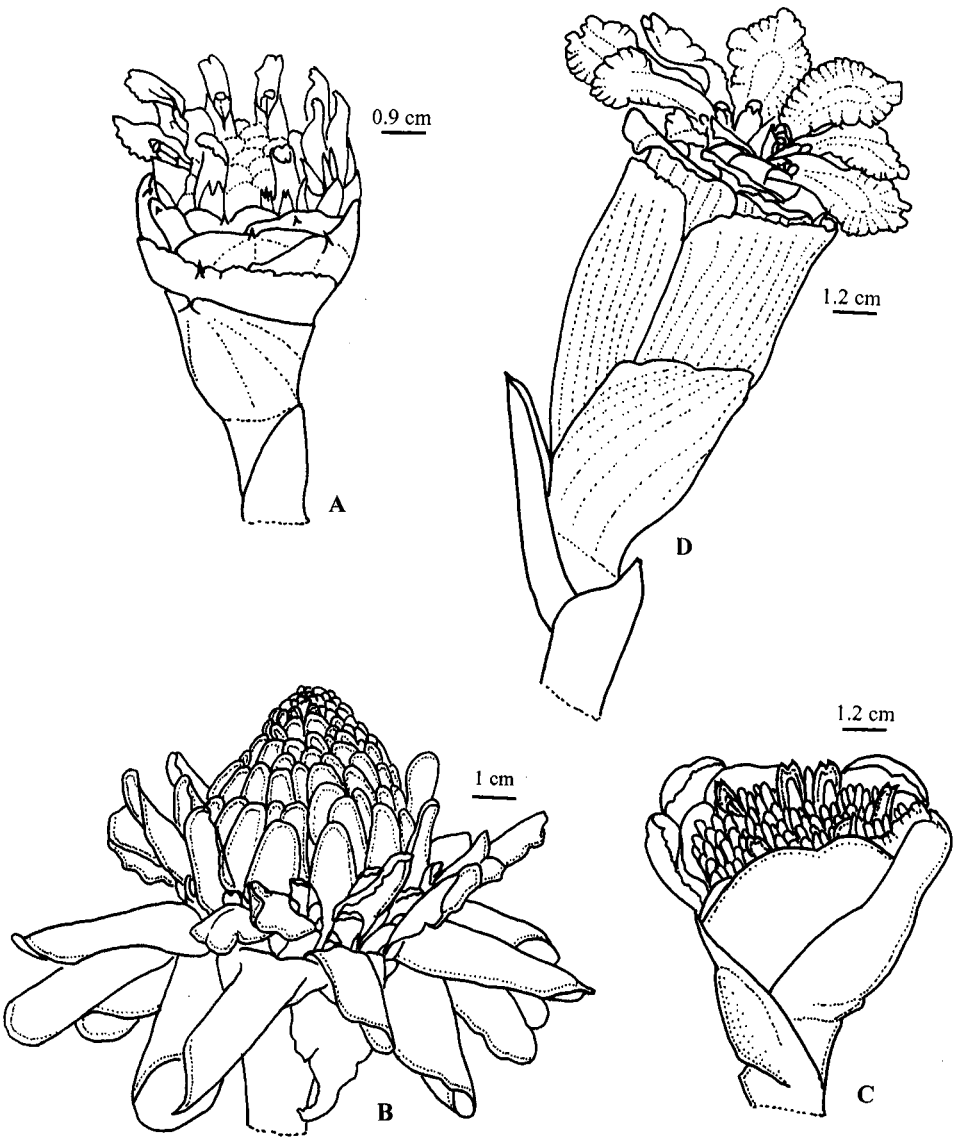
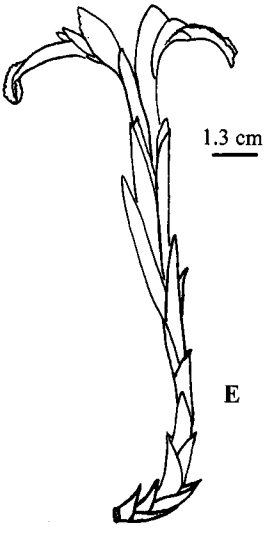
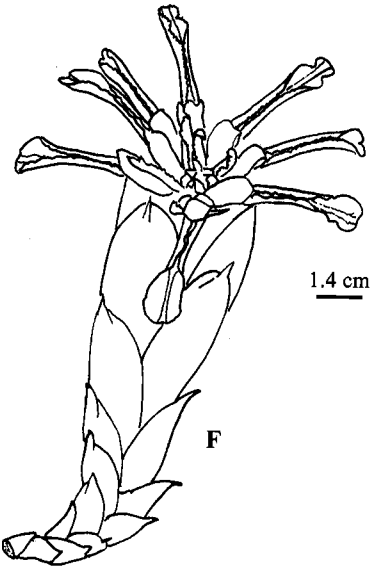
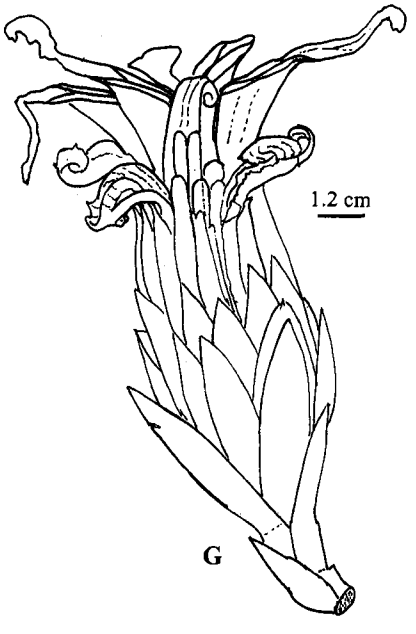
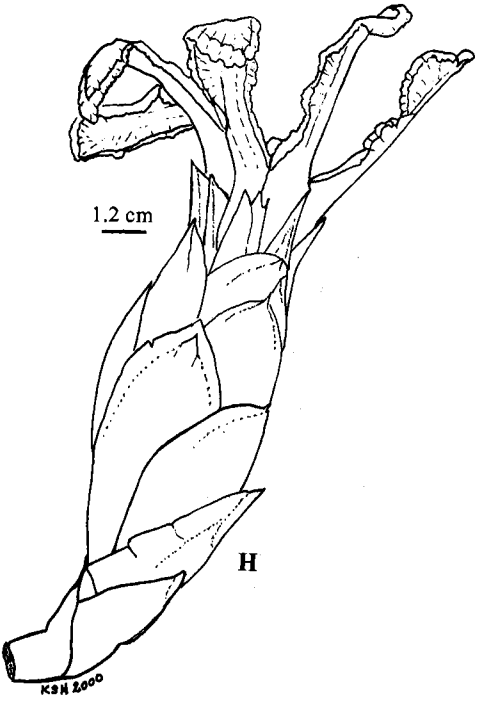


Figure 1. Inflorescence types in *Etlingera*. A, *E. maingayi*; B, *E. elatior*; C, *E. fulgens*; D, *E. triorgyalis*; E, *E. pauciflora*; F, *E. punicea*; G, *E. metriocheilos*; H, *E. littoralis*; (from living material).


1.3 cm
E


1.4 cm
F


1.2 cm
G


1.2 cm
H

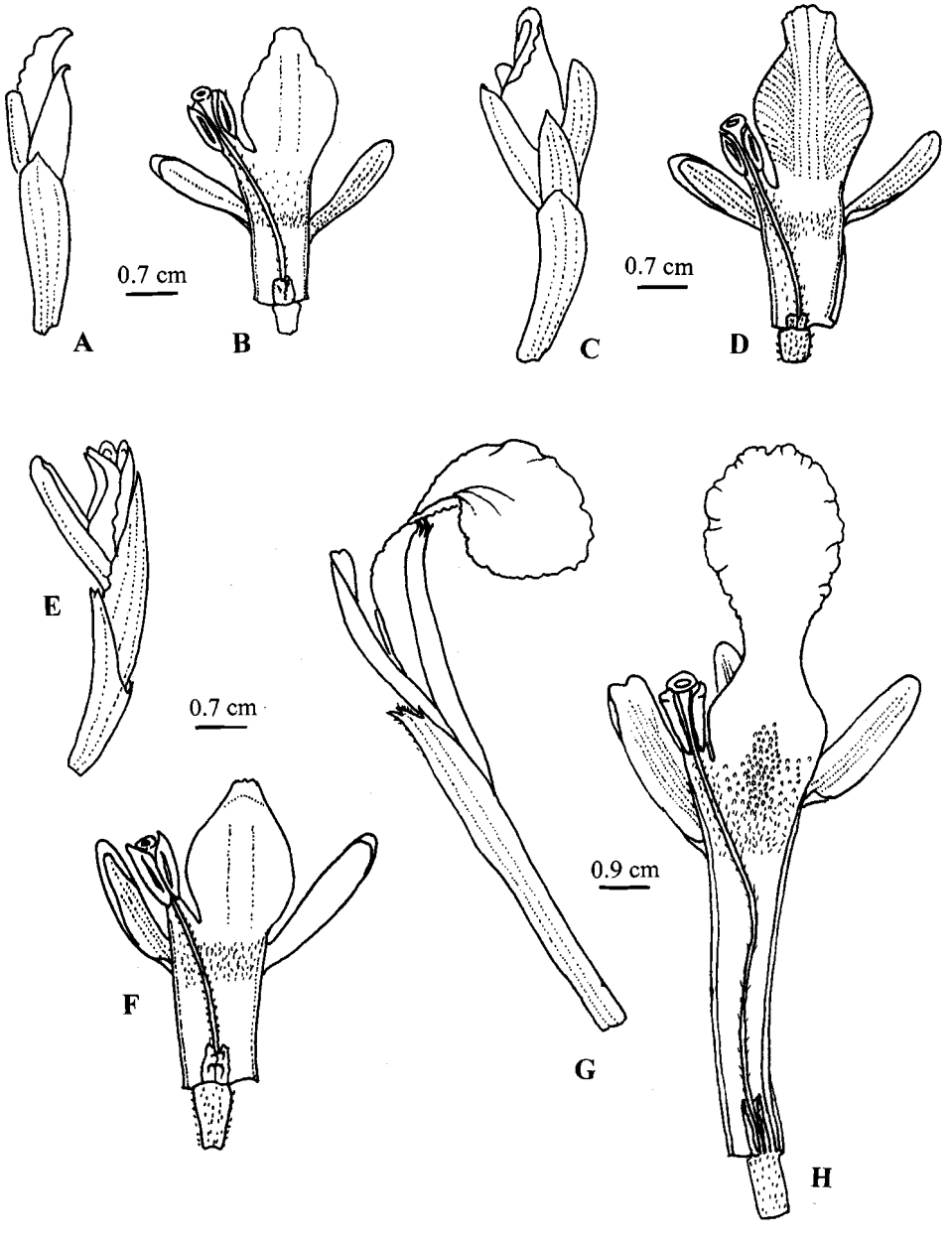
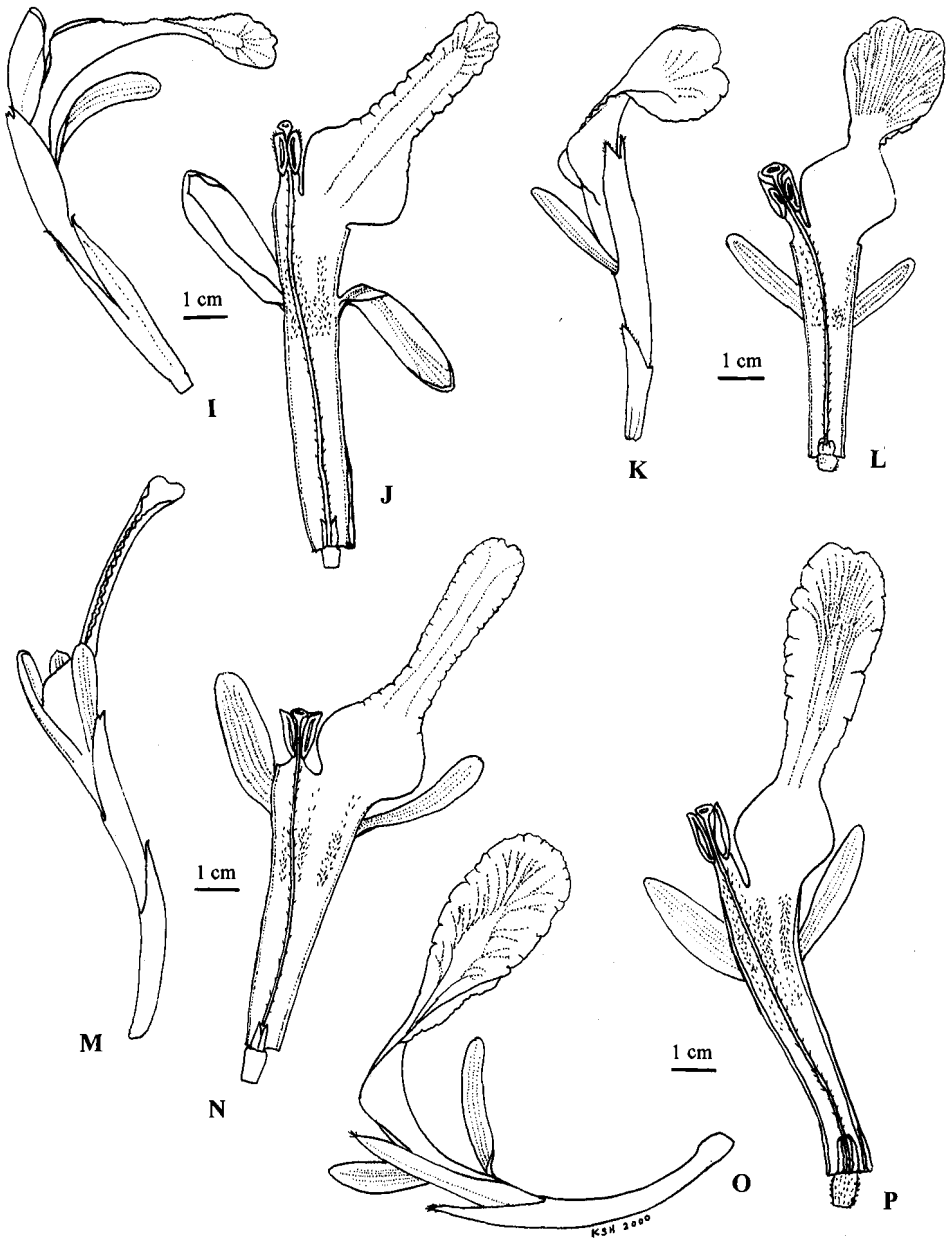


Figure 2. Flower and labellum types in *Etlingera*. A, B, *E. maingayi*; C, D, *E. elatior*; E, F, *E. fulgens*; G, H, *E. triorgyalis*; I, J, *E. pauciflora*; K, L, *E. metriocheilos*; M, N, *E. punicea*; O, P, *E. littoralis*; (left, flower in lateral view; right, dissected flower; from spirit material).


1 cm
I
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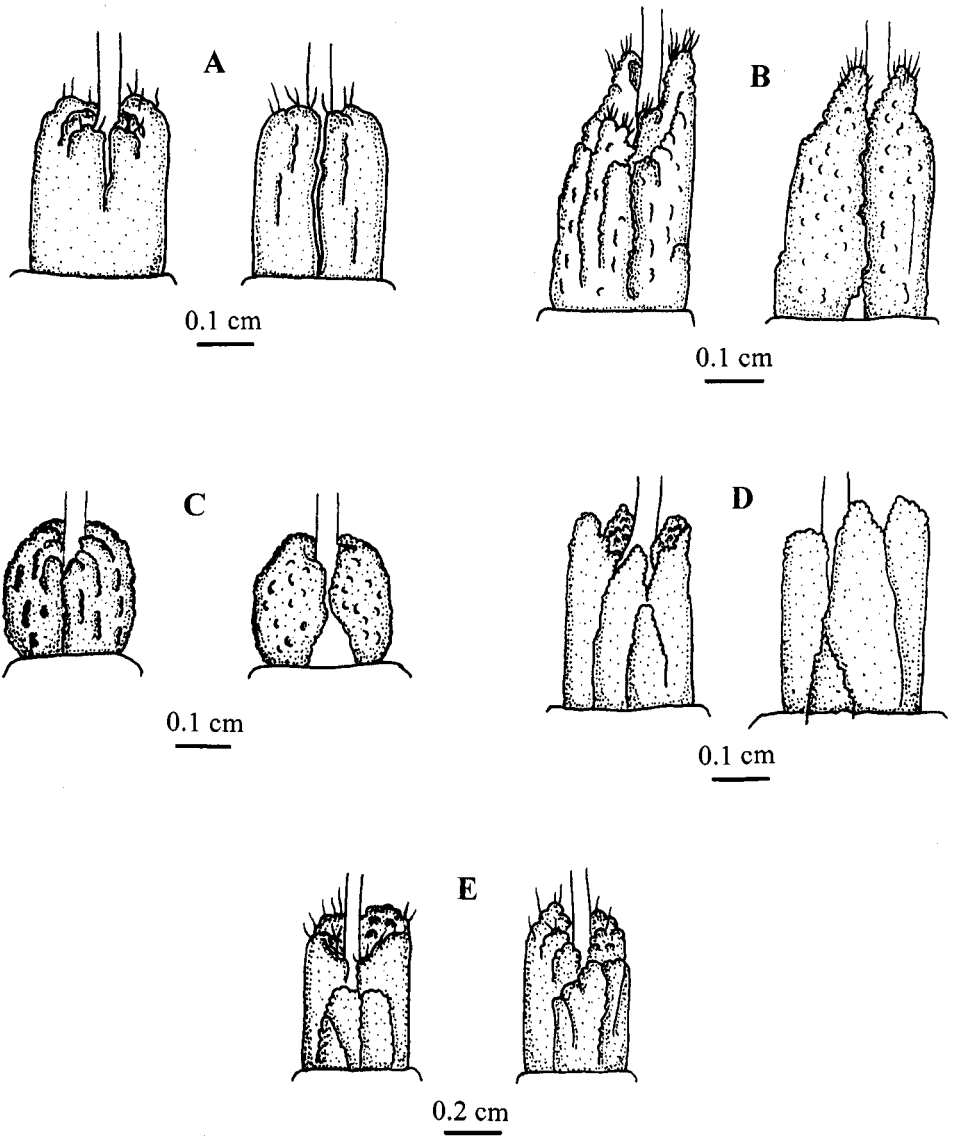
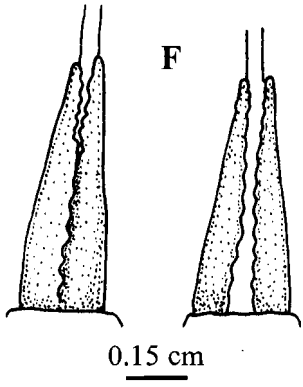
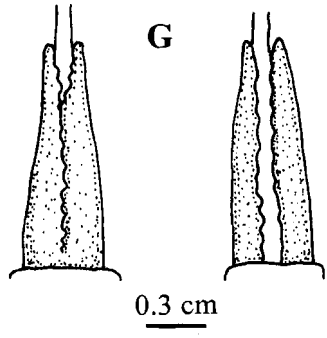
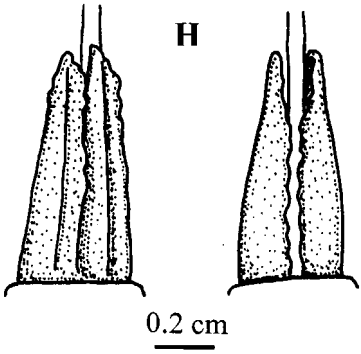
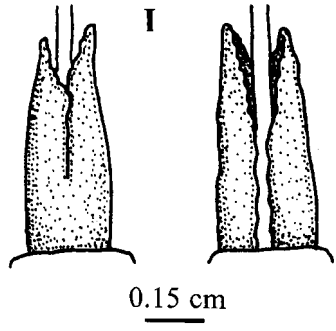


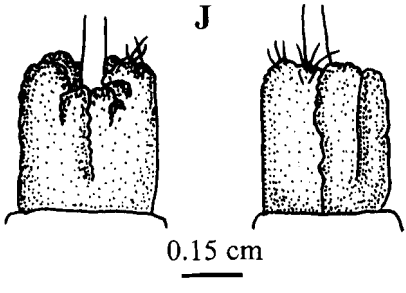
Figure 3. Epigynous glands in *Etlingera*. A, *E. maingayi*; B, *E. fulgens*; C, *E. elatior*; D, *E. corneri*; E, *E. venusta*; F, *E. pieeae*; G, *E. triorgyalis*; H, *E. pauciflora*; I, *E. punicea*; J, *E. metriocheilos*; K, *E. littoralis*; (A–K, left, adaxial view; right, abaxial; from spirit material).

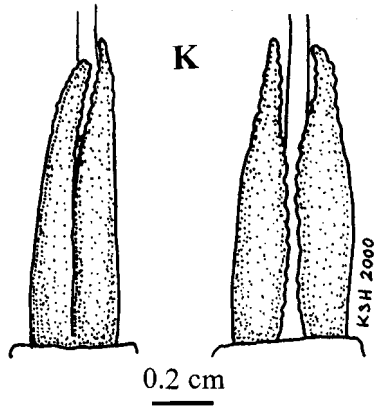

F
0.15 cm


G
0.3 cm


H
0.2 cm


I
0.15 cm


J
0.15 cm


K
0.2 cm
K3H 2000

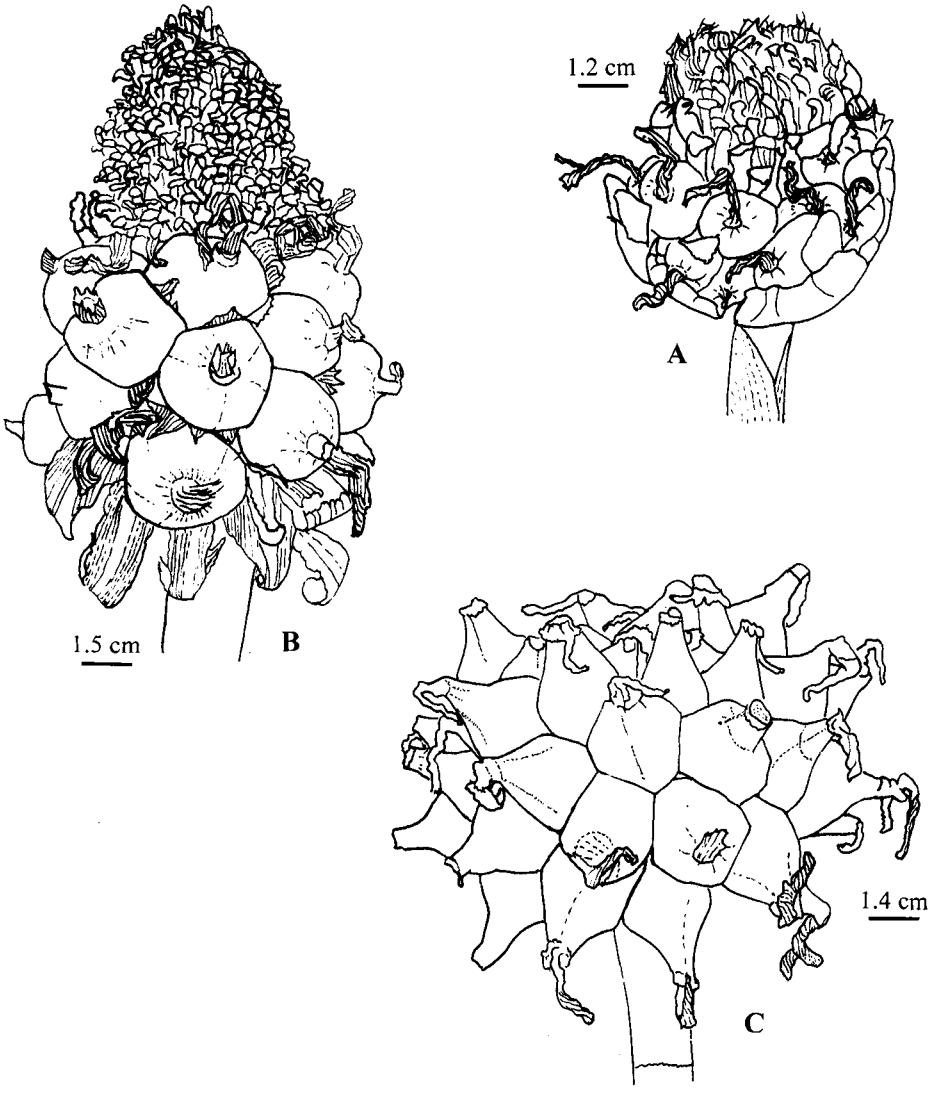
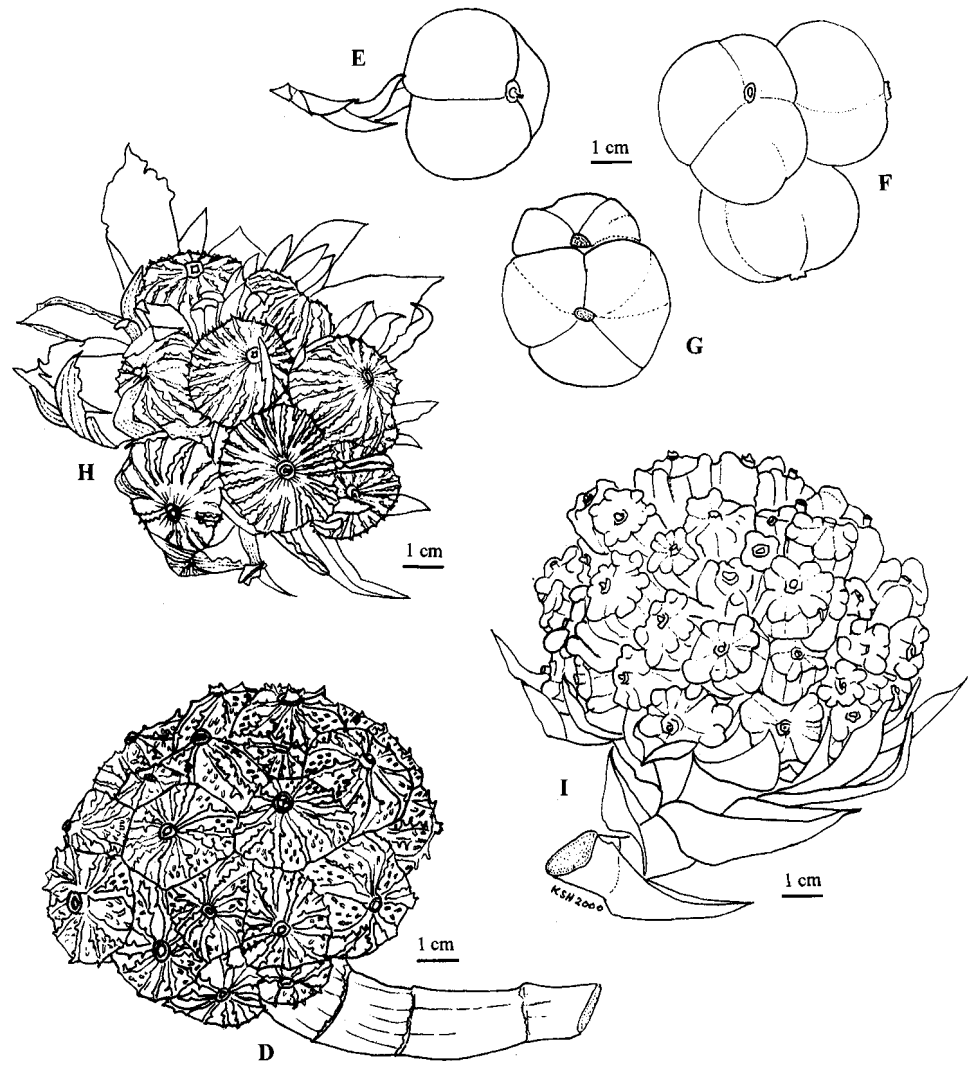


Figure 4. Infructescence types in *Etlingera.* A, *E. maingayi*; B, *E. elatior*; C, *E. fulgens*; D, *E. triorgyalis;* E, F, G, *E. pauciflora*; H, *E. punicea*; I, *E. metriocheilos*; (from spirit material).


E
1 cm
F
G
H
1 cm
I
KSH 2000
1 cm
1 cm
D

prominent warts (Fig. 4I). In addition, infructescences of three species (*E. triorgyalis*, *E. pauciflora* and *E. punicea*) stated as unknown by Holttum, are described and illustrated here (Fig. 4D, E–G, H).

Description of the Genus *Etlingera* in Peninsular Malaysia

Rhizomes at, just below, or deeper in the ground (*E. pauciflora*, *E. punicea* and *E. littoralis)*; elements long and slender between the leafy shoots in the smaller species (*E. maingayi* and *E. pauciflora*) or stout in the larger species; with stilt-roots above the soil, leaf-litter or swampy ground (*E. maingayi* and *E. corneri)*. *Leafy shoots* tall, to 6 m in the larger species, often with swollen, bulbous bases; close together forming clumps or widely spaced to about 1 m apart; sheaths ribbed longitudinally with cross-bars covered by tufts of short, white hairs (often clearer on young sheaths); *scent* of crushed sheaths either a pleasant sour scent (all species in the *Phaeomeria* group and including *E. corneri*) or strong and peppery (in *E. triorgyalis* and *E. pieeae*) or without a distinct odour; *ligule* bilobed or entire; *petiole* usually present or lamina subsessile (*E. venusta*); *laminas* many, large, to about 1 m long, often when young pink or with brownish-pink broad bars or deep purple-red beneath (*E. fulgens* and *E. metriocheilos*). *Inflorescence* on a separate leafless shoot, arising from the base of the leafy shoot. *Peduncle* covered by bladeless sheaths in two ranks, widely spaced and not overlapping (the *Phaeomeria* group) or overlapping (the *Achasma* group); long, slender with a short horizontal subterranean axis, which turns upwards, forming a much longer, erect, aerial stalk (Fig. 5A) with the flower head raised well above the ground (in the *Phaeomeria* group and *E. corneri*) or with the horizontal subterranean part of the peduncle relatively longer (Fig. 4D), the erect part only a few cm long with the flower head just below ground level, so that only the opened flowers are displayed on the soil surface (the *Achasma* group) or the peduncle is at first horizontal and subterranean but then erect and producing a flower head well above the ground level (*E. pieeae*, Fig. 7A, B). *The flower head* enclosed by broad sterile bracts; usually tightly imbricating and forming either a capitate, wide cup-like structure (the *Phaeomeria* group, Fig. 1A–C, 5B, 6B) or a narrower, sub-cylindric structure (the *Achasma* group, Fig. 1D, F–H). In both cases, in side view the sterile bracts hide a portion of the flower-head proper except in *E. pauciflora*, *E. subterranea* and *E. pieeae* where the narrow lanceolate sterile bracts are loosely imbricating at the bases only, so do not form a sub-cylindric structure (Fig. 1E, 7B), their inflorescence heads proper thus in side view are visible between the bracts. *Receptacle of inflorescence* with apex inflated, rounded

or flat, usually elongating only a few cm but up to 17 cm in *E. elatior*; with numerous (55—200 or more) flowers per flower head in the *Phaeomeria* group, 30—60 in the *Achasma* group, 20—35 in *E. pieeae* and 1—3 flowers in *E. pauciflora* and *E. subterranea. Sterile and fertile bracts*: the outermost sterile bracts show a transition from the uppermost sheath of the peduncle, bracts usually not persisting until fruit maturity, coloured or whitish, erect or spreading, much broader than the fertile bracts; outermost fertile bracts show a transition from the sterile bracts, decreasing in size towards the centre of the flower-head; each fertile bract producing one flower. *Bracteole* tubular, two-lobed, deeply slit down the opposite side. *Calyx* tubular, 3-lobed, deeply slit down the opposite side. *Corolla* tubular, often densely hairy at entrance to tube; with three erect lobes (petals), the dorsal lobe slightly wider than the lateral ones. *Labellum* with a short or elongated blade, broadening at the base to form distinct basal lobes (Fig. 2, 7H) or without basal lobes (*E. venusta* and *E. corneri*, Fig. 5H, 6J); the lowest part of the labellum joined to the base of the stamen to form a short, fleshy staminal tube above the bases of the corolla-lobes; usually with the basal lobes erect on either side of the anther or folded together, partially or entirely covering the anther; after flowering, the lower part of the blade inrolling while the distal part withers; with the blade erect or spreading horizontally and the apex slightly reflexed; the apex entire or bilobed. *Staminodes* lacking. *Filament* short or in *E. venusta* and *E. corneri* almost sessile. *Anther* erect or bent forward towards the labellum. *Epigynous glands* as two fleshy, rounded mounds surrounding the base of the style, each mound irregularly lobed at the apex in the *Phaeomeria* group (Fig. 3A–E) and *E. metriocheilos* (Fig. 3J) or as two fleshy, compressed blades, not encircling the base of the style, each blade not further lobed, apex shortly pointed in most species of the *Achasma* group (Fig. 3F–I, K). *Ovary* glabrous or hairy, stigma rather large. *Infructescence* large, usually globular but elongate in *E. elatior*; *fruits* close together, pericarp smooth and each with a long persistant calyx in the *Phaeomeria* group (Fig. 4A–C, 5I, 6M) or ridged longitudinally and with warts in the *Achasma* group (Fig. 4D, H, I) or in *E. pauciflora* (Fig. 4E–G) and *E. littoralis* (Holttum, 1950) smooth; indehiscent, fleshy or dry; maturing within about two months. *Seeds* irregularly angular and truncate, each surrounded by thin, whitish, translucent pulp.

Key to *Etlingera* species in Peninsular Malaysia

1a. Inflorescence raised well above the ground on peduncles 40–200 cm; sterile bracts showy, aerial, tightly imbricating, with their upper half spreading horizontally, forming a very shallow or deep, wide, cup (with diameter exceeding or nearly the same as the height); lip with a very short blade 2

1b. Inflorescence almost entirely subterranean on peduncles 5–20 cm or rarely (only in *E. pieeae*) raised above the ground on peduncles to 48 cm long; sterile bracts not showy, usually embedded in the ground except for their distal parts, usually tightly imbricating, then forming a long narrow sub-cylinder (with diameter always less than the height) or loosely imbricating at the bases only, thus not forming a sub-cylinder; lip with elongated blade. 6

2a. Sterile bracts tightly imbricating at the bases only, forming a very shallow, inconspicuous cup, with the upper half of the bracts spreading horizontally; receptacle of inflorescence elongating markedly during flowering forming a cone-shaped flower head within the involucral cup ..... **1. *E. elatior***

2b. Sterile bracts tightly imbricating, forming a firm cup; receptacle of inflorescence hardly elongating during flowering forming a flat or bowl-like flower head at side view. 3

3a Involucral cup up to *c.* 3 cm high and *c.* 4 cm wide, in side view the cup hiding a third of the flower-head; sterile bracts densely appressed white-hairy all over surface. ..... **2. *E. maingayi***

3b. Involucral cup up to *c.* 9 cm high and *c.* 7.5 cm wide, in side view the cup hiding almost entirely the flower-head; sterile bracts glabrous or only sparsely white-hairy. 4

4a. Leaves with upper surfaces glossy, dark green, lower surfaces conspicuously purple-red when young; lamina smooth, not prominently ribbed, margin markedly crisped; sterile bracts subrotund, strongly incurved at apex; lip with blade widening at base to form distinct basal lobes, red with yellow margin; fruits pale green, densely appressed short-hairy ..... **3. *E. fulgens***

4b. Leaves entirely green on both surfaces even when young; lamina prominently ribbed, margin not markedly crisped; sterile bracts oblong-elliptic, recurved at apex; lip with blade narrowed to base, not widening to form distinct basal lobes, white with red median band; fruits bright red and glabrous 5

5a. Stilt-roots absent; petiole always inconspicuous (leaf subsessile); leaf base always cuneate; sterile and fertile bracts with acute apices, purple-pink, pale green at the base; the involucral cup completely decayed before fruit maturity. ..... **4. *E. venusta***

5b. Stilt-roots 10–25 cm long; petiole 1.5–4 cm long; leaf base mostly rounded (sometimes cuneate); sterile and fertile bracts with subtruncate apices, bright red, white at the base; involucral cup persisting to fruit maturity. ..... **5. *E. corneri***

6a. Peduncles to 30 cm; fertile part of inflorescence with all sterile bracts raised well above the ground; bracts loosely imbricating at the bases only, not forming a sub-cylinder, in side view the flower head visible between the bracts. ..... **6. *E. pieeae***

6b. Peduncles 3–15 cm; fertile part of inflorescence always subterranean except for distal parts of sterile bracts; bracts tightly imbricating, forming a long, narrow sub-cylinder, in side view hiding one to two thirds of the flower-head 7

7a. Flowers 1–3 per inflorescence. 8

7b. Flowers 30–60 per inflorescence. 9

8a. Corolla lobes 1–2 cm longer than calyx, dorsal lobe 3–4 x *c.* 1.5 cm; lip yellow at centre with red margins. ..... **7. *E. pauciflora***

8b. Corolla lobes almost same length as calyx, dorsal lobe 1–1.5 x *c.* 0.5 cm; lip crimson with white margins. ..... **8. *E. subterranea***

9a. Corolla *c.* 2 cm longer than calyx; dorsal corolla lobe hiding the entire anther; stigma hidden under dorsal corolla lobe; lip with yellow median band and red margins. ..... **9. *E. punicea***

9b. Corolla about the same length as calyx; dorsal corolla lobe hiding only the basal part of anther; stigma clearly visible; lip entirely red or with yellow, orangey-red or white margins, always without a yellow median band. 10

10a. Leaf sheaths purple-red; lower surface of young leaves purple-red; sterile bracts deep-red; lip purple-red with white margin; stigma purple-red, almost black. ..... **10. *E. metriocheilos***

10b. Leaf sheaths green; lower surface of young leaves entirely green or green flushed pale-pink; sterile bracts white or pale green with pink apices; lip entirely red or with a yellow margin; stigma pale-pink or bright red. 11

11a. Outer sterile bracts with apices recurved; lip entirely pink-red; stigma pale-pink; crushed leaf sheaths with a distinct peppery scent; inner surface of staminal tube densely hairy and conspicuously warty; fruits with longitudinally ridged pericarp. ..... **11. *E. triorgyalis***

11b. Outer sterile bracts with apices not recurved; lip entirely red or with a yellow or orange-red margin; stigma bright red; crushed leaf sheaths without any distinct scent; only inner surface of staminal tube densely hairy, not warty; fruits with smooth pericarp. ..... **12. *E. littoralis***

Description of the Species

1. Etlingera elatior (Jack) R.M. Sm., Notes Roy. Bot. Gard. Edinb. 43 (1986) 244; Lim, Folia malaysiana 1 (2000) 4. Syn.: *Alpinia elatior* Jack, Misc. mal. 3, 7 (1822) 2 (*s.v.*); *Elettaria speciosa* Blume, Enum. Pl. Javae (1827) 51; *Alpinia magnifica* Roscoe, Monandr. Pl. (1828) t. 75 (*s.v.*); *Phaeomeria imperialis* Lindl., Nat. Syst. Ed. 2 (1836) 446 (s.v.); Ridl., Fl. Malay Penins. 4 (1924) 272; *Nicolaia imperialis* Horan., Prodr. Monogr. Scitam. (1862) 32, t. 1. (*s.v.*); *Nicolaia speciosa* Horan., Monogr. Scitam. (1862) 32 (*s.v.*); Valeton, Bull. Jard. Bot. Buitenz. 3rd Ser. 3 (1921) 138; *Hornstedtia imperialis* Ridl., in J. Str. Br. Roy. Asiat. Soc. 32 (1899) 148; Mat. Fl. Malay. Penins. (1907) 40; *Phaeomeria magnifica* (Roscoe) K. Schum., Pflanzenr. Zingib. (1904) 262; *Phaeomeria speciosa* (Blume) Merr., Enum. Philip. Pl. 1 (1922) 241; Holttum, Gard. Bull. Sing. 13 (1950) 181; Henderson, Malayan Wild Flowers, Monocots. (1954) 153. Type: Sumatra, *Jack s.n.*, (*s.v.*) – specimen lost?

Figures 1B, 2C & D, 3C, 4B

Rhizomes just below ground; stout, 3–4 cm diam.; scale-leaves overlapping, green. *Leafy shoots* 5–6 m tall; 10–18 cm apart, forming clumps; young sheaths longitudinally ribbed, with cross-bars not covered by tufts of short, white hairs; crushed sheaths with a pleasant, sour fragrance; *ligule c.* 2 cm long, apex broad, entire or slightly bilobed, margin with short brown hairs; *petiole* 2.5–3.5 cm long, surface longitudinally ribbed. *Laminas c.* 17 pairs; (topmost) *c.* 33 x 4.5 cm, (middle) 66–81 x 15–18 cm, (basal) *c.* 36 x 14 cm; upper surface with slightly raised lateral veins; entirely green on both surfaces, (sometimes flushed pink in young leaves); lower surface glabrous; base variable, mostly broadly rounded or cordate, sometimes cuneate or unequal. *Peduncle* to 100–200 cm; shortly horizontal, then erect, aerial, close to base of leafy shoot; sheaths *c.* 13, shortest at base 5–20 cm long, apex rounded with subapical tooth 0.1 cm long, pale green at apex, dark green towards base; not overlapping, widely spaced. *Inflorescence* raised

well above the ground. *Fertile apical part of inflorescence* with well developed sterile bracts tightly imbricating at the bases only, forming a very shallow inconspicuous cup-like structure c. 2.5 cm high, 6 cm wide and with the upper half of the bracts reflexed; in side view the cup hiding *c.* 1/3 or less of the conical inflorescence head proper; the cup not persistent until fruit maturity. *Receptacle of inflorescence* 4–9 cm long, lengthening to 17 cm (usually shorter); apex inflated and rounded; bearing up to 200 or more flowers; 11–13 flowers open simultaneously; flower (from base of ovary to apex of labellum) *c.* 4.5 cm long. *Sterile bracts c.* 13; 5.5–10 x 1.5–3.5 cm; soft (not rigid), spreading outwards from a loosely imbricating base; oblong-elliptic, strongly recurved; apex rounded, with subapical tooth *c.* 0.5 cm long; glabrous; pink with white margins. *Outer floral bracts* resembling the sterile bracts, *c.* 7.5 x 1–2 cm; *inner floral bracts* smaller *c.* 4 x 0.7 cm. *Bracteole* 2–2.5 x *c.* 1.5 cm (when flattened); unequally 2-lobed, apex of lobe acute with *c.*1 cm slit on opposite side; glabrous, translucent with a pink median band. *Calyx* 2.5–3 x *c.* 1.5 cm (when flattened); 3-lobed, each lobe with an apical tuft of short, brown hairs; tube with *c.*1.5 cm slit on opposite side; glabrous; white, deep pink at apex. *Corolla tube* 1–1.5 cm long; inner surface densely covered with long hairs at entrance to tube; *lobes (petals)* longer than calyx, 2–2.5 cm long, apices rounded, slightly hooded, white with pink tips; dorsal lobe not hiding the anther and stigma, *c.* 0.7 cm wide, lateral lobes narrower, *c.* 0.4 cm. *Labellum* held erect; blade 1.8–2 cm long, *c.* 0.8 cm wide; deep red with a yellow margin except at basal lobes; margin of blade plain; apex rounded and retuse. *Staminal tube* 0.5–1 cm long above the base of the corolla-lobes; inner surface of tube sparsely covered with long hairs, more hairy below anther, (not warty). *Filament* short, *c.* 0.5 x 0.3 cm wide, adaxially hairy. *Anther* c. 0.7 x 0.3 cm; dark red, with white hairs on pollen sacs. *Epigynous glands* 0.2–0.4 x 0.2–0.3 cm; comprising 2 rounded mounds, surrounding base of style, each mound deeply and irregularly lobed, apices glabrous, surface conspicuously warty. *Ovary* 0.4–0.6 x 0.3–0.5 cm; densely covered with appressed, white, short hairs; *style* white, hairy; *stigma* dark red, 0.3 cm across. *Infructescence* elongate, up to *c.* 19 cm but usually shorter x 10 cm in diam.; surmounted by withered flowers; withered, sterile bracts persistent until fruit maturity at base of fruit head; floral bracts persistent with fruits at their axils; number of fruits per head 15–25 (or more). *Fruits* obovoid; *c.* 2.5 x *c.* 3 cm wide at the top; densely covered with appressed short hairs; apex with remnant of calyx *c.* 3 cm long; pericarp smooth, not ridged longitudinally; pericarp 0.2–0.3 cm thick; buff or pale green at maturity. *Seeds* irregularly angular, truncate; *c.* 0.4 x 0.3 cm wide.

Distribution: This species is widely cultivated and has been collected from several places in the Peninsula. Ridley (1924) reported the species wild in forests in Rawang, Selangor and in Tambun near Ipoh and the Taiping Hills in Perak. The species is described as native to the Peninsula, Java and Sumatra (Ridley, 1899).

Notes: Locally known as *kantan*, this is commonly cultivated as a flavouring, the young inflorescences and fruits being used in curries. The newly opened inflorescence is beautiful but the bracts quickly turn black and rot, rendering it unsuitable for the cut-flower trade.

One of the most conspicuous features of this species is the lengthening of the receptacle of the inflorescence during flowering, the spike thus forming an elongating cone within the involucral cup.

Ridley (1899 p: 148 & 149) described the lip as white edged in *Hornstedtia imperialis* var. *imperialis* and the margins as yellow in var. *speciosa*. Ibrahim (1986) reported a form with white bracts and yellow flowers from Pulau Tioman.

Specimens seen: PERAK: Tanjong Malim, *Burkill & Haniff 14002* (SING); Ipoh, Ampang limestone cliffs, *Burkill & Haniff 13934* (SING); Taiping, Batu Tegoh, *Henderson 10139, 10143, 10312* (SING); Larut Hills, *King's Collector 3075* (SING); Telok Anson, Durian Sebatang, *Haniff 15293* (SING); Taiping Waterfall, *Ridley s.n.* (SING); Bubu F.R., Jalong, *Symington SFN 39556* (KEP). SELANGOR: Rawang, *Ridley 7811* (SING); Kanching, Bukit Takun, *Stone 8787* (SING). JOHOR: Kota Tinggi, *Ridley s.n.* (SING). PAHANG: Pelangai or Manchis, *Burkill & Haniff 16793* (SING); Ulu Tembeling, Sg. Sat, *Henderson 22068* (SING). TERENGGANU: Ulu Brang, *Moysey & Kiah SFN 33873* (SING); Kuala Terengganu, Bukit Berangan, *Sinclair & Kiah SFN 40891* (SING).

2. *Etlingera maingayi* (Baker) R.M. Sm., Notes Roy. Bot. Gard. Edinb. 43 (1986) 247; Lim, Folia malaysiana 1 (2000) 5. Syn.: *Amomum maingayi* Baker, in Hook. *f.*, Fl. Brit. India 6 (1892) 235; *Hornstedtia maingayi* (Baker) Ridl., in J. Str. Br. Roy. Asiat. Soc. 32 (1899) 150; Mat. Fl. Malay. Penins. 1 (1907) 41; *Phaeomeria maingayi* (Baker) K. Schum., Pflanzenr. Zingib. 20 (1904) 266; Ridl., Fl. Malay Penins. 4 (1924) 272; Holttum, Gard. Bull. Sing. 13 (1950) 180; Henderson, Malayan Wild Flowers, Monocots. (1954) 155; *Nicolaia maingayi* (Baker) K. Larsen, Nat. Hist. Bull. Siam Soc. 23: 574 (1970). Type: Malacca, *Maingay 1586, s.v.* (K).

Figures 1A, 2A & B, 3A, 4A

Rhizomes long, slender, creeping, *c.* 2.5 cm diam.; supported by stilt-roots 10–30 cm long; scale-leaves overlapping; green flushed orange-pink. *Leafy shoots* 3–4 m tall; 10–20 cm apart, forming clumps; young sheaths slightly longitudinally ribbed, with cross-bars covered by tufts of very short, white

hairs; crushed sheaths with a pleasant, sour fragrance; *ligule* to 1.5 cm, apex entire or slightly bilobed, margin and surface with short, light-brown hairs; *petiole* to 0.5 cm, surface longitudinally ribbed. *Laminas c.* 17 pairs, (topmost) 25–62 x 3–5 cm, (middle) *c.* 66 x 10–12 cm, (basal) 20–43 x 5.5–8.5 cm; upper surface smooth, entirely green (young leaves sometimes brownish-pink all over on both surfaces or with brownish-pink bars on green lamina), lower surface glabrous, base cuneate, unequal. *Peduncle* up to *c.* 100 cm long, shortly horizontal, then erect, close to base of leafy shoot; sheaths *c.* 9, shortest at base 2–7 cm long, apex rounded, with subapical tooth *c.* 0.2 cm long, pink or purplish-red at apex, green towards base, not overlapping, widely spaced. *Inflorescence* raised well above the ground. *Fertile apical part of inflorescence* with well developed sterile bracts tightly imbricating, forming a firm, cup-like structure, 2–3 x *c.* 4 cm; in side view the cup hiding *c.* 1/3 of the inflorescence head proper, the cup persistent until fruit maturity. *Receptacle of inflorescence* 1.5–2 cm long; apex inflated and conical; bearing *c.* 70 flowers; *c.* 9 flowers open simultaneously; flower (from base of ovary to apex of labellum) *c.* 4.5 cm long. *Sterile bracts c.* 8; 3–4 x 4.5–5 cm; rigid, erect, subrotund, the whole concave towards the inside; apex broadly rounded, retuse, with a subapical tooth 0.2–0.5 cm long; outer surface with densely appressed, white hairs, red. *Outer floral bracts* like sterile bracts; *c.* 3.5 x 1.5–3 cm; *inner floral bracts* smaller, 3–3.5 x 0.5–1.5 cm. *Bracteole c.* 2 x 1 cm (when flattened); apex 2-lobed and rounded with 0.5 cm slit on opposite side; densely, tawny hairy on entire surface. *Calyx* 2.5–3 x *c.*1 cm (when flattened); 3-lobed, each lobe with a glabrous, subapical tooth 0.2 cm long; tube with *c.*1 cm slit on opposite side; surface densely covered with appressed, tawny hairs; red. *Corolla tube c.* 1.5 cm long; inner surface densely covered with long hairs at entrance of tube; *lobes (petals)* shorter than calyx, *c.* 1.5 cm long, apices rounded, not hooded, red; dorsal lobe not hiding the anther and stigma, *c.* 0.5 cm wide, lateral lobes narrower, *c.* 0.2 cm. *Labellum* held erect; blade 1.5–2 cm long, 0.6–0.8 cm wide; blade and basal lobes pink with a red median band not reaching the apex, margins of base white; margins of blade crisped; apex rounded and bilobed. *Staminal tube c.* 1 cm long above the base of the corolla-lobes; inner surface of tube densely covered with long hairs, not warty. *Filament* very short, *c.* 0.1 x 0.2 cm, adaxially hairy. *Anther c.* 0.8 x 0.2 cm, red, hairy on pollen sacs. *Epigynous glands c.* 0.3 x 0.2 cm; comprising 2 rounded mounds, surrounding base of style, each mound minutely lobed, apices hairy, (not warty). *Ovary c.* 0.3 x 0.3 cm, glabrous; *style* red, hairy; *stigma* red, *c.* 0.2 cm wide. *Infructescence* spherical, small, 5–7 x 5.5–7 cm in diameter; surmounted by withered flowers; sterile bracts persisting until fruit maturity at base of fruit-head; floral bracts persistent with fruits at their axils; 12—15 fruits per head. *Fruits* obovoid, *c.* 2.5 x 2.5–

3.5 cm wide at the top; glabrous; apex with remnant of calyx *c.* 3 cm long; pericarp smooth, not ridged longitudinally; pericarp 0.4–0.8 cm thick; bright red, shiny. *Seeds* irregularly angular, truncate, *c.* 0.4 x 0.4 cm.

Distribution: In Peninsular Malaysia, this species had been collected from many localities in lowland forests. It is also found in Thailand (Smith, 1986).

Notes: This widely distributed species has involucral/sterile bracts of variable widths and apices. The inflorescence is recognizable from its red peduncle, small subglobose flower-heads and pink outer bracts entirely covered with appressed silvery-white hairs and rose-red flowers.

Lim (2000) published a new variety, var. *ovata* (type at KEP), which has much broader leaves, 18.5 cm wide, compared with *c.* 12 cm wide and sessile, (not petiolate) in var. *maingayi.* Unfortunately, vegetative characters are less reliable than those of the inflorescence in *Etlingera* taxonomy. Within the same species, some leafy shoots may produce both petiolate and sessile leaves, as in *E. pauciflora.* Lim did not give any measurements of the inflorescence or its organs for a comparative study although his photographs showed specimens in flower. A more complete study is required for a taxonomic decision on the status of this variety.

In the same publication, Lim (2000) rendered Holttum's var. *longibracteata* (type at SING) synonymous with var. *maingayi.* In his variety, Holttum (1950) described the involucral bracts as *c.* 3 x 1.5 cm (v. *c.* 3 x 2.5 cm in var. *maingayi*), with the apex narrowly rounded instead of broadly rounded. Without stating sound reasons, Lim declared that var. *longibracteata*, "may be an aberration, and has so far not been found again near the type location – where the usual form is not uncommon". However, not being able to relocate a taxon at the type-site (moreover, 'Tembeling' covers a large area) is insufficient grounds for eliminating Holttum's var. *longibracteata.* The variety should be maintained until detailed comparative studies with var. *maingayi* are made.

Specimens seen: PERLIS: Lubuk Sireh, Hutan Simpan Mata Ayer, *Wan Fadhilah HI 931* (KLU). KEDAH: Pass to Kroh from Baling, *Corner SFN 31569* (SING); Yan, G. Jerai, Batu Hampar, *Saw FRI 44640* (KEP). PERAK: Upper Perak, *Wray s.n.* (SING); Temengor, *Ridley 14419* (SING). SELANGOR: Dusun Tua, *Ridley 7801* (SING). JOHOR: Sedili River, below Mawai, *Corner SFN 36969* (2 sheets) (KEP, SING,); Batu Pahat, *Ridley s.n.* (SING); Ulu Kahang, *Holttum 10902* (SING); Kota Tinggi, G. Panti F.R., West, *Saw FRI 37746* (KEP). KELANTAN: Kuala Lebir, *Gimlette s.n.* (SING); Gua Musang, *Saw FRI 37403* (KEP). PAHANG: Kota Glanggi, *Furtado s.n.* (SING); Ulu Sg. Sat, *Mohd. Shah & Mohd. Noor MS 1772* (KEP, SING); Genting Highlands, Awana Trail, *Saw FRI 37406* (KEP); Taman Negara, Sg. Relau, *Chua, Mustapa & Apok FRI 40607* (KEP).

3. *Etlingera fulgens* (Ridl.) C.K. Lim, Folia malaysiana 1 (2000) 6. Syn.: *Hornstedtia fulgens* Ridl., J. Str. Br. Roy. Asiat. Soc. 32 (1899) 149; Mat. Fl. Malay. Penins. (1907) 40; *Phaeomeria fulgens* (Ridl.) K. Schum., Pflanzenr. Zingib. (1904) 262; Ridl., Fl. Malay Penins. 4 (1924) 272; Holttum, Gard. Bull. Sing. 13 (1950) 180; *Nicolaia fulgens* (Ridl.) K. Larsen, Nat. Hist. Bull. Siam Soc. 23 (1970) 574. Type: Perak, *Ridley s.n.* (SING, iso).

Figures 1C, 2E & F, 3B, 4C

Rhizomes just below ground; *c.* 3 cm diam.; scale-leaves overlapping, creamy-white. *Leafy shoots* 4–5 m tall; 10–14 cm apart, forming clumps; young sheaths faintly ribbed longitudinally, with cross-bars not covered by tufts of short, white hairs; crushed sheaths with a pleasant, sour fragrance; *ligule* 1.5–2 cm, apex broad, entire or slightly bilobed, margin with short, light brown hairs; *petiole* 1.5–2 cm, surface longitudinally ribbed. *Laminas* *c.* 15 pairs; (topmost) *c.* 31 x 4 cm, (middle) 64–96 x 14–19 cm, (basal) 12–28 x 4.5–8.5 cm; upper surface smooth, glossy, dark green; lower surface glabrous; young leaves with lower surface conspicuously dark purple-red, older leaves with only petiole and midrib purple-red; base variable, blunt or rounded, unequal. *Peduncle* up to *c.* 100 cm, shortly horizontal at first, then erect, aerial, close to base of leafy shoot; sheaths *c.* 12, shortest at base 2.5–12 cm long, apex rounded with subapical tooth 0.1 cm long, green, not overlapping, widely spaced. *Inflorescence* raised well above the ground. *Fertile apical part of inflorescence* with well developed sterile bracts tightly imbricating, forming a firm, broad cup-like structure *c.* 8.5 x *c.* 7.5 cm, in side view the cup almost entirely hiding the inflorescence head proper, the cup not persisting until fruit maturity. *Receptacle of inflorescence* *c.* 1.5 cm long, apex inflated and rounded; bearing *c.* 60 flowers; 3–6 flowers open simultaneously; flower (from base of ovary to apex of labellum) *c.* 5 cm long. *Sterile bracts* *c.* 7; 5–7 x 3.5–5.5 cm; rigid, erect, subrotund, strongly incurved at apex; apex broadly rounded, slightly retuse, with subapical tooth hardly 0.1 cm long; outer surface glabrous to sparsely hairy all over with white hairs, deep pink with green margins. *Outer floral bracts* resembling sterile bracts, 4–5 x 2–3.5 cm; *inner floral bracts* smaller, 3–4 x 0.5–1.5 cm. *Bracteole* 2.5 x *c.* 1 cm (when flattened); 2-lobed, apex of lobe acute with 1.5 cm slit on opposite side; glabrous, translucent, tinged red. *Calyx* *c.* 4 x 1 cm (when flattened); 3-lobed, each lobe with a glabrous subapical tooth less than 0.1 cm; tube with *c.* 2 cm slit on opposite side, glabrous, red. *Corolla-tube* *c.* 1.5–2 cm long, inner surface densely covered with long hairs at entrance into tube; *lobes (petals)* longer than calyx, 2 cm long, apices rounded, slightly hooded, red with white tips; dorsal lobe not hiding the anther and stigma, *c.* 0.5 cm wide, lateral lobes *c.* 0.3 cm. *Labellum*

held erect; blade 1.8–2 cm long, *c.* 0.8 cm wide; blade and basal lobes pink-red with a yellow margin except at basal lobes; margins of blade plain, apex rounded and retuse. *Staminal tube c.* 0.5 cm long above the base of the corolla-lobes; inner surface of tube sparsely covered with long hairs, more hairy below the anther, (not warty). *Filament* short, *c.* 0.3 x 0.2 cm, adaxially hairy. *Anther c.* 0.8 x 0.4 cm, pink-red, hairy on pollen sacs. *Epigynous glands* 0.5-0.6 x 0.2 cm; comprising 2 rounded mounds, surrounding base of style, each mound deeply and irregularly lobed, apices hairy, surface conspicuously warty. *Ovary c.* 0.6 x 0.3 cm; densely appressed hairy with white, short hairs; *style* red, hairy; *stigma* pink-red, *c.* 0.3 cm across. *Infructescence* globular, flat-topped, large; *c.*11 x 13 cm in diameter; not surmounted by withered flowers; sterile and floral bracts completely disintegrated at fruit maturity; 30—35 fruits per head. *Fruits* ovoid; *c.* 4–5 x 2.5–3.5 cm at the middle; densely covered by appressed short hairs; apex with remnant of calyx 3–4 cm long; pericarp smooth, (not ridged longitudinally); pericarp 0.2–0.4 cm thick; pale green at maturity. *Seeds* irregularly angular, truncate; *c.* 0.4 x 0.3 cm.

Distribution: In Peninsular Malaysia, this species is not common. Holttum (1950) reported it was in cultivation in Singapore. Larsen (1970) recorded it occurs in southern Thailand.

Notes: This species is recognized by its shiny leaves that are dark green above and when young are conspicuously purple-red beneath but turn green when old and have wavy margins, and by its inflorescences with rounded, sterile bracts, strongly incurved at the apex, rose-red with greenish white margins, forming a shallow, wide cup. The young plants sometimes produce short stilt-roots but these are not observed in adult plants.

Smith (1986) had combined this taxon with a Javan one as *Etlingera hemisphaerica* (Blume) R.M. Sm.. Lim (2000) rejected this decision and resurrected the epithet *fulgens* for the Peninsular Malaysian taxon. Among the arguments he presented were that Smith (1986), in making the combination *E. hemisphaerica*, did so without having viewed the types of either Ridley's Malayan *Hornstedtia fulgens* or Blume's Javan *Elettaria hemisphaerica.* However, Lim did not make clear whether he had actually seen the types of these two species himself nor did he give a critical assessment of the inflorescence characters of both the species. The arguments presented by Lim for his decision are therefore not conclusive. Since I have not seen Blume's type from East Java, and to avoid any unnecessary changes until the types of both species are examined, *E. fulgens*, is used in the present work for the taxon from Peninsular Malaysia.

Specimens seen: PERAK: Jor, Batang Padang, *Henderson 10854* (SING). PAHANG: Krau Wildlife Reserve, Hulu Sg. Lompat, *Chua FRI 41742* (KEP). TERENGGANU: Ulu Brang, *Moysey & Kiah SFN 33670* (SING).

4. *Etlingera venusta* (Ridl.) R.M. Sm., Notes Roy. Bot. Gard. Edinb. 43 (1986) 250. Syn.: *Hornstedtia venusta* Ridl., in J. Str. Br. Roy. Asiat. Soc. 32 (1899) 149; Mat. Fl. Malay Penins. (1907) 40; *Phaeomeria venusta* (Ridl.) K. Schum., Pflanzenr. Zingib. (1904) 264; Ridl., Fl. Malay Penins. 4 (1924) 272; Holttum, Gard. Bull. Sing. 13 (1950) 182; *Nicolaia venusta* (Ridl.) K. Larsen, Nat. Hist. Bull. Siam Soc. 23 (1970) 575. Type: Selangor, Genting Bidai, *Ridley 7810* (K, holo; SING, iso).

Figure 5

Rhizomes just below ground; 2.5–4.5 cm diam.; scale-leaves overlapping, green. *Leafy shoots* 2.5–4 m tall; 10–18 cm apart, forming clumps; young sheaths longitudinally ribbed, with cross-bars not covered by tufts of short, white hairs; crushed sheaths with a pleasant, sour fragrance; *ligule* 2–3 cm; apex deeply bilobed; margin and surface densely covered with short, brown hairs; thin, papery, upper portion breaking off easily; *petiole* inconspicuous, always subsessile. *Laminas c.* 10 pairs; (topmost) 51–64 x 9.5–13 cm, (middle) 66–80 x 14–20 cm, (basal) 45–54 x 13–14.5 cm; lamina prominently ribbed; entirely green on both surfaces; lower surface glabrous; base cuneate always. *Peduncle* to 60–80 cm; shortly horizontal, then erect, aerial, close to base of leafy shoot; sheaths *c.* 12, shortest at base 2–9 cm long, apex rounded with subapical tooth 0.2 cm long, flushed red at apex, green towards base, not overlapping, widely spaced. *Inflorescence* raised well above the ground. *Fertile apical part of inflorescence* with well developed sterile bracts, tightly imbricating, forming a firm, deep cup-like structure 8–9 x *c.* 7.5 cm; in side view the cup almost entirely hiding the inflorescence head proper; cup not persisting until fruit maturity. *Receptacle of inflorescence* 2–3 cm long; apex inflated and conical; bearing 60–70 flowers; 1–5 flowers open simultaneously; flower (from base of ovary to apex of labellum) 5–5.3 cm long. *Sterile bracts c.* 8; 7.5–12 x 4–5.5 cm; rigid, erect, oblong-elliptic, strongly recurved at apex; apex acute, with subapical tooth *c.* 0.5 cm; outer surface glabrous or sparsely covered with white hairs; bracts entirely purple-pink or with some white towards apex, pale green at base. *Outer floral bracts* resembling inner sterile bracts but narrower, 7.5–8 x 2.5–3.7 cm; inner floral bracts smaller, 2–6 x 0.5–1.5 cm. *Bracteole c.* 3 x 1.5 cm (when flattened); 2-lobed, apex of lobe acute; with *c.* 2 cm slit on opposite side; glabrous, translucent, pink towards apex. *Calyx* 4–4.3 x *c.* 1.5 cm (when flattened); 2- or 3-lobed, each lobe with a glabrous or hairy subapical tooth 0.1 cm; tube with 2–2.5 cm slit on opposite side; glabrous, with brown hairs

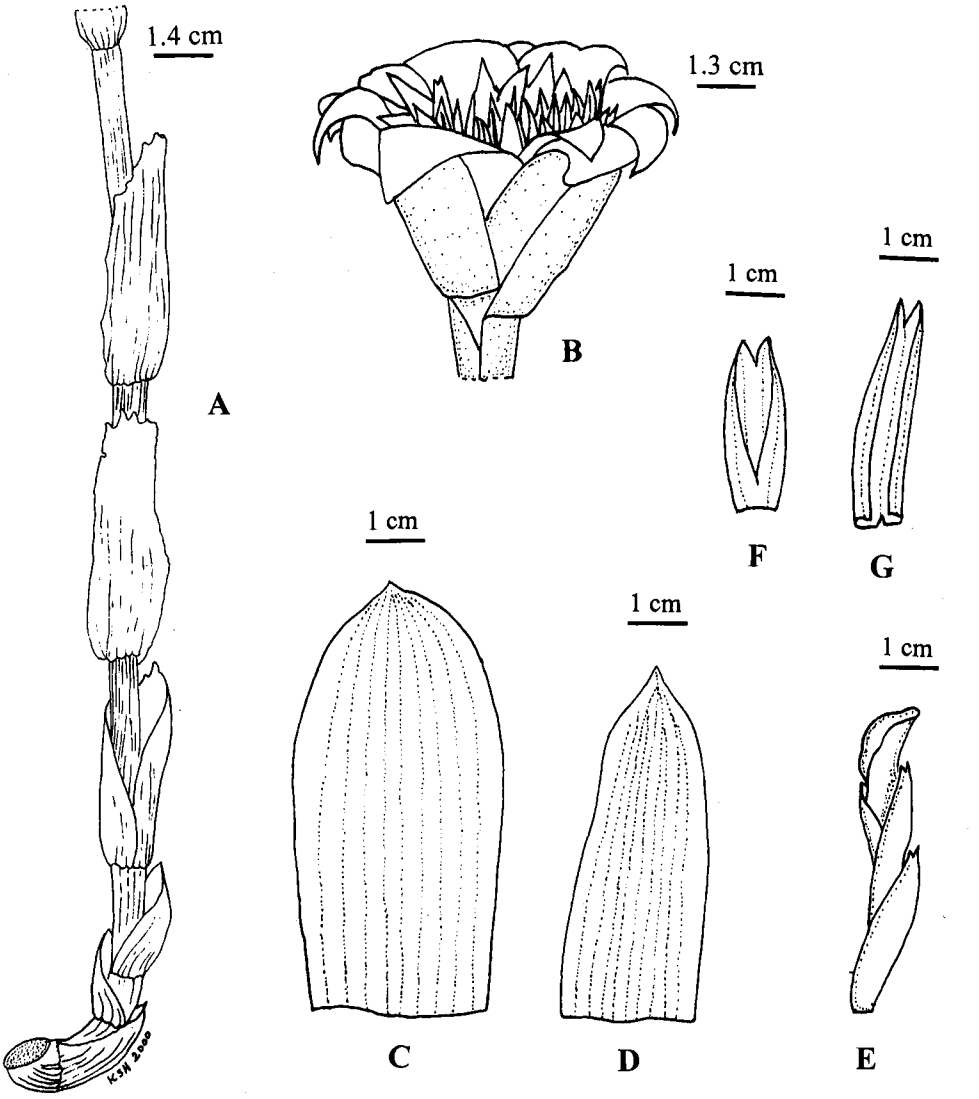
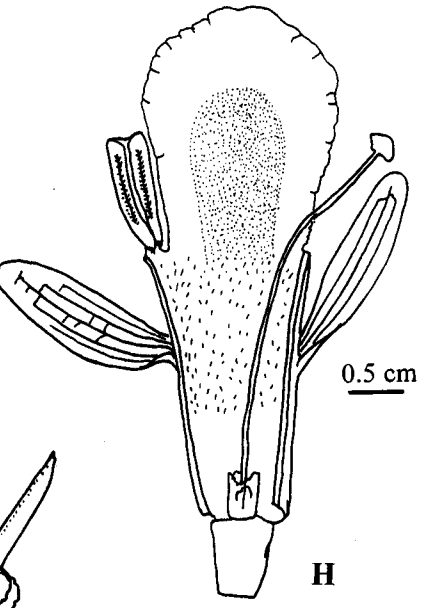


Figure 5. ***Etlingera venusta.*** A, base of peduncle; B, inflorescence; C, sterile bract; D, floral bract; E, flower with bracteole, side view; F, bracteole; G, calyx; H, flower dissected with style displaced; I, infructescence; (A from dry material, B–I from spirit material of *Khaw KSH 244*).



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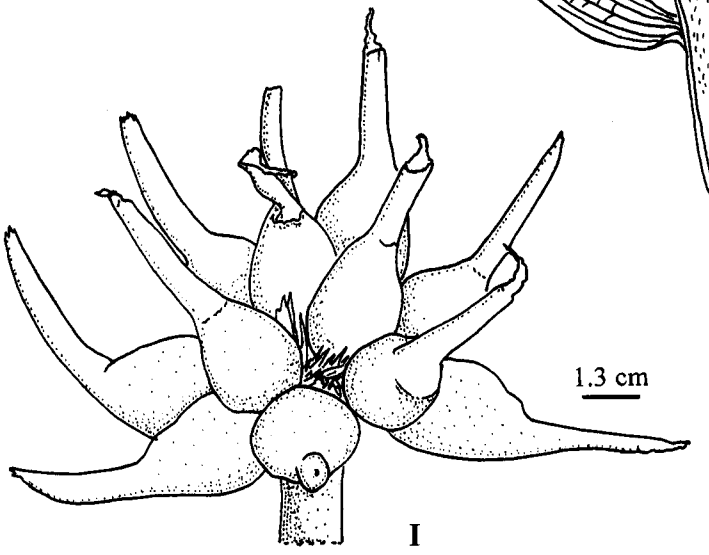


I

at apex only; white, deep purple-red towards apex. *Corolla-tube* 1–1.2 cm long, inner surface with long hairs at entrance into tube; *lobes (petals)* shorter than calyx, *c.* 1.5 cm long, apices rounded, slightly hooded, white with pink tips; the dorsal lobe not hiding the anther and stigma, 0.5–0.7 cm wide, lateral lobes 0.4–0.5 cm. *Labellum* held erect; blade narrowed to base without widening to form basal lobes; 2–2.2 x 1.2–1.3 cm; white with a red median band not reaching the apex, without red lines radiating from the red band towards the margin; margin slightly crisped or plain; apex rounded, (not retuse). *Staminal tube* 1.2–1.3 cm long above the base of the corolla-lobes; inner surface of tube with long hairs, (not warty). *Filament* very short, *c.* 0.1 x 0.2–0.3 cm wide, adaxially hairy. *Anther c.* 1 x 0.3 cm, pale yellow or white, with white hairs on pollen sacs. *Epigynous glands c.* 0.5 x 0.2 cm; comprising 2 rounded mounds, surrounding base of style, each mound deeply and irregularly lobed, apices hairy, surface warty towards the apices. *Ovary* 0.4–0.7 x 0.4–0.7 cm, glabrous; *style* white, hairy; *stigma* pale pink, 0.3 cm across. *Infructescence* globular; large, *c.* 9 x 13–15 cm diam.; not surmounted by withered flowers; sterile and floral bracts completely disintegrated at fruit maturity; 15—20 fruits per head. *Fruits* ovoid, *c.* 5 x c. 3.5 cm wide at the middle; glabrous, apex with remnant of calyx 3–4.5 cm long; pericarp smooth, not ridged longitudinally; pericarp 0.4–0.5 cm thick; bright red or pink, shiny. *Seeds* irregularly angular, truncate; *c.* 0.4 x 0.3–0.5 cm wide, widest at apex.

Distribution: In Peninsular Malaysia, this species is collected mainly from Perak, Selangor and Pahang. As it has not been recorded elsewhere, *P. venusta* is therefore endemic to Peninsular Malaysia.

Notes: This species is distinguished from *E. corneri* by the absence of stilt-roots, its subsessile, broader leaves with cuneate bases; its rose-pink inflorescences formed by bracts with acute apices and infructescences of red fruits not surrounded by bracts, which completely decay during fruit development.

Specimens seen: PERAK: Ulu Batang Padang, *Ridl. 13835* (SING); Tapah Hills, Sg. Woh, *Ng FRI 1330* (KEP, SING); Tapah Hills, S. Keteh, *Whitmore FRI 15668* (KEP); Hulu Perak, Temenggor F.R., Sg. Samlor, *Khaw KSH 378* (KEP). PAHANG: Genting Highlands, Awana Hotel Trail, *Saw FRI 36448* (KEP).

5. *Etlingera corneri* J. Mood & H. Ibrahim, Nord. J. Bot. 20 (24. 8. 2000) 278–283. Syn.: *Etlingera terengannuensis* C.K. Lim, Folia malaysiana 1 (2000) 9. Type: Thailand, Narathiwat Province, 1991, *Vitoon, Lyon 91.433, s.v.* (KLU, SING).

Figure 6

Rhizome above leaf-litter or just below soil level, 3–4.5 cm diam.; supported by pinkish-orange stilt-roots, 10–25 cm long; scale-leaves overlapping, green tinged dull red. *Leafy shoots* 2.5–4 m tall; close together, 6–14 cm apart, forming clumps; sheaths longitudinally ribbed, with cross-bars not covered by tufts of short, white hairs, when crushed emitting a pleasant, sour fragrance; *ligule* 1.5–2 cm, apex deeply bilobed, margin and surface densely covered with short hairs; *petiole* 1.5–4 cm, surface reticulate. *Laminas* 10–11 pairs; (topmost) 36–47 x 5.5–8 cm, (middle) 57–65 x 13–16 cm, (basal) 14–35 x 5–10 cm; apex shortly-pointed, *c.*1 cm long; base variable, mostly rounded, occasionally unequal, sometimes cuneate; entirely green on both surfaces when young; upper surface prominently ribbed; lower surface glabrous; margin red, crisped, with short white or light brown hairs. *Peduncle* *c.* 90 cm, shortly horizontal to *c.* 4 cm, then erect, close to base of leafy shoot; sheaths *c.* 12, shortest at base, 2.5–13 cm long, apex bilobed with subapical tooth to *c.* 0.5 cm long, surface with short hairs, red at apex, pale green towards base; not overlapping, widely spaced. *Inflorescence* raised well above the ground. *Fertile apical part of inflorescence* with well developed sterile bracts tightly imbricating, forming a firm, deep, cup-like structure 8–9 x *c.* 7.5 cm; the cup almost entirely hiding the inflorescence-head proper in side view; the cup persistent until fruit maturity. *Receptacle of inflorescence* 1–1.5 cm long; apex inflated, conical or rounded; bearing 50–60 flowers; 1–5 flowers open simultaneously; flower (from base of ovary to apex of labellum) 5.3–6 cm long. *Sterile bracts* 8–14; 6.5–8.5 x 2–5.5 cm; rigid, erect, oblong-elliptic, recurved at apex; apex subtruncate, retuse, with subapical tooth *c.* 0.5 cm long; outer surface of bract glabrous, densely covered with appressed white hairs at base only; bracts bright red, white or pale green at base. *Outer floral bracts* resembling the sterile bracts but smaller, 5.5–7.5 x 2–4 cm; *inner floral bracts* smaller still, 3.5–4 x 0.5–1.5 cm. *Bracteole* tubular at base; *c.* 3.5 x 1.5 cm when flattened; unequally 2-lobed, apex of lobe acute or rounded with *c.* 2 cm slit on opposite side; surface with white hairs; white with red apex. *Calyx* tubular at base; 4–4.4 x *c.* 1.5 cm when flattened; 3-lobed, each lobe with a glabrous or hairy subapical tooth *c.* 0.1 cm long; tube with *c.* 2.5 cm slit on opposite side; glabrous, with appressed white hairs at base only; white, red at apex. *Corolla-tube* 1.5–2 cm long, inner surface densely covered with long hairs at entrance into tube; *lobes (petals)* shorter than calyx, *c.* 2 cm long, apices rounded, not hooded, pink; dorsal lobe not hiding the anther and stigma, *c.* 0.5 cm wide, lateral lobes narrower, *c.* 0.4 cm wide. *Labellum* held erect, blade narrowed to base without widening to form basal lobes; *c.* 2 x 1.2–1.3 cm; white with a red median band not reaching the apex, with red lines

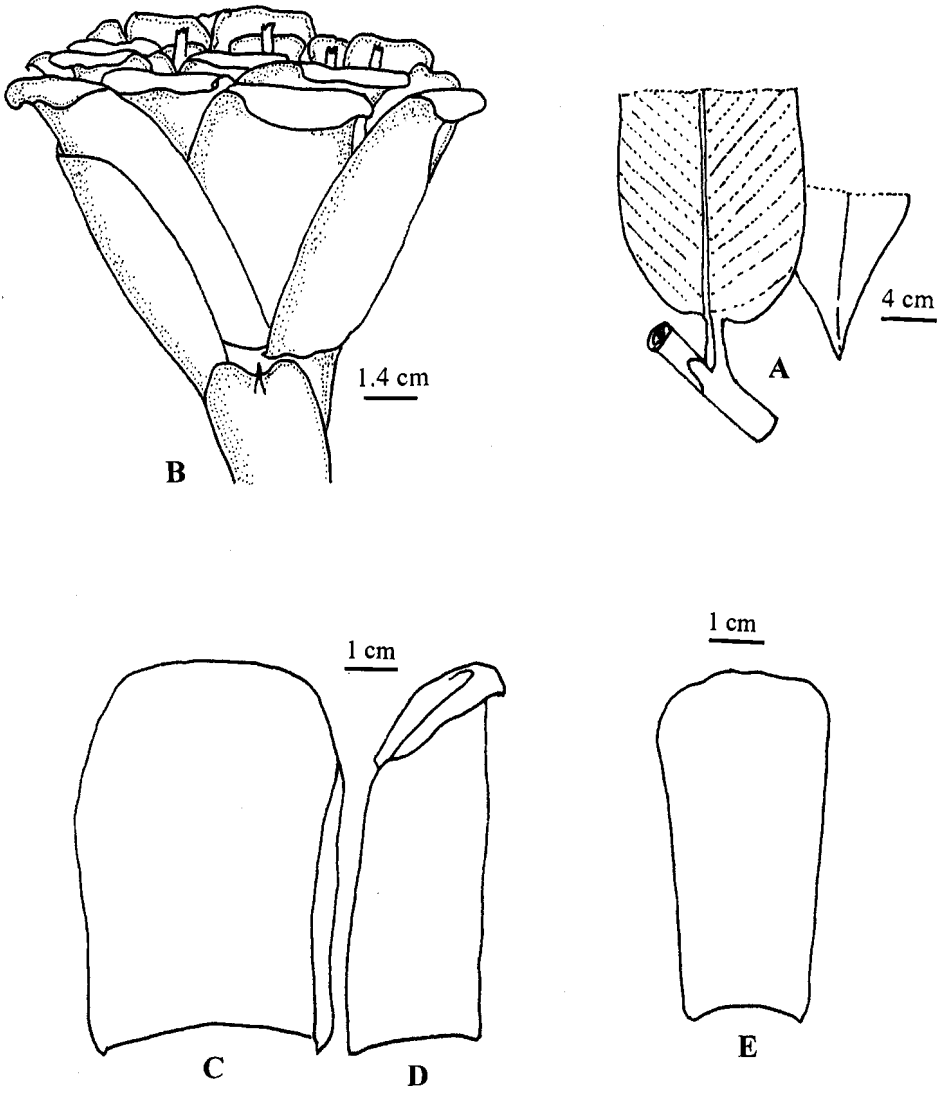
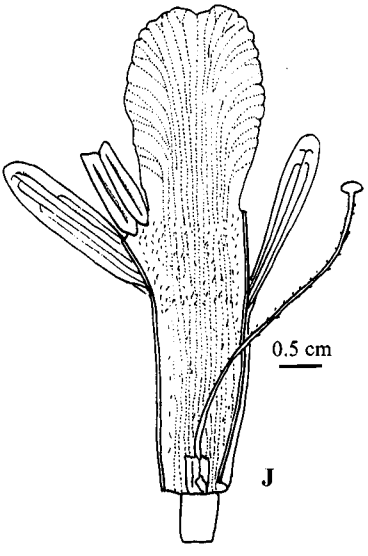
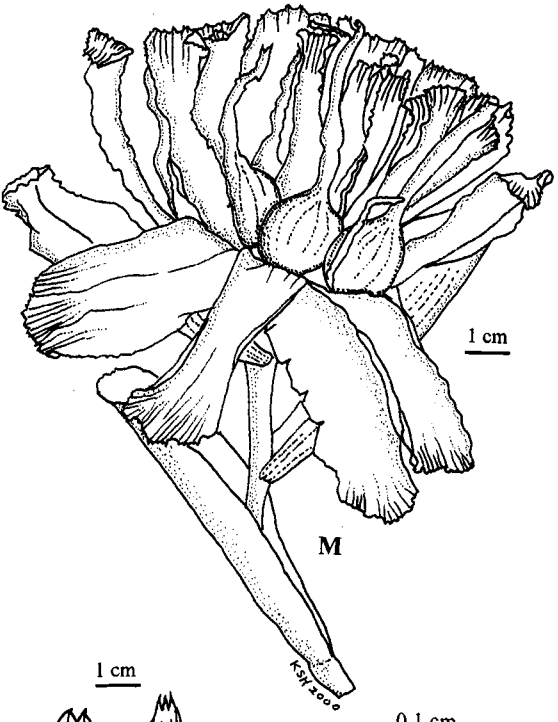
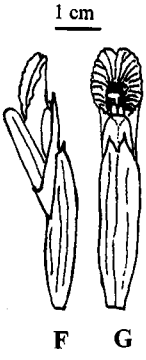
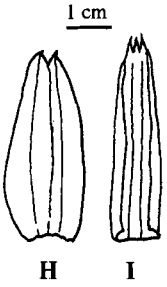


Figure 6. ***Etlingera corneri.*** A, leaf base and tip; B, inflorescence; C, sterile bract, adaxial view; D, sterile bract, lateral view; E, floral bract, adaxial view; F, flower with bracteole, lateral view; G, flower with bracteole, adaxial view; H, bracteole, flattened, adaxial view; I, calyx, flattened, adaxial view; J, flower dissected with style displaced; K, epigynous glands, adaxial view; L, epigynous glands, abaxial view; M, infructescence with persistent involucral and floral bracts displaced; (A, B from fresh material, C-L, spirit, M, dry; from *Khaw KSH 601*).


0.5 cm
J


1 cm
M
KSH 2000


1 cm
F
G


1 cm
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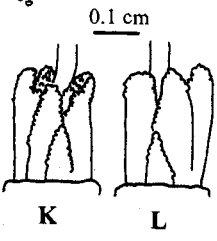

0.1 cm
K
L

radiating from the red band towards the margin; margin slightly crisped; apex rounded, slightly retuse. *Staminal tube* 0.9–1 cm long above the base of the corolla-lobes, inner surface of tube densely covered with long hairs, (not warty). *Filament* very short, *c.* 0.1 x 0.2–0.3 cm, adaxially hairy. *Anther* *c.* 1 x 0.3 cm, red at apex, white at base, with yellow hairs on pollen sacs. *Epigynous glands* *c.* 0.4 x 0.2 cm; comprising two rounded mounds, surrounding base of style, each mound deeply and irregularly lobed, apices glabrous, surface warty towards the apices. *Ovary* 0.4–0.6 x *c.* 0.4 cm, glabrous, white; *style* white, hairy; *stigma* pink, *c.* 0.2 cm across. *Infructescence* globular, large, *c.* 9 x 10–11 cm, not surmounted by withered flowers, sterile bracts surrounding fruits persisting to fruit maturity, 8—17 fruits per fruit head. *Fruit* ovoid; *c.* 4 x 2.5 cm at the middle; glabrous; apex with remnant of calyx 3–4.5 cm long; bright red or pink, shiny; pericarp smooth, not ridged longitudinally, 0.3–0.4 cm thick. *Seeds* 35–45 in each fruit; covered with a white, pulpy aril; dark brown; irregularly angular truncate; *c.* 0.4 x 0.3–0.5 cm, widest at apex.

Distribution: This attractive species of horticultural potential has been recorded in the Peninsula from the states of Kedah, Perak, Pahang and Terengganu. It is not common and there are few collections. It is also found in southern Thailand (Mood & Ibrahim, 2000).

Notes: The confusion over *Etlingera corneri* and *E. venusta* is discussed in detail by Mood & Ibrahim (2000). *E. corneri* is distinguished from *E. venusta* by its stilt roots, petiolate leaves usually with rounded bases, its bright red inflorescence in the form of a deep cup; the outer bracts that are strongly recurved and have subtruncate apices, and the infructescence of red fruits surrounded by persistent bracts.

The plants from northern Perak, on which the above description is based, have leaves that are entirely green on both surfaces, even when young. This character differs from that described by Mood & Ibrahim (2000): "dark green above, ... green (or purple) below ...". For two specimens from Johor, which were previously annotated as *Phaeomeria venusta* and which were cited by Mood & Ibrahim as being *E. corneri,* the field notes read: "leaves dark green, glossy with undulate edge, purple beneath, though old leaves may lose the purple" (*Corner SFN 32778*, KEP, SING) and "dark green above, purple beneath, glossy on both surfaces" (*Sinclair 10596*, SING). This leaf character is reminiscent of *E. fulgens*. As I am uncertain of the identity of *Corner SFN 32778* and *Sinclair SFN 10596*, I have excluded them from the list below of specimens seen. The field notes in *Corner SFN 32778* also mention "stilts 2–4" high", shorter than those described here. Until Mood and Ibrahim (2000) clarified the confusion over the identities

of *E. venusta* and *E. corneri*, these two species were often misidentified. The photographs in Weber (1995) showing the inflorescence and infructescences of *E. venusta* from Sekayu, Terengganu are actually those of *E. corneri*. This was noted by Mood and Ibrahim (2000). Similarly, photographs of *E. venusta* infructescences in Larsen *et al.* (1999) are in fact those of *E. corneri*, while the photograph showing "clusters of horn-like *Etlingera* fruits" are the fruits of *E. venusta*.

Specimens seen: KEDAH: Ulu Muda F.R., Baling, Waduk, *K.H. Lim, LKH 158* (KEP). PERAK: Hulu Perak,Temenggor F.R., Pos Chiong, Sg. Sara, *Khaw KSH 373* (KEP); Sg. Tiang, *Khaw KSH 586, 601, 606* (KEP). PAHANG: Kuantan, Sg. Pohoi, *Mohd. Shah, Sidek & Samsuri MS 3787* (KEP). TERENGGANU: Ulu Brang, *Moysey & Kiah SFN 33721* (KEP, SING); Hulu Terengganu F.R., Hutan Lipur Sekayu, *Anthonysamy SA 648* (KEP); Ulu Terengganu (Extension) F.R., Cpt. 43, *Saw FRI 39880* (KEP); Ulu Terengganu F.R., *C.K. Lim LIM 4229* (KEP).

6. *Etlingera pieeae* Khaw, *sp. nov.*

Etlingera triorgyali affinis sed inflorescentia supra terram elevata, pedunculo saltem duplo longiore, bracteis involucralibus tantum basin laxe imbricatis ergo cupulam involucralem conspicuam non formanti, inflorescentia inter bracteas a latere visibili, bracteis rigidis leviter expansis, oblanceolatis, longitudinaliter inflexis non recurvatis, pallide viridis marginibus et apicibus rubris et longitudinaliter rubro-striatis, apice inflato axis florifero conico, flore, bractea involucrale, bracteis, bracteolis et calycibus brevioribus et angustioribus, corolla calyce longiore loba dorsali antheram et stigma occultanti, tubo corollae multo breviore, labello erecto loba media breviore et angustiore, tubo staminali breviore, infructescentia minore vestigiis bractearum involucrarum persistentibus, fructibus paucis minoribus, pericarpio laeve non porcato recedit. ***Typus:*** Perak, Hulu Perak, Belum F.R., Sg. Beruar, *Khaw KSH 420* (*holotypus* KEP; *isotypus* KLU).

Figure 7

Rhizomes just below soil level; 3–4 cm diam.; scale-leaves overlapping, green. *Leafy shoots* to 4–5 m tall; 7–18 cm apart, forming clumps; sheaths conspicuously longitudinally ribbed with cross-bars covered by short, white hairs; when crushed with a strong, peppery scent; *ligule* 2–2.5 cm long, apex acute, margin and surface densely covered with short, brown hairs; *petiole* 2.5–4 cm long, surface reticulate. *Laminas* 13–14 pairs; (topmost) 68–73 x 7–9 cm, (middle) 87–93 x 16-21 cm, (basal) *c.* 55 x 13 cm; when young entirely green on both surfaces; upper surface prominently ribbed; lower surface and margin with soft, short hairs; base cuneate, unequal;

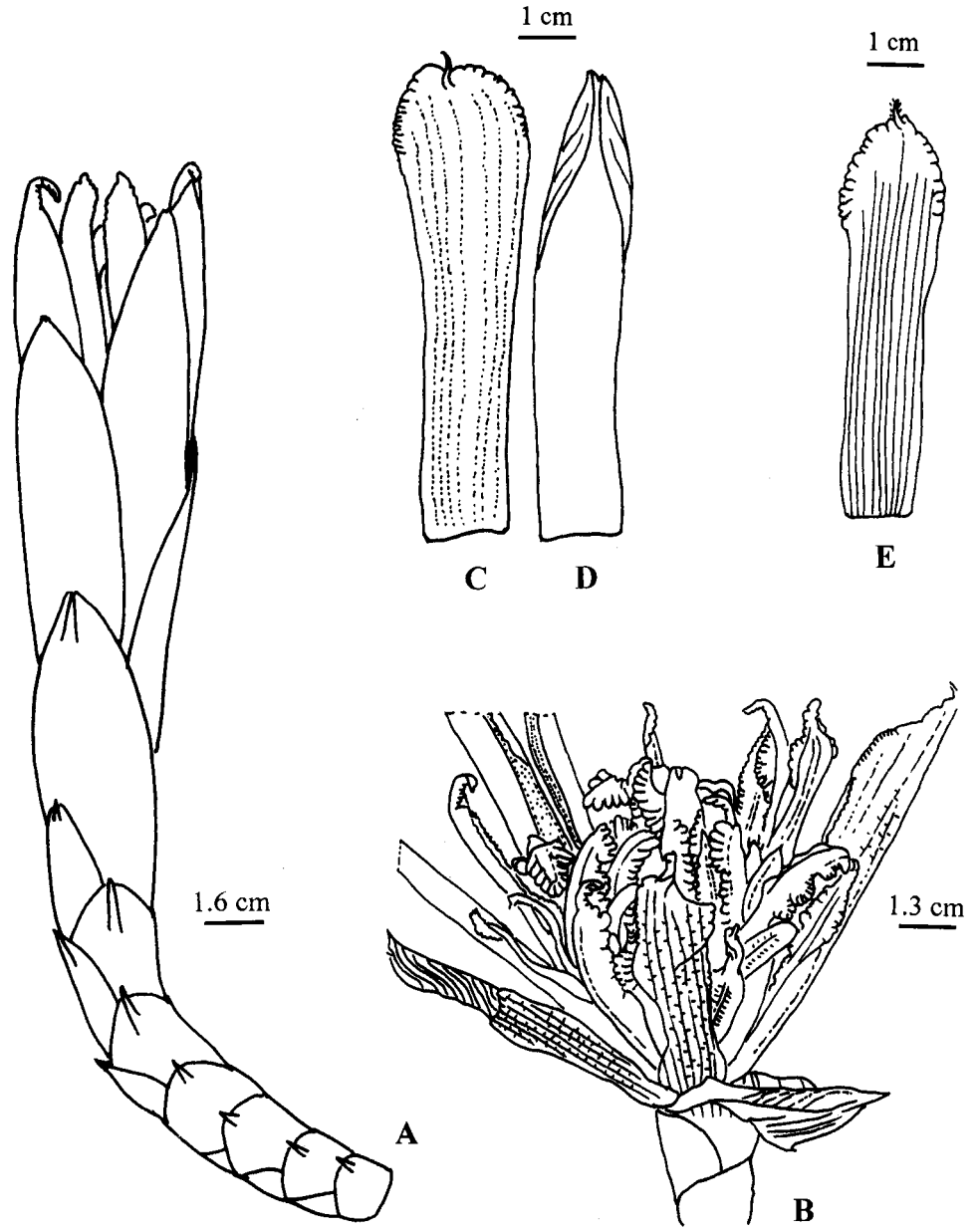
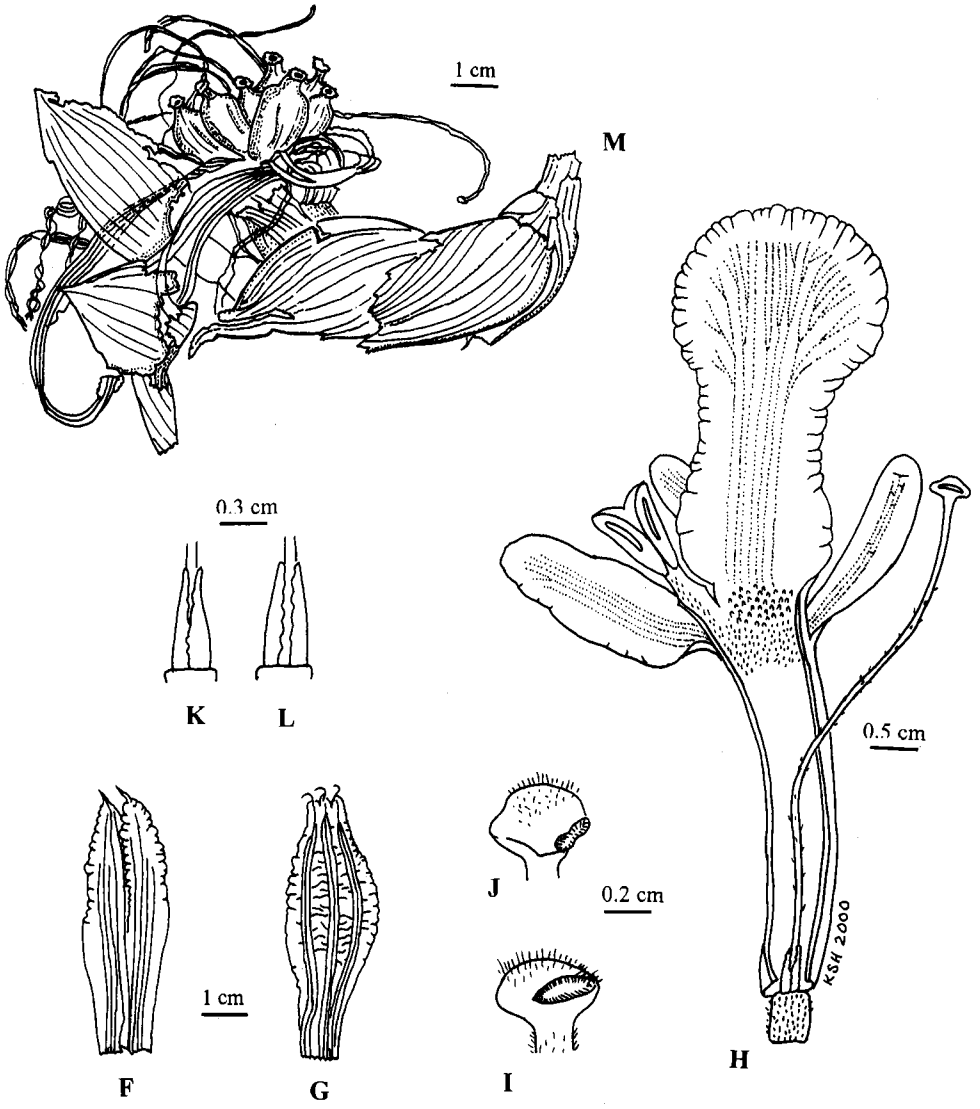


Figure 7. ***Etlingera pieeae*** S.H. Khaw, ***sp. nov.*** A, young inflorescence; B, inflorescence with sheaths and flower-head; C, sterile bract, abaxial view; D, sterile bract, adaxial view; E, floral bract, abaxial view; F, bracteole, flattened, abaxial view; G, calyx, flattened, abaxial view; H, flower dissected with style displaced; I, stigma, abaxial view; J, stigma, lateral view; K, epigynous glands, adaxial view; L, epigynous glands, abaxial view; M, infructescence with fruits surrounded by remnants of sheaths and bracts with skeletonized veins. (A-L from spirit material of *Khaw KSH 420*, M from dry material.)


1 cm
M
0.3 cm
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KSH 2000
H
J
0.2 cm
I
1 cm
F
G

apex shortly pointed, *c.* 1 cm long. *Peduncle* to *c.* 48 cm long, horizontal, then erect, aerial, close to base of leafy shoot; sheaths *c.* 12, shortest at base from 1.5–13 cm, apex rounded with a sharp, hard, subapical spine *c.* 0.1 cm, overlapping, green, striped deep pink, dull purple-red at apex. *Inflorescence* raised well above the ground. *Fertile apical part of inflorescence* with well developed sterile bracts, loosely imbricating at the bases only, (not forming any conspicuous sub-cylindric structure), in side view the inflorescence head proper visible between the bracts. *Receptacle of inflorescence c.* 1 cm long, apex inflated and conical; bearing 20–35 flowers; 7–12 flowers open simultaneously; flower (from base of ovary to apex of labellum) *c.* 9 cm long long. *Sterile bracts* 5–8; 9-12 x 1.5–3 cm; rigid, spreading slightly, oblanceolate, longitudinally inflexed but not recurved; apex rounded, retuse, crisped, with subapical hairy spine *c.* 0.2 cm long; outer surface with white hairs, densely appressed hairy at apex and base; surface pale green, apex and margin red and longitudinally striped reddish-pink. *Outer floral bracts* like inner sterile bracts; 8.5–9.5 x 1.5–2.5 cm; *inner floral bracts* smaller, *c.* 6 x 0.5–1 cm. *Bracteole* 5–6.5 x c. 1.5 cm (when flattened); 2-lobed, apex of each lobe rounded with *c.* 3 cm slit on opposite side; surface densely covered with tawny hairs; pink. *Calyx* 4.5–6 x *c.* 1.5 cm (when flattened); 3-lobed, each with a glabrous, subapical tooth *c.* 0.1 cm; tube with *c.* 2 cm slit on opposite side; surface densely covered with appressed white hairs. *Corolla tube c.* 4 cm long, inner surface densely covered with long hairs at entrance of tube, rest of tube glabrous; *lobes (petals)* 1–2 cm longer than calyx, *c.* 2 cm long, apices rounded, not hooded, margins crinkled, red; dorsal lobe hiding the anther and stigma, *c.* 1 cm wide, lateral lobes narrower, *c.* 0.5 cm. *Labellum* held erect, blade elongate, 3.5–4 cm long, *c.* 2 cm wide; blade and basal lobes entirely bright pink-red; margin of blade crisped and crinkled; apex broadly rounded, slightly retuse. *Staminal tube c.* 0.5 cm long above the base of the corolla-lobes; inner surface of tube densely covered with long hairs especially below the anther, rest of surface densely covered by warts (glands?). *Filament* short, *c.* 0.3 x 0.4 cm, adaxially hairy. *Anther c.* 1 x 0.3 cm, white, hairy on pollen sacs. *Epigynous glands* 0.5–0.6 x *c.* 0.2 cm; comprising 2 fleshy, compressed blade-like structures, not encircling base of style, each blade not further lobed, apex glabrous, shortly-pointed, (surface not warty). *Ovary c.* 0.5 x 0.4 cm, densely covered with appressed, white, short hairs; *style* white or pale pink, hairy; *stigma* pink, *c.* 0.4 cm across. *Infructescence* a small spherical head, *c.* 2.5 x 5 cm (when dry), not surmounted by withered flowers, surrounded by remnants of sterile bracts with skeletonized veins persistent at fruit maturity, *c.* 10 fruits per fruit head. *Fruit* obovoid; *c.* 1.5 x 1 cm at the top (when dry); buff coloured; densely covered with appressed, short hairs; apex with remnant of calyx base only, *c.* 0.5 cm long (when dry);

pericarp smooth, not ridged longitudinally; pericarp 0.1–0.2 cm thick. *Seeds* irregularly angular, truncate.

Distribution: Endemic to Peninsular Malaysia: Perak and Kedah (in Ulu Muda F.R., Baling, Waduk, sighted only, not collected).

Ecology: By banks of shaded as well as more open, unshaded, small streams in lowland forest at *c.* 300 m altitude.

Notes: *Etlingera pieeae* closely resembles *E. triorgyalis* in vegetative characters. Both have tall leafy-shoots with sheaths that emit a strong peppery scent when crushed. They are often found growing near each other. However, its inflorescence shows that *E. pieeae* is a distinct species. It has a combination of floral characters of both the *Phaeomeria* and *Achasma* groups of *Etlingera*. It resembles the *Phaeomeria* group in having a long peduncle with its flower-head held well above the ground, but has overlapping peduncle-sheaths and a long labellum like those of the *Achasma* group. Its flower-head is neither cup-shaped (typical of the *Phaeomeria* group) nor sub-cylindric (most of the *Achasma* inflorescences). Instead, its inflorescence with slightly spreading oblanceolate, sterile bracts, loosely imbricating at the bases only, resembles that of *E. pauciflora* of the *Achasma* group. This combination of features in *E. pieeae* from the two groups makes it an interesting species, lending support to the union of *Phaeomeria* and *Achasma* into a single genus, *Etlingera*.

Table 2 summarises the differences between *E. pieeae* and *E. triorgyalis*, its closest relative.

This species is named for Mr. Abdullah Piee, who first discovered this new species, in appreciation for his assistance and companionship in ginger field trips.

Specimens seen: PERAK: Hulu Perak, Temenggor F.R., Sg. Emban, *Khaw KSH 603* (KLU), *KSH 604* (KEP); Belum F.R., Sg. Beruar, *Khaw KSH 420* (KEP, KLU).

7. *Etlingera pauciflora* (Ridl.) R.M. Sm., Notes Roy. Bot. Gard. Edinb. 43 (1986) 248. Syn.: *Hornstedtia pauciflora* Ridl., in J. Str. Br. Roy. Asiat. Soc. 32 (1899) 144; Mat. Fl. Malay. Penins. (1907) 38; Fl. Malay Penins. 4 (1924) 270; *Achasma pauciflorum* (Ridl.) Holttum, Gard. Bull. Sing. 13 (1950) 187. Type: Selangor, Gua Batu, *Ridley 8174, s.v.* (K).

Figure 1E, 2I & J, 3H, 4 E–G

Rhizomes 6–13 cm below the ground; *c.* 0.6 cm diam.; scale leaves overlapping, white. *Leafy shoots* 2–4 m tall; close together or widely spaced,

Table 2. Characters that distinguish *Etlingera pieeae* from *E. triorgyalis.*

	E. pieeae	*E. triorgyalis*
Peduncle length (cm)	to *c.* 48	5–15
Inflorescence	raised well above the ground	subterranean except for apices of sterile bracts and flowers
flower-head	sterile bracts loosely imbricating at the bases only, not forming any conspicuous subcylinder	sterile bracts tightly imbricating, forming a narrow subcylinder,
	the flower head visible between the bracts in side view	the subcylinder hiding *c.* 2/3 of the flower-head in side view
number of flowers	20–35	40–50
flower length (cm)	*c.* 9	*c.* 13.5
sterile bracts		
form	rigid, spreading slightly, oblanceolate, longitudinally inflexed but not recurved	rigid, erect, oblong-obovate, recurved at apical part, concave
width (cm)	1.5–3	3–6
colour	pale green, apex and margin red, longitudinally striped red	white or pale green, deep pink towards apex
corolla lobes	1–2 cm longer than calyx	equal to calyx
	dorsal lobe hiding anther and stigma	dorsal lobe not hiding anther and stigma
tube length (cm)	*c.* 4	5.8–6.5
labellum length (cm)	3.5–4	*c.* 5
staminal tube length (cm)	*c.* 0.5	*c.* 1.2
Infructescence size (cm)	*c.* 2.5 x 5 (dry)	*c.* 6 x 10
persistence of sterile bracts at fruit maturity	the bracts partially decay, remnants of bracts with skeletonized veins surrounding infructescence	bracts completely decayed
number of fruits	*c.* 10	20–35
Fruit		
colour	buff	dark red or pink
size (cm)	*c.* 1.5 x 1 (dry)	*c.* 3 x 3 cm
pericarp	smooth, not ridged longitudinally	ridged longitudinally, each ridge with many irregular fine spine-like processes

9–80 cm apart; sheaths slightly longitudinally ribbed with cross-bars covered by tufts of short, white hairs (clearer in young sheaths), without distinct scent when crushed; *ligule* 1–2.5 cm; apex rounded, entire; margin with short, brown hairs; surface glabrous; lamina often sessile or with *petiole* 0.5–1 cm long in laminas with unequal bases, surface reticulate. *Laminas c.* 11 pairs; (topmost) *c.* 37 x 6.5 cm, (middle) 44–65 x 9–11 cm, (basal) *c.* 40 x 12.5 cm; upper surface prominently ribbed; entirely green on both surfaces when young; lower surface glabrous; margins crisped, red with brown hairs; base cuneate, sometimes unequal. *Peduncle* 5–10 cm long; horizontal, then erect, entirely subterranean at base of leafy shoot or some distance away; sheaths *c.* 8, shortest at base 0.5–5.5 cm, apex acute with stiff apical spine *c.* 0.1 cm, overlapping, white. *Inflorescence* entirely subterranean except for apices of sterile bracts and flowers. *Fertile apical part of inflorescence* with 1–3 well developed sterile bracts loosely imbricating at the bases only, not forming any conspicuous, sub-cylindric structure; in side view the inflorescence head proper visible between the bracts; the sterile bracts not persisting to fruit maturity. *Receptacle of inflorescence c.* 0.5 cm long; apex inflated and rounded, bearing 1–3 flowers; 1 or 2–3 flowers open simultaneously; flower (from base of ovary to apex of labellum) 11.5–13 cm long. *Sterile bracts* 1–3; 5–6 x 1–1.5 cm; rigid, spreading slightly outwards from a loosely imbricating base; lanceolate, concave, apex acute, with a stiff, sharp point; outer surface glabrous; white. *Floral bracts* like sterile bracts, *c.* 5 x 1 cm. *Bracteole* 4.5–5 x 1.5–2 cm (when flattened); unequally 2-lobed; apex of lobe rounded with *c.* 3 cm slit on opposite side; glabrous; red. *Calyx* 6.5–7 x 1.5 cm (when flattened); 3 lobed, each lobe with an apical tuft of long, brown hairs; tube with *c.* 2.5 cm slit on opposite side; glabrous, tawny hairs at apex only; pink, red at apex. *Corolla tube* 4.5–6 cm long; inner surface densely covered with long hairs at entrance into tube, rest of tube glabrous; *lobes (petals) c.* 1–2 cm longer than calyx, 3–4 cm long; apices rounded, not hooded, red; the dorsal lobe hiding the anther and stigma, *c.* 1.5 cm wide, lateral lobes narrower, *c.* 1 cm. *Labellum* held horizontal; blade elongate, *c.* 5 cm long; *c.* 1.5 cm wide; blade yellow with red margins, basal lobes yellow tinged red; margin of blade crisped and crinkled, apex rounded, entire or slightly retuse. *Staminal tube c.* 1.5 cm long above the base of the corolla lobes; inner surface of the base of the tube densely covered with long hairs, (not warty). *Filament* short, *c.* 0.5 x 0.6 cm wide, back glabrous. *Anther c.* 1 x 0.5 cm; red, hairy on pollen sacs. *Epigynous glands* 0.6–0.7 cm by 0.2–0.3 cm; comprising 2 fleshy, compressed, blade-like structures, not encircling base of style, each blade not further lobed, apex glabrous, shortly-pointed, surface not warty. *Ovary c.* 0.5 x 0.5 cm, with white, short hairs; *style* pale-pink, hairy; *stigma* white, 0.3 cm across. *Infructescence* spherical; small, *c.* 4 x 4 cm in diameter; not

surmounted by withered flowers; bracts completely disintegrated at fruit maturity; 1—3 fruits per head. *Fruits* spherical; *c.* 2–4 x 3–4 cm wide at the middle; densely covered with appressed white, short hairs; apex with scar of calyx only, hardly 0.1 cm long; pericarp smooth, not ridged longitudinally; pericarp *c.* 0.1 cm thick; white. *Seeds* irregularly angular, truncate, *c.* 0.6 x 0.4 cm wide at the top.

Distribution: Endemic to Peninsular Malaysia. Although there are few collections, where this species occurs, it is common. Weber (1995) mentions that it has been found in Selangor, Pahang, Terengganu and Johor. It has also been found in Perak (Khaw, 2000).

Notes: This species is easily recognized in being few-flowered, usually with only 1–3 flowers. In flower coloration, it is similar to *Etlingera punicea* in that the lip has a yellow centre but it is a distinct species as the leafy shoots, inflorescence (Fig. 1E, F), flowers (Fig. 2I, J, M, N) and infructescence (Fig. 4, E–G, H) of *E. pauciflora* and *E. punicea* are entirely different.

Specimens seen: JOHOR: Kota Tinggi, *Holttum s.n.* (SING); Sg. Segun, G. Panti, *Corner SFN 30890* (2 sheets) (SING). TERENGGANU: Ulu Kajang, Kemaman, *Corner SFN 30430* (SING).

8. *Etlingera subterranea* (Holttum) R.M. Sm. Notes Roy. Bot Gard. Edinb. 43 (1986) 250. Syn.: *Achasma subterraneum* Holttum, Gard. Bull. Sing. 13 (1950) 187. Type: Pahang, Cameron Highlands, 5000 ft., *Holttum, SFN 31212* (SING).

Distribution: This species is endemic to Peninsular Malaysia.

Notes: I have not been able to locate this species in the field. It has only been collected twice, on both occasions from Cameron Highlands, Pahang. According to Holttum (1950): "This is like *A. sphaerocephalum* in flowers, but like *A. pauciflorum* in inflorescence. In leaf-characters it is rather between *A. sphaerocephalum* and *A. macrocheilos*, having a petiole of moderate length. ... The fruits agree exactly with the fruits of *A. megalocheilos* as described in Java by Valeton (Ic. Bog. 2: t. 199), but are only 2 or 3 instead of 12 or more".

Other specimen seen: PAHANG: Cameron Highlands, 4,600 feet, *Henderson SFN 23562* (SING).

9. *Etlingera punicea* (Roxb.) R.M. Sm. Notes Roy. Bot. Gard. Edinb. 43 (1986) 250. Syn.: *Alpinia punicea* Roxb., Fl. Indica 1 (1820) 73; *Achasma macrocheilos* Griff., Notul. Plant. Asiat. 3 (1851) 429, Ic. Plant. Asiat. (1851) t. 357; Holttum, Gard. Bull. Sing. 13 (1950) 188; *Amomum macrocheilos* Baker, Fl. Brit. India 6 (1892) 235; *Hornstedtia macrocheilos* Ridl., in J. Str. Br. Roy. Asiat. Soc. 32 (1899) 147; Fl. Malay Penins. 4 (1924) 271; *Hornstedtia metriocheilos* (Griff.) Ridl., in J. Str. Br. Roy. Asiat. Soc. 32 (1899) 147; Fl. Malay Penins. 4 (1924) 271 (not of Griffith). Type: Malacca, *Griffith s.n., s.v.* (specimen lost?).

Figure 1F, 2M & N, 3I, 4H

Rhizomes to *c.* 12 cm below ground; slender, *c.* 1.5 cm diam.; overlapping scale-leaves, green tinged dull red or pink. *Leafy shoots* 2–5 m tall; close together or widely spaced, 11–40 cm apart; sheaths conspicuously ribbed with cross bars covered by tufts of short, white hairs (clearer in young sheaths), sometimes smooth, green or yellowish with purple blotches, crushed sheaths without distinct scent; *ligule* 0.5–1 cm, apex broadly rounded, entire, margin and surface densely covered by short, brown hairs; *petiole c.* 0.5 cm or subsessile, surface reticulate. *Laminas c.* 10 pairs; (topmost) *c.* 58 x 9 cm, (middle) 62–91 x 14–17 cm, (basal) 18–22 x 7 cm; upper surface smooth or with slightly raised lateral veins; entirely green (sometimes with brown bars on lower surface of young leaves); lower surface glabrous; base cuneate, sometimes with auricles. *Peduncle* 5–10 cm; horizontal, then erect, entirely subterranean at base of leafy-shoot or some distance away; sheaths *c.* 13, shortest at base 0.5–5 cm long, apex acute, with a stiff spine 0.4 cm long, overlapping, pale green. *Inflorescence* entirely subterranean except for apices of sterile bracts and flowers. *Fertile apical part of inflorescence* with well developed sterile bracts tightly imbricating forming a narrow sub-cylindric structure, 10–13 x *c.* 4 cm wide, in side view hiding *c.* 2/3 or more of the inflorescence head proper; sterile bracts persisting to fruit maturity. *Receptacle of inflorescence c.* 0.5 cm long; apex inflated and rounded; bearing *c.* 30 flowers; 7–10 flowers open simultaneously; flower (from base of ovary to apex of labellum) 10.5–12.5 cm long. *Sterile bracts c.* 5; 5.5–6 x 2–2.5 cm; rigid, erect, lanceolate, broadest at middle, strongly concave; apex acute, with a stiff, sharp point; outer surface sparsely covered with white hairs, more densely hairy at base; white, pink towards apex. *Outer floral bracts* resembling the sterile bracts; *c.* 6 x 2 cm; *inner floral bracts* smaller *c.* 5 x 1 cm. *Bracteole c.* 4 x 1.5 cm (when flattened); 2-lobed, apex of lobe rounded with 1.5 cm slit on opposite side; surface with light brown hairs; pink. *Calyx c.* 7 x 1.5 cm (when flattened); 3-lobed, each lobe with a hairy, subapical tooth *c.* 0.1 cm; tube with *c.* 3 cm slit on opposite side; glabrous, with tawny hairs only at apex.

Corolla-tube c. 6 cm; inner surface with hairs mostly at upper 1/3 of tube; *lobes (petals)* c. 1–2 cm longer than calyx, c. 3 cm long, apices rounded, not hooded, red; dorsal lobe hiding the anther and stigma, c. 0.8 cm wide, lateral lobes narrower, c. 0.5 cm. *Labellum* held horizontal, blade elongate, 5.5–6 cm long, c. 1.5 cm wide; blade and basal lobes yellow with a narrow scarlet margin broadening to the spatulate apex, scarlet margins of the haft infolded so that the 'margin' appears to be yellow; margin of blade crisped and crinkled; apex rounded, retuse or deeply bilobed. *Staminal tube* 0.8–1 cm long above the base of the corolla-lobes; inner surface of tube glabrous or sparsely covered with long hairs, (not warty). *Filament* short, c. 0.3 x 0.3 cm, adaxially glabrous. *Anther* c. 1 x 0.5 cm; red, hairy on pollen sacs. *Epigynous glands* c. 0.5 x 0.2–0.3 cm; comprising 2 fleshy compressed blade-like structures, not encircling base of style, each blade not further lobed, apex glabrous, shortly-pointed, surface not warty. *Ovary* c. 0.5 x 0.4 cm; covered with appressed, white, short hairs; *style* white, hairy; *stigma* pink, 0.3 cm across. *Infructescence* globular; large c. 6 x 9 cm in diameter; not surmounted by withered flowers; sterile bracts at base of fruit head persisting to fruit maturity; floral bracts persistent with fruits at their axils; 5—15 fruits per head. *Fruits* obovoid; 3–3.5 x 3–4.5 cm wide at the top; densely covered with appressed short hairs; apex with remnant of calyx base only, less than 0.5 cm long; pericarp ridged longitudinally, each ridge with many irregular, coarse, spine-like processes; pericarp c. 0.2 cm thick (excluding ridges), pinkish-red. *Seeds* irregularly angular, truncate; c. 0.4 x 0.3 cm wide at the top.

Distribution: A common species found in lowland forests throughout the Peninsula. It also occurs in Thailand, Borneo, Java and Sumatra (Smith, 1986).

Notes: The conspicuous character of this species is the colour of the lip, yellow in the middle, the rest scarlet. There is variation in the details of the lip, especially the tip of the mid-lobe.

Specimens seen: PERAK: Tanjong Malim, *Burkill & Haniff 13476* (SING). SELANGOR: Genting Bidai, *Ridley 7812* (SING); Genting Simpah, *Hume 9722* (SING); Klang, Teluk Reserve, *Burkill SFN 5997*, Bukit Rajah Forest, *Burkill 15512* (SING); Ulu Gombak, *Yong FRI 99256* (KEP). NEGRI SEMBILAN: G. Tampin, *Burkill 3179* (SING); Seremban, G. Telapak Buruk, *Saw FRI 40052* (KEP). JOHOR: B. Tinjau Laut, *Corner SFN 37061* (2 sheets) (SING); Sg. Pelepah, G. Panti, *Md. Nur 20012* (SING); Kuala Tebing Tinggi, *Ridley s.n.* (SING); Batu Pahat, *Ridley s.n.* (SING); Sg. Kayu Ara, Mawai-Jemaluang Rd., *Corner SFN 31476* (SING); G. Pulai, *Ridley s.n.* (SING); G. Panti, *Ridley s.n.* (SING); 12 Mile Mawai-Jemaluang Road, *Corner SFN 29993* (SING); Sg. Tebrau, *Ridley s.n.* (SING). TERENGGANU: Sg. Kemaman, Kampong Ayer Puteh, *Corner SFN 30717* (KEP, SING).

10. *Etlingera metriocheilos* (Griff.) R.M. Sm. Notes Roy. Bot Gard. Edinb. 43 (1986) 247. Syn.: *Achasma metriocheilos* Griff., Notul. Plant. Asiat. 3 (1851) 427, Ic. Plant Asiat. (1851) t. 356; *Amomum sphaerocephalum* Bak. in Hook. *f.*, Fl. Brit. India 6 (1892) 234; *Amomum metriocheilos* Bak. in Hook. *f.*, Fl. Brit. India 6 (1892) 234; *Hornstedtia albomarginata* Ridl., in J. Str. Br. Roy. Asiat. Soc. 32 (1899) 145; Fl. Malay Penins. 4 (1924) 269; *Hornstedtia sphaerocephala* (Baker) K. Schum., Pflanzenr. Zingib. (1904) 192; *Achasma sphaerocephalum* (Bak.) Holtt., Gard. Bull. Sing. 13 (1950) 189. Type: Malacca, *Griffith 5758, s.v.* (K).

Figure 1G, 2K & L 3J, 4I

Rhizomes just below ground or creeping at soil surface; stout, 2–4.5 cm diam.; scale leaves overlapping, conspicuously pink, bright red or dull purple-red. *Leafy shoots* 2–6 m tall; close together or widely spaced, 10–80 cm apart; sheaths dull red or green, conspicuously ribbed longitudinally with cross-bars covered with tufts of short, white hairs or with sheaths bright red, surface slightly reticulate; crushed sheaths without distinct scent; *ligule c.* 1 cm long, apex broadly rounded, entire, margin and surface with short, brown hairs (densely, silky-hairy in var. *major*); *petiole* 0.5–1.5 cm (*c.* 3.5 cm in var. *petiolata*), surface reticulate. *Laminas c.* 15 pairs; (topmost) 22–55 x 3–4.5 cm, (middle) 57–80 x 9.5–14.5 cm, (basal) 9–25 x 5.5–8.5 cm; smooth (prominently ribbed in var. *petiolata*); entirely dark green above, when young dark purple-red beneath (or with brown-red bars on upper surface in var. *rubrostriata*); lower surface glabrous (with rather rough, short, brown hairs in var. *major*); base variable on the same leafy shoot, rounded or cuneate. *Peduncle* 4–10 cm; horizontal, then erect, entirely subterranean at base of leafy shoot or more usually some distance away; sheaths *c.* 7, shortest at base 1–4 cm long, apex acute with subapical spine to 0.2 cm, overlapping, red. *Inflorescence* entirely subterranean except for apices of sterile bracts and flowers. *Fertile apical part of inflorescence* with well developed sterile bracts tightly imbricating forming a narrow sub-cylindric structure 4–6 x *c.* 5 cm, hiding *c.* 1/3 of the inflorescence head proper in side view; sterile bracts persisting to fruit maturity. *Receptacle of inflorescence c.* 2 cm long; apex inflated and conical; bearing 25–60 flowers; 5–6 flowers open simultaneously; flower (from base of ovary to apex of labellum) 8–10.5 cm long. *Sterile bracts c.* 8; 3–4.5 x 2–3 cm; rigid, erect, oblong-elliptic, broadest below middle, strongly concave; apex acute, with a stiff spine 0.2 cm long; outer surface densely covered with appressed, brown hairs, hairs golden brown at base of bract; entirely red, or red at base and deep purple-red at apex. *Outer floral bracts* resembling the sterile bracts, *c.* 4.5 x 1.5 cm; *inner floral bracts* smaller, *c.* 4 x 1 cm. *Bracteole* 2.5–3 x *c.* 1.5 cm (when flattened); unequally 2-lobed, apex of lobe acute with

c. 1 cm slit on opposite side; surface with brown hairs, red. *Calyx* 5–6.5 x 1.5 cm (when flattened); 3-lobed, each lobe with a glabrous, subapical tooth *c.* 0.2 cm long; tube with 2.5–3 cm slit on opposite side; glabrous, only the apex with tawny hairs; red. *Corolla tube* 2.5–3.5 cm long; inner surface of tube at the entrance sparsely hairy, rest of tube glabrous; *lobes (petals)* variable: equal to, shorter or longer than calyx, 2–2.5 cm long, apices rounded, not hooded, red; dorsal lobe not hiding the anther and stigma, *c.* 0.5 cm wide, lateral lobes narrower, *c.* 0.4 cm. *Labellum* held horizontal, blade elongate, 3.5–5 cm long, *c.* 1.5–1.8 cm wide; blade and basal lobes crimson, margins of lobes white; margin of blade plain or slightly crisped; apex retuse or deeply bilobed. *Staminal tube* 1.5–2 cm long above the base of the corolla-lobes, inner surface of tube glabrous or sparsely covered with long hairs, (not warty). *Filament* short, *c.* 0.6 x 0.3 cm wide, adaxially glabrous. *Anther c.* 1 x 0.5 cm; crimson, hairy on pollen sacs. *Epigynous glands* 0.3–0.4 x 0.3 cm; comprising 2 rounded mounds, surrounding base of style, each mound minutely lobed, apices hairy, surface not warty. *Ovary c.* 0.5 x 0.4 cm; densely covered with appressed, white, short hairs; *style* pink, hairy; *stigma* dark purple, almost black, 0.4 cm across. *Infructescence* globular; large, *c.* 7 x 9 cm diam.; not surmounted by withered flowers; sterile bracts at base of fruit head and floral bracts persisting to fruit maturity; 25—45 fruits per head. *Fruits* obovoid; 3–4 x *c.* 2.5 cm wide at the top; densely covered with appressed, short hairs; apex with remnant of the base of the calyx only, less than 0.5 cm long; pericarp ridged longitudinally, each ridge with a shoulder-like apical mound, covered in prominent warts; pericarp *c.* 0.2 cm thick (excluding ridges); dark purple. *Seeds* irregularly angular, truncate, *c.* 0.4 x 0.3 cm wide at the top.

Distribution: Found in many parts of the Peninsula, in lowland forests and at moderate elevations on the mountains. It is also found in Borneo (Smith, 1986).

Notes: This species is variable and Holttum (1950) described four varieties, ranging from the few-flowered, small-sized var. *rubrostriata*, to the robust var. *petiolata*. The distinguishing characters of this species are: (1) the striking red or purple lower surface of young leaves and leaf-sheaths except for var. *rubrostriata,* which has a red-barred upper surface and is green beneath, (2) a sub-globose or sub-cylindric inflorescence, (3) the deep red or crimson involucral bracts that are distinctly shorter than the calyces, and (4) the deep crimson lip with white (never yellow) margins.

While noting it was possible that *Achasma sphaerocephalum* (Baker) Holttum was identical with *A. metriocheilos* Griff., Holttum (1950 p. 191) nevertheless thought it better to exclude Griffith's name. The reason he

cited was that the details given by Griffith were inadequate for him to decide with certainty whether the two species were conspecific.

Smith (1986 p. 247) combined *Achasma metriocheilos* Griff. with *Amomum sphaerocephalum* Bak. as *Etlingera metriocheilos* (Griff.) R.M. Sm.. However, she included in the combination, *Hornstedtia metriocheilos* (Griff.) Ridl., the species which Ridley (1899 p. 147) described as having a crimson lip with a yellow centre. However, this is a different species and, as Holttum had noted, it is in fact *Etlingera punicea.*

Types seen: Syntypes of *Hornstedtia albomarginata* Ridl., J. Str. Br. Roy. Asiat. Soc. 32 (1899) 145. — Penang, road to Penara Bukit, *Ridley s.n.* (SING); Selangor, Petaling, *Ridley s.n.* (SING).
Achasma sphaerocephalum (Bak.) var. *petiolatum* Holttum, in Gard. Bull. Sing. 13 (1950) 191. — Johor, Ulu Segun, G. Panti, *Corner SFN 30745* (SING).

var. *rubrostriatum* Holttum, in Gard. Bull. Sing. 13 (1950) 190. — Selangor, K. Kubu side of the Gap, *Corner SFN 30776* (SING).

var. *grandiflorum* Holttum, in Gard. Bull. Sing. 13 (1950) 191. — Terengganu, Kemaman, Bukit Kajang, *Corner SFN 30234* (SING).

var. *majus* Holttum, in Gard. Bull. Sing. 13 (1950) 190. — Terengganu, Kemaman, Bukit Kajang, *Corner SFN 30205* (SING).

Other specimens seen: PERAK: Maxwell's Hill, *Coll.? s.n.* (SING); Tea Gardens, *Curtis s.n.* (SING); Kuala Kangsar, Kg. Hitam Jong, Sg. Plus F.R., *Hashim Pendek KLU 119* (KEP). SELANGOR: Petaling, *Ridley s.n.* (SING); UPM campus, *Anthonysamy SA 199* (KEP).

11. *Etlingera triorgyalis* (Baker) R.M. Sm. Notes Roy. Bot. Gard. Edinb. 43 (1986) 250. *Amomum triorgyale* Baker, in Hook. *f.*, Fl. Brit. India 6 (1892) 237; *Hornstedtia triorgyale* (Baker) Ridl., in J. Str. Br. Roy. Asiat. Soc. 32 (1899) 144; Mat. Fl. Malay. Penins. 1 (1907) 38; Fl. Malay Penins. 4 (1924) 269; *Achasma triorgyale* (Baker) Holttum, Gard. Bull. Sing. 13 (1950) 186. Type: Perak, Larut, *King's Collector 2105, s.v.* (K).

Figure 1D, 2G & H, 3G, 4D

Rhizomes just below ground; stout, 2.5–4.5 cm diam.; scale leaves overlapping, green tinged dull red or pink. *Leafy shoots* 5–6 m tall; close together or widely spaced to *c.* 1 m apart; sheaths conspicuously ribbed longitudinally with cross-bars covered by tufts of short, white hairs (especially in young sheaths), when crushed with a strong scent suggestive

of pepper; *ligule* 1–2.5 cm; apex rounded, entire; margin and surface with short, brown hairs; *petiole* 1.5–3 cm, surface reticulate. *Laminas c.* 15 pairs; (topmost) *c.* 43 x 3.5 cm, (middle) 80–100 x 6–21.5 cm, (basal) *c.* 25 x 7 cm; smooth or with slightly raised lateral veins, when young entirely green on both surfaces; lower surface softly hairy with short hairs; margin broadly crisped, red with brown hairs; base broadly cuneate, unequal, slightly decurrent. *Peduncle* short, 5–15 cm; horizontal, then erect, entirely subterranean at base of leafy shoot; sheaths *c.* 14, shortest at base 4–7.5 cm long, apex acute with subapical spine 0.2–1 cm long, white or pale green tinged deep pink, overlapping. *Inflorescence* subterranean except for distal parts of sterile bracts and flowers. *Fertile apical part of inflorescence* with well developed sterile bracts tightly imbricating, forming a narrow sub-cylindric structure 10–14 x *c.* 6 cm wide, in side view hiding *c.* 2/3 or more of the inflorescence-head proper, the sterile bracts not persisting to fruit maturity. *Receptacle of inflorescence c.* 1 cm, apex inflated and rounded; bearing 40–50 flowers; 8–17 flowers open simultaneously; flower (from base of ovary to apex of labellum) *c.* 13.5 cm long. *Sterile bracts c.* 7; 9–11 x 3–6 cm; rigid, erect, oblong-obovate, recurved at apex, concave, apex broadly rounded, retuse, with subapical spine *c.* 0.1 cm; outer surface with white hairs, hairs densely appressed at base; white or pale green, deep pink towards apex. *Outer floral bracts* resembling the sterile bracts, *c.* 10.5 x 2.5 cm; *inner floral bracts* smaller, *c.* 8.5 x 1 cm. *Bracteole c.* 8 x 2 cm (when flattened); 2-lobed, apex of lobe rounded with *c.* 2 cm slit on opposite side; surface with light-brown hairs; white with red apex. *Calyx* 7.5–9 x *c.* 2 cm (when flattened); 3-lobed, each lobe with a hairy, subapical tooth *c.* 0.1 cm long; tube with *c.* 4.5 cm slit on opposite side; glabrous, with tawny-hairs at apex only; white, pink-red at apex. *Corolla tube* 5.8–6.5 cm long, inner surface densely covered with long hairs at entrance of tube, rest of tube glabrous; *lobes (petals)* equal to calyx, *c.* 2.8 cm long, apices rounded, not hooded, red; dorsal lobe not hiding the anther and stigma, *c.* 1 cm wide, lateral lobes narrower, *c.* 0.7 cm. *Labellum* held horizontal, blade elongate, *c.* 5 cm long, *c.* 2.5 cm wide; blade and basal lobes entirely bright pink-red; margin of blade crisped and crinkled, apex broadly rounded and retuse. *Staminal tube c.* 1.2 cm long above the base of the corolla lobes; inner surface of tube densely covered with long hairs below anther only, rest of surface densely covered by warts. *Filament* short, 0.4 x 0.3 cm, adaxially hairy. *Anther c.*1 x 0.5 cm, red. *Epigynous glands c.*1 x 0.2–0.3 cm; comprising 2 fleshy compressed blade-like structures, not encircling base of style, each blade not further lobed, apex glabrous, shortly-pointed, surface not warty. *Ovary c.* 1 x 0.5 cm, densely covered with appressed, white short hairs; *style* pale pink, hairy; *stigma* pale pink, *c.* 0.5 cm across. *Infructescence* globular, large, *c.* 6 x 10 cm diam.; not surmounted by withered flowers;

bracts completely disintegrated at fruit maturity; 20—35 fruits per head. *Fruits* obovoid; *c.* 3 x 2.5–3 cm wide at the top; densely covered with appressed, short hairs; apex with remnant of calyx base only, less than c. 0.5 cm long; pericarp ridged longitudinally, each ridge with many irregular, fine spine-like processes; pericarp *c.* 0.2 cm thick (excluding ridges), dark red or pink. *Seeds* irregularly angular, truncate *c.* 0.4 x 0.3 cm wide at the top.

Distribution: In Peninsular Malaysia, recorded from Perak, Selangor and Pahang. It also occurs in Borneo and Sumatra (Smith, 1986).

Notes: The very broad bracts, recurved at the deep rose apices, together with the cherry red or deep rose lips are striking characters of this species.

Specimens seen: PERAK: Ipoh, foot of limestone rocks, Curtis *SFN 3317* (SING). SELANGOR: Genting Peras, *Ridley 7806* (SING). PAHANG: Ulu Sg. Sat, *Mohd. Shah & Mohd. Noor MS 1880* (KEP, SING); Temerloh, Sg. Nering, *Henderson 10583* (SING).

12. *Etlingera littoralis* (König) Giseke. Syn.: *Hornstedtia megalochilus* Ridl., in J. Str. Br. Roy. Asiat. Soc. 32 (1899) 146; Mat. Fl. Malay. Penins. 1 (1907) 38; Fl. Malay Penins. 4 (1924) 270; *Amomum megalocheilos* Baker, Fl. Brit. India 6 (1892) 236; *Achasma megalocheilos* Griff., Notul. Plant. Asiat. 3 (1851) 426, Ic. Plant. Asiat. (1851) t. 355; Valeton., Ic. Bog. 2 (1903) t. 188, 199.

Figure 1H, 2O & P, 3K

Rhizomes at surface or below ground to *c.* 10 cm deep; thick, 3–3.5 cm diam.; scale-leaves overlapping, green tinged dull red. *Leafy shoots* 3–6 m tall; close together or widely spaced, 12–48 cm apart; sheaths conspicuously ribbed longitudinally, with cross-bars covered by tufts of short, white hairs (clearer in young sheaths); crushed sheaths without distinct scent; *ligule* 1.5–2 cm long; apex broadly rounded, entire; margin with short brown hairs, surface with purple blotches, glabrous; *petiole* 1.5–4.5 cm; surface reticulate. *Laminas* *c.* 13 pairs; (topmost) *c.* 69 x 8 cm, (middle) *c.* 101 x 18 cm, (basal) *c.* 27 x 7 cm; smooth; entirely green, in young leaves sometimes flushed pink beneath; mostly glabrous, sometimes with short hairs; base variable on the same leafy shoot, cuneate, rounded or truncate, always unequal. *Peduncle* 4–10 cm; horizontal, then erect, entirely subterranean, at base of leafy shoot or some distance away; sheaths *c.* 11, shortest at base from 1.5–6 cm, apex acute with a stiff subapical spine 0.1 cm, overlapping, pale green or white tinged pink. *Inflorescence* subterranean except for apices of sterile bracts and flowers. *Fertile apical part of inflorescence* with

well developed sterile bracts tightly imbricating forming a narrow sub-cylindric structure *c.* 12 x 5 cm, in side view hiding *c.* 2/3 or more of the inflorescence-head proper. *Receptacle of inflorescence c.* 0.5 cm; apex inflated and rounded; bearing 30–35 flowers; 5–9 flowers open simultaneously; flower (from base of ovary to apex of labellum) 13–16 cm long. *Sterile bracts* 5 or 6; 6–8.5 x 2–5 cm; rigid, erect, oblong-obovate, broadest at middle, concave; apex acute, with a stiff spine 0.1 cm long; outer surface glabrous, densely covered with appressed, white hairs at base only; white, pink towards apex. *Outer floral bracts* resembling the sterile bracts; *c.* 8.5 x 1.5–2.5 cm; *inner floral bracts* smaller, *c.* 8 x 0.5 cm. *Bracteole* 7–7.5 x *c.* 1.5 cm wide (when flattened); 2-lobed, apex of lobe acute with 3 cm slit on opposite side; surface with brown hairs; pale pink. *Calyx* 7–9 x *c.* 1.5 cm (when flattened); 3-lobed; subapical tooth inconspicuous; tube with *c.* 3 cm slit on opposite side; glabrous, with tawny hairs at apex only; pink. *Corolla tube* 6–6.8 cm long, inner surface densely covered with long hairs at entrance oftube, rest of tube sparsely hairy; *lobes (petals)* equal to calyx, *c.* 2.5 cm long, apices rounded, not hooded, pink; dorsal lobe not hiding the anther and stigma, *c.* 1 cm wide, lateral lobes narrower, *c.* 0.5 cm. *Labellum* held horizontal, blade elongate, *c.* 7 cm long, *c.* 2 cm wide; blade and basal lobes entirely red or with a yellow margin sometimes not reaching the broad apex; margin of blade plain or crisped and crinkled; apex rounded, entire or slightly retuse. *Staminal tube c.* 1.5 cm long above the base of the corolla-lobes; inner surface of tube densely covered with long hairs, (not warty). *Filament* short, *c.* 0.5 x 0.4 cm wide, adaxially hairy. *Anther c.* 1 x 0.5 cm; red, hairy on pollen sacs. *Epigynous glands c.* 1 x 0.2–0.3 cm; comprising 2 fleshy, compressed, blade-like structures, not encircling base of style, each blade not further lobed, apex glabrous, shortly pointed, surface not warty. *Ovary* 0.5–0.6 x 0.5 cm; densely covered with appressed, yellow, short hairs; *style* pink, hairy; *stigma* red, 0.3 cm across. *Fruit* not known.

Distribution: Common in lowland forests throughout the Peninsula. It is also found in China, Thailand, Borneo, Java and Sumatra (Smith, 1986).

Notes: There is variation in lip colour in this species. Most commonly encountered are plants with scarlet lips with a yellow margin. However, plants growing nearby may have scarlet lips edged orange-red or a third type with much narrower lips are scarlet with a thin yellow margin.

The description of the infructescence by Holttum (1950) was based on fruits described from Java by Valeton. I have attempted in the field to find the infructescence of this common species but without success. The inflorescences in a large patch growing in the Temenggor F.R., Perak,

were tagged and the site revisited two months later to look for the fruits but none was found. The fact that it has never been found in fruit in Peninsular Malaysia warrants further investigation.

Specimens seen: PERLIS: Wang Kelian, *Wan Fadhilah HI 919* (KLU); Mata Ayer F.R., *Saw, Kamarudin, Jamaludin & Baya FRI s.n.* (KEP). PERAK: Tambun limestone cliff, *Burkill SFN 6294* (SING); Upper Perak, *Wray 3444* (SING); SELANGOR: Gua Batu, *Ridley s.n.* (SING); Kuala Lumpur, *Ridley s.n.* (SING). MALACCA: Bukit Sadanen, *Ridley s.n.* (SING). JOHOR: Castleroad, *Ridley s.n.* (SING); Sg. Segun, G. Panti, *Corner SFN 30891, 30892* (SING); Batu Pahat, *Ridley s.n.* (SING); Kota Tinggi, *Ridley s.n.* (SING). KELANTAN: Sg. Lebir, *Ben. Stone & Mahmud Sidek 12507* (KEP). PAHANG: Jerantut, *Corner SFN 30768* (SING); Temerloh, Titi Bungor, *Henderson 10674* (SING); Telom, *Ridley 13832* (SING); Tanjong Gajah, *Ridley s.n.* (SING); Sg. Pertang, Bentong, *Burkill & Haniff SFN 16515* (SING); Pekan, *Ridley 1632* (SING); Tahan Woods, *Ridley s.n.* (SING). TERENGGANU: Kemaman, Sg. Nipa, *Corner SFN 30581* (SING), Bukit Kajang, *Corner SFN 30378* (SING).

Acknowledgements

I thank Dr Saw Leng Guan, (KEP) for his encouragement, advice and providing photographs of the type and other specimens of *Phaeomeria venusta* from Kew and to the Curators of KEP, KLU and SING for permission to use their herbaria. I thank Dr J. Dransfield (Royal Botanic Gardens, Kew) for the Latin diagnosis. I also acknowledge with thanks Dr Saw Leng Guan, Dr Ruth Kiew and unnamed reviewers for advice on this paper. Thanks are due to the Malaysian Nature Society for help during the Malaysian Heritage and Scientific Expedition: Belum phase 1 (1993/1994) and phase 2 (1998). Advice from Dr E. Soepadmo (FRIM) during the Belum Expeditions is also gratefully acknowledged. Help and companionship in the field from Ms Rosema Abdullah and Mr Abdullah Piee are very much appreciated.

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Postscript: While the account above was in press, the note by Latiff (2001) appeared discussing the question of priority of *E. terengannuensis* C.K. Lim and *E. corneri* J. Mood & H. Ibrahim. As noted above, not all the specimens cited by Mood & Ibrahim (2000) belong to a single taxon and Lim confirms that *Corner SFN 32778* and "the Curtis specimen of 1890" belong to *E. fulgens* based on the purple undersides of their leaves. However, as Latiff points out, this does not affect the validity of the name *E. corneri*, which is based on the type so the fact that the specimens cited included more than one taxon is not relevant to the problem of the priority of names.

Detailed examination of the species in question based on living material has allowed accurate description of the species (see main text) based only on specimens of *E. corneri.*

Reference: Latiff, A. 2001. Notice of priority of *E. terengganuensis* C.K. Lim. *Folia malaysiana.* **2**(2): 75—68.