

A REVISION OF THE ORCHID GENERA *ANIA* LINDLEY, *HANCOCKIA* ROLFE, *MISCHOBULBUM* SCHLTR. AND *TAINIA* BLUME

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SUMMARY

This study presents a taxonomic revision of the orchid genera *Ania*, *Hancockia*, *Mischobulbum* and *Tainia*. Keys to the genera and species are given, together with a description of each species. All species are also represented by line drawings. In toto, 31 species and 2 subspecies are recognised. Four new species are described and 1 new combination is made. Many names are reduced to synonymy. A short discussion is given of the taxonomic history of each genus.

INTRODUCTION

The four genera treated in this study, *Ania* (including *Ascotainia*), *Hancockia*, *Mischobulbum* and *Tainia*, have been assigned to different higher-level taxa in the classifications proposed for Orchidaceae thus far. Lindley (1831) placed both *Ania* and *Tainia* in the tribe Epidendreae. Pfitzer, in Engler & Prantl (1889), assigned *Tainia* (including *Ania*), to the subtribe Phajinae of the subfamily Monandreae. The genera *Nephelaphyllum*, *Collabium*, *Chrysoglossum* and *Diglyphosa*, which are considered to be closely related to the genera treated here by many later authors, he placed in the subtribe Collabiinae, characterised by alternating one-leaved sterile shoots and leafless fertile ones with a terminal inflorescence. J.J. Smith (1912) transferred *Tainia*, in which he included *Mischobulbum* and *Ascotainia*, to the Collabiinae. Schlechter (1914) agreed with J.J. Smith on the position of *Tainia*, but he maintained *Mischobulbum* as a separate genus and added Rolfe's new genus *Hancockia*. He retained *Ascotainia* in the subtribe Phajinae. Senghas (1984) maintained Schlechter's classification, although he used the name Bletiinae rather than Phajinae for reasons of nomenclatural priority. As regards the Collabiinae, he criticized (l.c.: 839) the use of the term 'terminal inflorescence', which he claimed to be incorrect morphologically and ontogenetically, although he gave no reasons for this. Holttum (1964) grouped together the four genera *Nephelaphyllum*, *Diglyphosa*, *Chrysoglossum* and *Tainia* (including the genera *Mischobulbum* and *Ania*) under the name '*Nephelaphyllum* tribe'. Dressler (1981), finally, placed the genera *Tainia*, *Mischobulbum*, *Hancockia* and *Nephelaphyllum* in the subtribe Bletiinae of the tribe Arethuseae.

I tend to agree with Schlechter (1914) that the genera *Tainia*, *Mischobulbum* and *Hancockia* belong to the Collabiinae, while *Ania* should be placed in the Phajinae in this classification. According to Pfitzer (1889), the Collabiinae are characterised by a sympodial

growth habit with terminal inflorescences (series *Acranthae*), whereas the *Phajinae* have lateral inflorescences (series *Pleuranthae*). However, *T. paucifolia*, which in all other respects is a true *Tainia*, has lateral inflorescences, thus complicating matters. In Dressler's classification especially *Mischobulbum* and *Tainia* seem to be somewhat out of place in *Bletiinae*, which he characterises as having "corms or pseudobulbs of several internodes, ..., lip sometimes saccate or with a prominent spur ..." However, when using his key to the tribes and subtribes I either end up in *Bletiinae* or run aground.

It must be understood that the generic delimitation used in this work is probably artificial. A cladistic analysis is required to achieve a more natural classification; it is my intention to prepare such an analysis in the near future.

MATERIALS AND METHODS

During the preparation of this paper herbarium specimens only were available. All measurements are thus from dried specimens. Flowers were boiled in water and their parts spread out on a flat surface as much as possible before determining outlines or taking measurements. This point should be kept in mind when using the keys and in comparing fresh material with the descriptions given here, especially for measurements of those parts of the plant that shrink appreciably during drying, such as the pseudobulbs. A short account will be given here of the character states used in this paper to distinguish the species.

Shoot – A shoot is defined as the new growth of the plant. It arises laterally from the previous shoot and terminates in either a leaf (sterile shoot) or an inflorescence (fertile shoot). The shoot is divided by nodes into a number of internodes. The nodes usually carry a bract, a membranaceous scale.

Pseudobulb – In this work, the terminal internode of a shoot is called the pseudobulb. It may be thicker than the previous internodes or not. In *Ania*, several internodes can be swollen (the next to last ones are then usually compressed longitudinally). This whole swollen part is then called the pseudobulb. The following shapes are encountered in the genera treated here: cylindrical (the same width along the entire length), cylindrical and swollen towards the base (slightly broader near the base than in the distal part), conical (broad at the base, tapering towards the tip), ovoid (broadest in the lower part of the pseudobulb), ellipsoid (broadest \pm half-way the pseudobulb), and gourd-shaped.

Leaf – The leaves are either petioled or not. In *Ania* an articulation (thickening) is usually present in the upper part of the petiole, along which the leaf is shed. In the other genera, the entire petiole breaks away with the leaf. The shape of the leaf blade can be cordate (heart-shaped, in *Mischobulbum*), ovate (broadest in the lower part), elliptic (broadest \pm half-way) or obovate (broadest in the upper part). I have refrained from using terms such as lanceolate etc. to describe the relative width of the leaf blade; instead an index is given (length/width). The tip can be acute (margins meeting in a point) or acuminate (drawn out into a point). The margins can be straight, undulate (with a wavy appearance) or crenulate (wavy with the waves folding back on themselves). Rarely the margins are thickened. Except in *Mischobulbum*, the base of the leaf blade is decurrent along the petiole. The leaf blade is usually thin, rarely somewhat fleshy. The veins are usually somewhat prominent abaxially, a number of them distinctly so.

Inflorescence – The inflorescence can be either terminal or lateral; in the former case the next sterile shoot arises from the pseudobulb of the fertile shoot, in the latter it arises from

the previous sterile pseudobulb (*Ania* and *T. paucifolia*). It is divided into two parts: the peduncle, from the base up to the first floral bract, and the rhachis, from the first floral bract upwards. The peduncle consists of several internodes, with each node carrying a bract in the form of a tubular sheath, the peduncle scales.

Floral bracts – The floral bracts can be triangular (broadest at the base) or (rarely) ovate; the tip is acute to acuminate. Their position relative to the rhachis can be patent (angle between bract and rhachis $< 90^\circ$), spreading (angle c. 90°) or reflexed (angle $> 90^\circ$). In *Hancockia* the floral bracts are morphologically indistinguishable from the peduncle scales.

Flowers – The flowers are always resupinate in the genera treated here, i.e. during flowering the pedicel twists over an angle of 180° , so that the lip is turned downward in the open flower.

Tepals – The shape of sepals and petals can be triangular, ovate, elliptic or obovate. The tip of the tepals can be obtuse, rounded, acute, acuminate or caudate (tip drawn out into a long tail). In *Mischobulbum*, the lateral sepals are triangular and decurrent along the column foot towards the lip. The lateral sepals and the petals can be obliquely elliptic etc. (base cut off obliquely with respect to the long axis); furthermore, they can be straight or falcate (sickle-shaped). In *Tainia* and *Ania* the lateral sepals are slightly and narrowly decurrent along the column foot, the decurrent part curved downward and around the column foot. The mid-vein of the tepals can be thickened abaxially or not. The length of the tepals is measured when these are flattened, in a straight line from the point where the median vein enters the tepal up to the tip, also in falcate tepals. The width is always measured over the broadest part.

Lip – The lip can be spurred, saccate or without spur. The shape in outline can be the same as described above for the leaf blade and the bracts. In addition, the lip can be pandurate (violin-shaped, with the greatest width above the middle), obpandurate (the same, but with the greatest width below the middle) or rhomboid (diamond-shaped). The shape and dimensions are always determined on flattened specimens. The tip of the lip can be retuse (tip sunken) or have one of the shapes mentioned earlier. The margins can be straight or undulating. In *Mischobulbum* an important character for distinguishing several species is the presence of a sinus in the margin. This is an abrupt narrowing of the lip some way below the tip, which may result in a slight dent at the base of the narrower part of the lip, called a notch. The other extreme in this morphocline is reached when the notch becomes deep enough to divide the lip into two lateral lobes and a median lobe. The shapes are as above; in addition, for the median lobe, orbicular and transversely elliptic (wider than long). The margins and surfaces of the lip can be glabrous or (minutely) papillose. On the adaxial surface of the lip keels are normally present, which usually lie directly above the main veins, or are slightly offset from them. They can be low thickenings of the veins, ridge-like or plate-like, thickened or not, and can be straight, slightly or distinctly undulating. Their crests can be entire or denticulate, glabrous or papillose, and can be single, thickened or not, or doubled. In *T. maingayi* the keels end in lacinate flaps, and a dense mass of lacinate flaps covers a transverse band between the lateral lobes. The margins of the lateral and median lobes are also lacinate in this species.

Column – The column is semiterete (a half cylinder) in all species, and alate (with lateral wings). Its length is measured from the insertion of the median sepal to the tip, excluding the anther cap. Stelidia are absent or inconspicuous. The shape of the top part (the part above the rostellum) can be truncate, semiorbicular or triangular, with an entire, denticulate, or

erose margin. A column foot may be present. The wings are always seam-like and extend downwards at least to the base of the column, but usually continue along the margins of the column foot.

Anther – The anther can have no, one or two crests abaxially. The thecae are not divided, or distinctly or indistinctly 2- to 4-celled.

Pollinia – In most species treated here there are 8 pollinia, in two series of a larger, distal pair and a smaller proximal pair to each theca. In *T. maingayi* and *T. speciosa* the medial distal and proximal pollinia are more or less fused, resulting in 6 pollinia. A stipes (connective tissue on the abaxial side of the pollinia, holding them together) is probably always present.

Fruit – As far as could be observed the fruit is always ellipsoid.

TAXONOMIC HISTORY OF THE GENERA

a) *The genera Ania and Tainia*

The genus *Tainia* was established by Blume in 1825 with *T. speciosa* as the only species. He regarded *Nephelaphyllum* as its closest relative. In 1828, in his *Flora Javæ* etc., Blume changed the name *Tainia* to *Mitopetalum*. He later (1856) included *M. trinerve* and *M. plicatum*. Lindley (1831) established the genus *Ania* for two species collected in British India by Wallich (*A. angustifolia* and *A. latifolia*). As distinctive character state he mentioned the three-lobed, saccate or spurred lip. Unfortunately, however, he included a species without a spur on the lip in his new genus, namely *A. latifolia*. Understandably, since he apparently had access only to Blume's original description of *Tainia*, which, being based on *T. speciosa*, mentions an entire lip and very acuminate sepals as distinctive for the genus, he did not include his Indian species in this genus. In his treatment of *Tainia*, Lindley did not mention *Mitopetalum*, so he probably was not aware of its existence.

Blume (1856) did not recognise Lindley's genus, and included all species of *Ania* in his genus *Mitopetalum*. Reichenbach f. (1857) agreed with Blume that *Ania* did not seem to differ much from *Mitopetalum*, but in passing observed that the name *Tainia* had precedence over *Mitopetalum*, so he grouped all species known to him at that time under the former name. The same stance was taken by e.g. Bentham (1881), Bentham and Hooker f. (1883), Pfitzer (1889) and Hooker f. (1890).

In 1907, Ridley established the genus *Ascotainia* to accommodate a new species from the Malay Peninsula. The main differences with *Tainia* as noted by him were that in *Ascotainia* the pseudobulbs are conical, and that the lateral sepals are free from the column foot, thus not forming a mentum (I shall come back to the latter character state further on). Whether it was because he was not conversant with Lindley's genus or because he felt that the incorporation of *Ania latifolia* made this concept invalid, we may never know, but the fact remains that Ridley chose not to use the name *Ania* for his genus.

J.J. Smith (1912) disagreed that *Ascotainia* should be separated from *Tainia* and therefore reunited the two genera. In this he is followed by most recent authors. Schlechter (1914), on the other hand, agreed with Ridley and even went as far as to place the two genera in different groups: *Tainia* in the Collabiinae, *Ascotainia* in the Phajinae.

The Chinese orchidologists Tang and Wang, working in Kew, also came to the conclusion that Ridley's concept is indeed valid, but that Lindley's name for it has priority, so they

therefore resurrected the generic name *Ania* for those *Tainias* that have conical pseudobulbs and free lateral sepals (see Summerhayes, 1939). The same point of view was expressed by S. Y. Hu (1972, 1975, 1977) and Senghas (1984), who placed *Tainia* in the Collabiinae and *Ania* in the Bletiinae.

In this paper, I follow Tang & Wang in their division of the genera *Ania* and *Tainia*. However, I have failed to see in what way the lateral sepals of these two genera differ. As stated above, most authors who recognise *Ania* (or *Ascotainia*) as a separate genus state that here the lateral sepals are free, whereas in *Tainia* the lateral sepals are supposed to be adnate to the column foot, forming a distinct mentum. My findings are that the lateral sepals in both genera are slightly and very narrowly drawn out towards their base, but this out-drawn portion is in both cases curved downward and back around the column foot, and thus in a sense the sepals are indeed adnate to it, but they do not form a mentum. The spur which can be seen in most species of *Ania* is formed by the base of the lip, as can be deduced from the fact that the column foot is more fleshy than the lip itself, and can thus be distinguished from it. The main differences between *Tainia* and *Ania*, as mentioned in the key to the genera, are that *Tainia* always has cylindrical pseudobulbs usually consisting of one internode, usually terminal inflorescences, an at most slightly saccate lip, and no articulation on the petiole, while *Ania* has swollen, gourd-shaped to ovoidal to ellipsoidal pseudobulbs usually consisting of several internodes, lateral inflorescences, a usually distinctly spurred lip, and usually an articulation on the petiole.

As regards the subgeneric division of *Tainia*, it should be mentioned that J.J. Smith (1912) in reuniting *Ascotainia* and *Tainia* gave the former the status of section. He also included *Mischobulbum* as a section of *Tainia*. He further distinguished sections *Eutainia*, characterised by a slightly saccate lip and comprised of only the species *T. speciosa*, and *Mitopetalum*, in which he included the remaining species. Carr (1935) proposed a section *Chromatophyllon*, characterised by "small pseudobulbs, small leaves either entirely red or red-purple or with the underface so coloured and an entire lip" to accommodate the species *T. purpureifolia* and *T. vegetissima*.

I have refrained here from dividing the genus into subgenera or sections, firstly because the two remaining sections of J.J. Smith (*Eutainia* and *Mitopetalum*) seem to me to be quite artificial, and no longer very useful, and secondly because sect. *Chromatophyllon*, which might seem to form a natural group at first sight, is quite similar to *T. laxiflora* in the shape and texture of the leaf on the one hand, and to *T. obpandurata* in the form of the lip on the other. A meaningful subdivision of the genus should be preceded by a thorough cladistic analysis.

b) *The genus Mischobulbum*

This genus was separated from *Tainia* by Schlechter in 1911. He placed it in the Collabiinae. In his 'Orchideen' (1914) the name is printed as *Mischobulbon*; while this may be more correct linguistically, I feel that Schlechter was not right in changing it without giving a valid reason. I therefore consider the latter spelling to be an illegitimate name and shall use the original spelling in the following.

The genus has been differently accepted in the past, e.g. Rolfe (1912), Merrill (1921), Ridley (1924), Carr (1935), S. Y. Hu (1974, 1977) Senghas (1984) and Seidenfaden (1986) accepted it, while e.g. J.J. Smith (e.g. 1912, 1933), Holttum (1964) and Pradhan (1979) rejected it. Gagnepain (1933) considered *Mischobulbum*, *Tainia* and *Nephelaphyllum* all to

be congeneric; he therefore transferred many names from the first two genera to *Nephelaphyllum*, unfortunately including also a handful of species from other closely related genera such as *Collabium* and *Diglyphosa* and thus greatly adding to the already existing taxonomic confusion.

The distinguishing character states as noted by Schlechter are: the absence of a petiole, the cordate leaf blade being attached directly to the pseudobulb, and the texture of the leaves: thin, but somewhat fleshy, not plicate, in contrast to the parchment-like, very plicate leaves of *Ania* and *Tainia*. *Mischobulbum* differs from *Nephelaphyllum*, which it resembles in other respects, by the flowers being resupinate.

c) *The genus Hancockia*

The monotypic genus *Hancockia* was established by Rolfe in 1903 to accommodate a new species from China. He placed the genus in the Epidendreae, next to *Nephelaphyllum*, which he regarded as its closest relative, "but differing in its short, one-flowered scapes, connivent sepals and petals, and long slender spur." Hatusima in 1967 described the genus *Chrysoglossella* from Japan. He gave it a separate position next to the Collabiinae sensu Pfitzer as a separate subsection, the Chrysoglossellae. Maekawa (1973) reduced the genus to a synonym of *Hancockia*, but retained the Japanese plants as a separate species. In this he was followed by Senghas (who erroneously stated that it was only discovered in 1971). Garay & Sweet (1974) concluded that the plants from Japan and the mainland represent the same species.

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KEY TO THE GENERA TREATED IN THIS PAPER

It is advisable to consult the chapter on Materials and Methods before using the key for the first time.

- 1a. Lip with a long spur (> 15 mm); inflorescence with only one flower
 - 2. *Hancockia* Rolfe
 - b. Lip with at most a short spur (< 5 mm) or without spur; inflorescence with several flowers 2
- 2a. Leaf base (sub)cordate in mature plants; leaf without petiole
 - 3. *Mischobulbum* Schltr.
 - b. Leaf base more or less decurrent along the petiole 3

- 3a. Pseudobulbs swollen, conical, ovoid, (obliquely) ellipsoid or gourd-shaped, usually consisting of several internodes; inflorescence lateral; lip usually with a more or less distinct spur (absent in *A. ponggolensis*); petiole usually with an articulation \pm half-way (absent in *A. viridifusca*) **1. Ania** Lindley
- b. Pseudobulbs thin, cylindrical, sometimes swollen towards the base, usually consisting of only one internode; inflorescence usually terminal (lateral in *T. paucifolia*); lip at most very slightly saccate; petiole without an articulation **4. Tainia** Blume

1. ANIA

Ania Lindley, Gen. Sp. Orch. (1831) 129; Tang & Wang ex Summerh., Bot. Mag. 161 (1939) t. 9553; Tang & Wang, Acta Phytotax. Sin. 1 (1951) 46, 88; A. Hawkes, Enc. Cult. Orch. (1965) 50; Teuscher, Am. Orch. Soc. Bull. 40 (1971) 803; Senghas in Schltr., Orch. 1, ed. 3 (1984) 861. – Lectotype species (here chosen): *Ania angustifolia* Lindley.

Ascotainia Ridley, Mater. Fl. Mal. Penin. 1 (1907) 115; J.J. Smith, Bull. Jard. Bot. Buit. II, 8 (1912) 6 (Sect. *Ascotainia*); Schltr., Orch. (1914) 316; Fedde Rep. Beih. 4 (1919) 246 ('*Ascotaenia*'). – Type species: *Ania penangiana* (Hook. f.) Summerh.

Plant usually glabrous, creeping, sympodial, usually not branched. *Roots* 1–2 mm diam., not branched, with villous hairs, arising predominantly from the nodes of the shoots. *Shoots* arising from the basal part of the last pseudobulb, with a persistent or decaying, tubular, acute, membranaceous scale on each node; the sterile shoots with 1 terminal leaf, pseudobulb consisting of one or several internodes, erect, rarely prostrate, conical, rarely ovoid to ellipsoid or gourd-shaped. *Leaf* petiolate. *Petiole* usually with a distinct articulation in the upper half. *Leaf blade* elliptic to slightly obovate, tip acute to acuminate, margins straight, base decurrent along the petiole. *Inflorescence* lateral, erect, arising from the base of the pseudobulb of the previous shoot. Peduncle scales tubular, acute to slightly acuminate. *Floral bracts* triangular, acute. *Flowers* resupinate. *Sepals and petals* elliptic to obovate, entire. Lateral sepals slightly decurrent along the column foot, the decurrent part curved downward and around the column foot. *Lip* usually with a distinct spur 1–5 mm long, blade entire or three-lobed, adaxially with 3–7 keels. *Column* semiterete, alate. *Anther* usually with 2 crests abaxially, the 2 thecae usually 4-celled. Pollinia 8, in 4 pairs, subequal, 1 smaller pair proximally and 1 larger pair distally in each theca; stipes probably always present. *Fruit* ellipsoid.

Ecology – Terrestrial.

Cultivation – According to Hawkes (1965) a well drained pot filled with a compost of equal parts of fibrous loam, leaf mould, sharp white sand, chopped treefern fibre and chopped sphagnum moss should be used. Regular fertilizing is recommended. These plants require ample amounts of water, but after the new shoots have been formed, a rest period of about one month should be given them. They seem to thrive best at intermediate temperatures and in relatively bright situations, although care should be taken that the rather fragile foliage does not become sunburnt. Teuscher (1971) gives a detailed account of the cultivation of *A. penangiana*, which differs somewhat from the above account. He reports a dry rest period of several months, during which time they drop their leaves. At Montreal (where Teuscher has his nursery) this rest period begins in November. Flowering commences during the rest period, in January or February. Two or three months after flowering the rest period ends and the pseudobulb produces a new shoot. Teuscher advises to transplant the

plants every year at the end of the rest period, but before the new shoots appear and before roots are formed, in a loose mixture of humus and soil. In doing so, the pseudobulbs should be separated, leaving two pseudobulbs connected at a time. This will improve the strength of the new pseudobulb and inflorescence.

Distribution – SE Asia: India; Sikkim; Burma; China (Yunnan, Hainan, Guangdong); Hong Kong; Vietnam; Thailand. Malesia: Malay Peninsula; Sumatra; Java; Borneo; Philippines; Ambon; New Guinea.

KEY TO THE SPECIES OF ANIA

It is advisable to consult the chapter on Materials and Methods before using the key for the first time.

- 1a. Pedicel and abaxial side of sepals pilose; pseudobulb gourd-shaped; leaf blade index < 5 6. **A. ponggolensis** A. Lamb in H. Turner
- b. Pedicel and abaxial side of sepals glabrous; pseudobulb conical, ellipsoid or ovoid; leaf blade index usually > 5 2
- 2a. Lip distinctly three-lobed; median lobe distinctly narrowed towards the base ... 3
- b. Lip entire or slightly three-lobed, but then the median lobe broadest \pm at the base 8
- 3a. Keels on lip \pm uniformly low over their entire length
 - 4. **A. hongkongensis** (Rolfe) Tang & Wang
- b. Keels increasing in height towards the tip of the lip 4
- 4a. Lip blade index higher than 2, keels always straight ... 1. **A. angustifolia** Lindley
- b. Lip blade index less than 2, or, if higher than 2, then keels slightly to distinctly undulating 5
- 5a. Leaf blade in flowering portion of plant up to c. 30 cm long; leaf index higher than 12
 - 3. **A. elmeri** (Ames) A. Hawkes ex Senghas
- b. Leaf blade in flowering portion of plant more than c. 30 cm long; leaf index less than 11 6
- 6a. Three keels on lip 5. **A. penangiana** (Hook. f.) Summerh.
- b. Five to seven keels on lip 7
- 7a. Pseudobulb obliquely ovoid to ellipsoid, usually prostrate; petiole without an articulation \pm half-way; keels on the lip sometimes decreasing in height half-way between the base of the lip and the base of the lateral lobes, always \pm at the base of the median lobe, then increasing in height again 8. **A. viridifusca** (Hook.) Tang & Wang ex Summerh.
- b. Pseudobulb \pm conical, erect; petiole with an articulation \pm half-way; keels on the lip increasing in height uninterruptedly towards the tip of the lip
 - 7. **A. ruybarrettoi** S.Y. Hu & Barretto
- 8a. Petiole up to 150 mm long; leaf blade with less than 100 veins; most flowers open simultaneously; keels on lip \pm uniformly low over their entire length
 - 4. **A. hongkongensis** (Rolfe) Tang & Wang
- b. Petiole longer than 160 mm; leaf blade with (much) more than 100 veins; several flowers open simultaneously; keels on lip more or less distinctly increasing in height towards the tip of the lip 2. **A. borneensis** (Rolfe) Senghas

1. *Ania angustifolia* Lindley – Fig. 25.

Ania angustifolia Lindley, Gen. Sp. Orch. (1831) 129; Senghas in Schltr., Orch. 1, ed. 3 (1984) 863. – *Mitopetalum angustifolium* (Lindley) Blume, Mus. Bot. L.-B. 2 (1856) 185; Fl. Jav. n.s., 1 (1858) 135. – *Pachystoma angustifolium* (Lindley) Reichb. f., Bonplandia 5 (1857) 54. – *Tainia angustifolia* (Lindley) Benth. & Hook. f., Gen. Pl. 3 (1883) 515; Hook. f., Fl. Br. Ind., 5 (1890) 819; B. Grant, Orch. Burma (1895) 155; Seidenf., Contr. Orch. Fl. Cambodia, Laos, Vietnam 1 (1975) 105; Nord. J. Bot. 1 (1981) 192; *ibid.* 2 (1982) 214; Op. Bot. 89 (1986) 31, fig. 9b, 12; Averyanov, Prelim. List Vietn. Orch. 2 (1988) 87. – *Ascotainia angustifolia* (Lindley) Schltr., Fedde Rep. Beih. 4 (1919) 246 ('*Ascotaenia*'). – Type: Gomez s.n. (holo K, iso BM, E).

Non *Ania angustifolia* auct. non Lindley: Benth., Fl. Hongk. (1861) 356 (= *A. hongkongensis*).

Non *Tainia angustifolia* Gagnepain, Fl. Gén. I.-C. 6 (1933) 383 (see under incompletely known species of *Tainia*).

Ascotainia sutepensis Rolfe ex Downie, Kew Bull. (1925) 378. – *Tainia sutepensis* (Downie) Seidenf. & Smitin., Orch. Thail. 2, 1 (1959) 101; *ibid.* 4, 2 (1965) 738, fig. 549. – Type: Kerr 195 (holo K).

Eulophia evrardii Guillaumin, Bull. Bot. Fr. 77 (1930) 337; Gagnepain, Fl. Gén. I.-C. 6 (1933) 400, fig. 36: 5–9. – *Nephelaphyllum evrardii* (Guillaumin) Tang & Wang, Acta Phytotax. Sin. 1 (1951) 77; Seidenf., Contr. Orch. Fl. Cambodia, Laos, Vietnam 1 (1975) 83. – Type: Evrard 2387 (holo P).

Stem of sterile shoot with 1–4 internodes, 11–20 mm long, 12–24 mm diam. (herb.). *Pseudobulb* consisting of several internodes, erect, conical, sometimes \pm prostrate, obliquely ellipsoid, 11–20 by 12–24 mm, scale of subterminal node more or less persistent, 91–147 mm long, torn open at the base. *Petiole* 151–285 mm long, with an articulation in the upper half. *Leaf blade* elliptic to slightly obovate, 21–36 by 2.6–6.8 cm, index 4.7–8.1, acute to slightly acuminate; margin not undulate; thin, 69–187-veined (5–7 veins thickened abaxially). *Inflorescence* arising from the base of the pseudobulb, 32–73.3 cm long, 4–19-flowered. Peduncle 25–39.5 cm long, 3–6 mm diam. Peduncle scales 3–5, the longest 32–52 mm long, acute to slightly acuminate. Rhachis 9.8–33.8 cm long, 1–3 mm diam. *Floral bracts* spreading to reflexed, 4–13 mm long, acute. *Flowers* several open simultaneously. *Pedicel and ovary* 5–13 mm long, as long as to longer than the bracts. *Median sepal* elliptic, 14.5–23 by 3–5.5 mm, index 3.2–4.7, slightly acuminate to acute, mid-vein usually thickened abaxially. *Lateral sepals* \pm elliptic, 14.5–23 by 3.5–5 mm, index 3.2–4.6, acute to acuminate, tip sometimes keeled (cf. *T. viridifusca*), mid-vein usually thickened abaxially. *Petals* \pm obliquely elliptic, 14–23 by 3–5 mm, index 3.6–5.7, acute to slightly acuminate, mid-vein usually thickened abaxially. *Lip* with a distinct spur of 2–4.5 mm long; blade three-lobed, in general outline slightly obovate, 12–17 by 4–7.5 mm, index 2.1–3; median lobe \pm orbicular to slightly transversely elliptic, 4–4.5 by 4.5–6 mm, index 0.7–0.9; tip obtuse to slightly acuminate; margins entire, glabrous to minutely papillose; adaxial surface glabrous to minutely papillose; lateral lobes obliquely triangular, 1.5–2 mm long; tip \pm acute to obtuse; margins entire, sometimes slightly serrate medially, glabrous; adaxial surface glabrous to minutely papillose; lip adaxially with 5 (rarely 3) keels, the median keel 7.5–16 mm long, starting at 0–6 mm, raising plate-like from the basal part of the lip, abruptly increasing in height just below the base of the median lobe, terminating abruptly, highest distally, crest straight, entire proximally, usually distinctly dentate distally, glabrous, not thickened towards its distal end; the lateral keels 8.5–15 mm long, starting at 0–5 mm, raising plate-like from the basal part of the lip, abruptly increasing in height just below the base of the median lobe, terminating abruptly, highest distally, crest straight, entire proximally, usually distinctly dentate distally, glabrous, not thickened towards its distal end; the outer keels 5–15 mm long, starting at 0–8 mm, raising plate-like

from the basal part of the lip, abruptly increasing in height just below the base of the median lobe, terminating abruptly, highest distally, crest straight, usually distinctly dentate, glabrous, not thickened towards its distal end. *Column* 7–9 mm long, stelidia absent; top part truncate, margin \pm entire to distinctly denticulate; wings broadly seam-like, extending up to the tip of the column foot; column foot 0–1.5 mm long. *Anther* 1.5–2 by 1–2 mm, abaxially with 2 small or without crests; thecae indistinctly to distinctly 4-celled. Pollinia 8. *Fruit* not observed.

Colours – Flowers green to yellowish brown; lip white with purple.

Ecology – Mixed evergreen forest on humid soil and upper mixed deciduous forest. Altitude 660–1300 m. Flowering observed in IX–XI.

Distribution – Burma; China (Yunnan); Thailand; Vietnam.

2. *Ania borneensis* (Rolfe) Senghas – Fig. 26; Plate 5b.

Ania borneensis (Rolfe) Senghas in Schltr., Orch. 1, ed. 3 (1984) 863. – *Ascotainia borneensis* Rolfe in Gibbs, J. Linn. Soc. Bot. 42 (1914) 154; Ames & C. Schweinf., Orch. 6 (1920) 164; Ames, J. Str. Br. R. As. Soc., Spec. No. (1921) 182. – *Tainia rolfei* P. Hunt, Kew Bull. 26 (1971) 182. – Type: Gibbs 3958 (holo BM, iso K).

Non *Tainia borneensis* Ridley, J. Str. Br. R. As. Soc. 49 (1907) 32 (see under excluded species of *Tainia*). Non *Tainia borneensis* (Schltr.) Gagnepain, Bull. Mus. Natl. Hist. Nat. sér. 2, 4 (1932) 706 (= *Nephe-laphyllum pulchrum* Blume).

Tainia malayana J.J. Smith, Fedde Rep. 31 (1932) 76; *ibid.* 32 (1933) 160; Engl. Bot. Jahrb. 66 (1934) 167; Bull. Jard. Bot. Buit. III, 16 (1939) 122; Backer & Bakh. f., Fl. Java 3 (1968) 290; Comber, Orch. Java (1990) 107. – *Tainia penangiana* J.J. Smith p.p. non Hook. f., Orch. Java (1905) 183; Orch. Ambon (1905) 17; Fig. Atl. (1909) t. 138. – *Ania malayana* (J.J. Smith) Senghas in Schltr., Orch. 1, ed. 3 (1984) 863. – Type: J.J. Smith 109m (holo BO).

Tainia stenisi J.J. Smith, Blumea 5 (1943) 306, 318; Senghas in Schltr., Orch. 1, ed. 3 (1984) 854 ('*stenisii*'). – Type: Van Steenis 8960 (holo L, right plant; the left plant is *T. paucifolia*).

Stem of sterile shoot with c. 5 internodes, up to c. 58 mm long, c. 2 mm diam. (herb.). *Pseudobulb* consisting of several internodes, erect, conical, 22–36 by 5–12 mm, scale of subterminal node more or less persistent, 110–162 mm long, torn open at the base. *Petiole* 170–247 mm long, with an articulation \pm half-way. *Leaf blade* elliptic, 19.0–33.4 by 2.1–5.1 cm, index 6.5–10.0, slightly acuminate; margin not undulate; thin, 111–211-veined (3–7 thickened abaxially). *Inflorescence* arising from the base of the pseudobulb, 43.0–74.4 cm long, 5–12-flowered. Peduncle 21.0–54.4 cm long, 2–6 mm diam. Peduncle scales 5–6, the longest 25–50 mm long, acute. Rhachis 4.5–30 cm long, 1–2 mm diam. *Floral bracts* patent to reflexed, 6–15 mm long, acute. *Flowers* several open simultaneously. *Pedicel and ovary* 4–17 mm long, longer than the bracts. *Median sepal* elliptic to obovate, 11.5–20 by 2–4 mm, index 3.6–5.7, acute to slightly acuminate, mid-vein not to slightly thickened abaxially. *Lateral sepals* \pm elliptic, straight to slightly falcate, 12–20 by 2.5–4 mm, index 3.9–6, acute to slightly acuminate, mid-vein not to slightly thickened abaxially. *Petals* obliquely elliptic to obovate, 10–20 by 2–3.5 mm, index 3.7–6.7, acute to acuminate, mid-vein not to slightly thickened abaxially. *Lip* with a distinct spur of 2–3.5 mm long; blade entire with a more or less distinct notch, in general outline \pm obovate, 10–15 by 6–9 mm, index 1.5–2.2; tip acuminate; margins entire, glabrous, slightly undulating distally; adaxial surface \pm glabrous; lip adaxially with 3–5 keels, the median keel 1–10.5 mm long, starting at 0–9.5 mm, raising plate-like from just below the broadest part

of the lip, decurrent towards the tip, highest distally, crest straight, entire, glabrous, not thickened towards its distal end; the lateral keels 0.5–10 mm long, starting at 0–9 mm, raising plate-like from just below the broadest part of the lip, decurrent towards the tip or terminating more or less abruptly, highest distally, crest straight, entire, glabrous, not thickened towards its distal end; the outer keels when present 1–4 mm long, starting at 5.5–9 mm, raising plate-like from just below the broadest part of the lip, decurrent towards the tip or terminating more or less abruptly, highest distally, crest straight, entire, glabrous, not thickened towards its distal end. *Column* 7–10 mm long, stelidia absent; top part truncate to slightly semiorbicular, margin entire to slightly denticulate; wings seam-like, extending up to the tip of the column foot; abaxially sometimes with a distinct longitudinal ridge; column foot 0–1 mm long. *Anther* 1–2 by 1–2 mm, abaxially with 2 crests; thecae distinctly 4-celled. Pollinia 8. *Fruit* ellipsoid, 23–28 by 5–7 mm; stalk 3–5 mm long.

Colours – Pseudobulb purple. Flowers brown maroon (Gibbs); tepals pale greenish-yellow, reddish veins, lip paler (Collenette); lip yellow with crimson spots on outside of spur, column pale yellow spotted crimson adaxially (Comber).

Ecology – In undergrowth of deciduous jungle (Gibbs); sunny place on steep hillside above river, open secondary forest (Collenette); in light shade by side of path (Comber). Altitude 270–1400 m. Flowering observed in II, VI, VIII, IX.

Distribution – Sumatra; Java; Borneo; Ambon; New Guinea.

Notes – 1. In 1905 J.J. Smith described several specimens from Ambon and Java as *T. penangiana* (see there, note 5). He considered the lack of lateral lobes to be related to their autogamy. However, in 1932 he described them as a new species, *T. malayana*, after having obtained specimens from Sumatra and New Guinea which also had no sidelobes, but were apparently heterogamous, as deduced from the presence of a well-developed rostellum. In 1943 he described still another species, *T. steenisii*, from material collected by Van Steenis in Sumatra. Apparently he was led astray by the fact that this collection is a mixtum of *T. paucifolia* (which J.J. Smith considered to be a young specimen) and the present species. I have not been able to discern any appreciable difference between the two species described by J.J. Smith and Ridley's *T. borneensis*, except that Van Steenis 8960 (right) has slightly more pronounced notches on the lip and that some specimens of *T. malayana* have a somewhat bent spur. These differences are so minor and not consistent, however, that I refrain from maintaining them as separate species.

2. In some specimens (especially, but not exclusively, those from Borneo) the top part of the column has two distinct lateral lobes.

3. In addition to J.J. Smith, Comber also noted that in E Java (Gunung Arjuno) all specimens seem to be cleistogamous.

3. *Ania elmeri* (Ames) A. Hawkes ex Senghas – Fig. 27.

Ania elmeri (Ames) A. Hawkes ex Senghas in Schltr., Orch. 1, ed. 3 (1984) 863; A. Hawkes, Enc. Cult. Orch. (1965) 50 (comb. illeg.). – *Tainia elmeri* Ames, Elmer's Leaflet. Philip. Bot. 5 (1912) 1570. – *Ascotainia elmeri* (Ames) Ames, Orch. 5 (1915) 99; Schltr., Fedde Rep. Beih. 4 (1919) 246 ('*Ascotainia*'); Ames, Sched. Orch. 6 (1923) 79; Day, Philip. Orch. Rev. (1949) 14. – Type: Elmer 8526 (not seen).

Tainia inamoena Kränzlin, Fedde Rep. 17 (1921) 387; Senghas in Schltr., Orch. 1, ed. 3 (1984) 854 ('*inamoena*'). – Type: Loher 541 (holo CAL).

Stem of sterile shoot not observed. *Pseudobulb* consisting of one internode, erect, conical, 15–38 by 3–20 mm; scale of subterminal node more or less persistent, 34–150 mm long, torn open at the base. *Petiole* 50–210 mm long, with an articulation in the upper half. *Leaf blade* elliptic, 12.5–29.4 by 8–18 cm, index 13.5–22.3, acute; margin not undulate; thin, 33–79-veined (3 thickened abaxially). *Inflorescence* arising from the base of the pseudobulb, 31.8–80.4 cm long, 2–7-flowered. Peduncle 22.5–64.2 cm long, 2–5 mm diam. Peduncle scales 4–5, the longest 16–34 mm long, acute. Rhachis 2.4–16.2 cm long, 1–2 mm diam. *Floral bracts* patent to spreading, 5–13 mm long, acute. *Flowers* most open simultaneously. *Pedicel and ovary* 7–21 mm long, longer than the bracts. *Median sepal* elliptic, 20.0–25.0 by 3.5 mm, index 5.7–7.1, acute, mid-vein not thickened abaxially. *Lateral sepals* ± elliptic, falcate, 18.5–24.0 by 3.5–4 mm, index 5.2–6.0, acute, mid-vein not thickened abaxially. *Petals* obliquely elliptic, slightly falcate, 18–23 by 3.0–3.5 mm, index 6.0–7.1, slightly acuminate, mid-vein not thickened abaxially. *Lip* with a distinct spur of 2.5–5 mm long; blade three-lobed, in general outline elliptic, 14.5–19 by 7–9 mm, index 1.6–2.4; median lobe elliptic, 6–7 by 4–5.5 mm, index 1.1–1.6; tip acuminate; margins entire, slightly undulating distally, minutely papillose proximally, glabrous distally; adaxial surface minutely papillose; lateral lobes obliquely triangular, slightly falcate, 2.5–3 mm long; tip obtuse; margins entire, glabrous laterally, glabrous to minutely papillose medially; adaxial surface minutely papillose; lip adaxially with 3–5 keels, the median keel 8–14 mm long, starting at 0–6 mm, raising plate-like from the basal part of the lip, decurrent towards the tip, highest distally, crest slightly undulating proximally, slightly to distinctly undulating distally, entire proximally, entire to slightly dentate distally, glabrous, not thickened towards its distal end; the lateral keels 8–15 mm long, starting at 0–4 mm, raising plate-like from the basal part of the lip, decurrent towards the tip, highest distally, crest slightly undulating proximally, slightly to distinctly undulating distally, entire proximally, entire to slightly dentate distally, glabrous, not thickened towards its distal end; the outer keels when present c. 1 mm long, starting at 10.5–11 mm, raising plate-like, highest distally, crest slightly undulating, entire to slightly dentate, glabrous, not thickened towards its distal end. *Column* 8.5–11 mm long, stelia absent; top part triangular, margin ± entire; wings seam-like, extending up to the tip of the column foot; column foot 0.5–1.5 mm long. *Anther* 1.5–2 by 2–2.5 mm, abaxially with 2 crests; thecae distinctly 4-celled. Pollinia 8. *Fruit* not observed.

Colours – Flowers brown.

Ecology – Altitude 1300 m. Flowering observed in I, II, V.

Distribution – Philippines (Luzon).

4. *Ania hongkongensis* (Rolfe) Tang & Wang – Fig. 28.

Ania hongkongensis (Rolfe) Tang & Wang, Acta Phytotax. Sin. 1 (1951) 46, 88; S. Y. Hu, Q. J. Taiwan Mus. 25, 1+2 (1972) 48; Gen. Orch. Hong Kong (1977) 65, fig. 34; Senghas in Schltr., Orch. 1, ed. 3 (1984) 863. – *Ania angustifolia* auct. non Lindley: Benth., Fl. Hongk. (1861) 356. – *Tainia hongkongensis* Rolfe, Kew Bull. (1896) 195; J. Linn. Soc. Bot. 36 (1903) 20; Dunn & Tutcher, Kew Bull. Add. Ser. 10 (1912) 264; Herklots, Orch. Hong Kong (1932) 181; S. Y. Hu, Q. J. Taiwan Mus. 28 (1975) 167; Averyanov, Prelim. List Vietn. Orch. 2 (1988) 88. – *Ascotainia hongkongensis* (Rolfe) Schltr., Orch. (1914) 317; Fedde Rep. Beih. 4 (1919) 246 ('*Ascotaenia*'). – Syntypes: Wright 522 (lecto K, here chosen, iso NY, P); Wilford 384 (K); Hance s.n. (1670?) (K); Ford s.n. (12/79?) (K).

Stem of sterile shoot with c. 5 internodes, 25–28 mm long, c. 2 mm diameter (herb.). *Pseudobulb* consisting of one internode, erect, conical, 9–23 by 7–21 mm, scale of sub-terminal node more or less persistent, 90–162 mm long, torn open at the base. *Petiole* 52–140 mm long, with an articulation in the upper half. *Leaf blade* elliptic, 12.5–30.5 by 1.6–3.3 cm, index 6.6–13.7, acute to slightly acuminate; margin not undulate; thin, 47–93-veined (3 thickened abaxially). *Inflorescence* arising from the base of the pseudobulb, 36.7–52 cm long, 5–11-flowered. Peduncle 16–42 cm long, 3 mm diam. Peduncle scales 3–4, the longest 22–31 mm long, acute. Rhachis 8.7–32.5 cm long, 1.5–2 mm diam. *Floral bracts* spreading, 5–19 mm long, acute. *Flowers* most open simultaneously. *Pedicel and ovary* 7–12 mm long, about as long as to longer than the bracts. *Median sepal* elliptic, 15–22 by 2.5–3.5 mm, index 4.3–8.2, slightly acuminate, mid-vein usually not thickened abaxially. *Lateral sepals* ± elliptic, straight to falcate, 13.5–20 by 3–4 mm, index 3.4–6.7, acute to slightly acuminate, mid-vein usually thickened abaxially. *Petals* obliquely elliptic, slightly falcate, 14–21 by 2.5–3.5 mm, index 4.3–8.0, acute to slightly acuminate, mid-vein usually thickened abaxially. *Lip* with a distinct spur of 2–4 mm long; blade entire with a more or less distinct notch to slightly three-lobed, in general outline elliptic to slightly obovate, 11.5–13.5 by 5.5–8 mm, index 1.4–2.1; median lobe where present transversely elliptic to orbicular, 3.5–5 by 4–6.5 mm, index 0.7–1; tip acuminate; margins entire, slightly undulating, minutely papillose near base, glabrous towards tip; adaxial surface ± minutely papillose; lateral lobes where present obliquely triangular, 0.25–1 mm long; tip acute to obtuse; margins entire, minutely papillose medially, glabrous laterally; adaxial surface minutely papillose; lip adaxially with 3 keels, the median keel 5–10.5 mm long, starting at 0–5 mm, raised plate-like from the basal part of the lip, forming a low ridge only, highest half-way to distally, crest straight, entire, glabrous, not thickened towards its distal end; the lateral keels 5–10.5 mm long, starting at 0–5 mm, raised plate-like from the basal part of the lip, forming a low ridge only, highest half-way to distally, crest straight, entire, glabrous, not thickened towards its distal end. *Column* 6.5–8.5 mm long, stelia absent; top part truncate, margin entire to denticulate; wings seam-like, extending up to the tip of the column foot; column foot 1–2 mm long. *Anther* 2 by 1.5–2 mm, abaxially without or with 2 small crests; thecae indistinctly 4-celled. Pollinia 8. *Fruit* not observed.

Colours – Flowers olive-green to reddish brown with claret stripes and speckles; the lip pale green tinged purple adaxially and abaxially towards tip to entirely yellow, spur olive-brown.

Ecology – In forest, on and between rocks, in ravines. Flowering observed in III–V.

Distribution – China (Hainan, Guangdong); Hong Kong; Vietnam.

Note – Lei 447, from Hainan, is a stouter plant than the other specimens; as I am not certain of the identification, I have not included its measurements in the description.

5. *Ania penangiana* (Hook. f.) Summerh. – Fig. 29; Plate 5c.

Ania penangiana (Hook. f.) Summerh., Bot. Mag. 161 (1939) t. 9553; A. Hawkes, Enc. Cult. Orch. (1965) 50; Senghas in Schltr., Orch. 1, ed. 3 (1984) 862. – *Tainia penangiana* Hook. f., Fl. Br. Ind. 5 (1890) 820; ibid. 6 (1890) 192; Ic. Pl. 21 (1892) t. 2089; Ridley, J. Linn. Soc. 32 (1896) 314; Hook. f., Curtis Bot. Mag. 123 (1897) t. 7563; Koord., Exk. Fl. Java 1 (1911) 368; J.J. Smith, Bull. Jard. Bot. Buit. II, 8 (1912) 5; Seidenf. & Smitin., Orch. Thail. 2, 1 (1959) 101; Holttum, Fl. Malaya 1, ed. 3 (1964) 182; Vaughan, Nat. Mal. 6, 4 (1981) 19, 23; Seidenf., Nord. J. Bot. 5 (1985) 157, fig. 1; Op. Bot. 89 (1986) 33, t. 9f, 14. – *Ascotainia penangiana* (Hook. f.) Ridley, Mater. Fl. Mal. Penin. 1

(1907) 116; J. Str. Br. R. As. Soc. 59 (1911) 195 ('*Ascotania*'); Schltr., Orch. (1914) 317; Fedde Rep. Beih. 4 (1919) 246 ('*Ascotaenia*'); Ridley, Fl. Mal. Penin. 4 (1924) 112; Burkill & Henderson, Gard. Bull. Str. Seutl. 3 (1925) 437. – Type: Maingay 1642 (holo K, iso L).

Non *Tainia penangiana* auct.: J.J. Smith, Orch. Java (1905) 183 (= *A. borneensis*).

Tainia hookeriana King & Pantl., J. As. Soc. Beng. 64, 2 (1895) 336; Ann. R. Bot. Gard. Calc. 8 (1898) 103, t. 143; J.J. Smith, Bull. Jard. Bot. Buit. II, 8 (1912) 6; Brühl, Guide Orch. Sikkim (1926) 76; Mitra, Fl. Pl. E. Ind. 1 (1958) 302; Razi, Rec. Bot. Surv. Ind. 18 (1959) 54; Seidenf. & Smitin., Orch. Thail. 3 (1961) 347; *ibid.*, 4, 2 (1965) 740; Smitin., Nat. Hist. Bull. Siam Soc. 22 (1967) 109; Teuscher, Am. Orch. Soc. Bull. 40 (1971) 803; Holttum, Am. Orch. Soc. Bull. 41 (1972) 29; Seidenf., Contr. Orch. Fl. Cambodia, Laos, Vietnam (1975) 105; Pradhan, Ind. Orch. 2 (1979) 242 ('*hookerana*'); Biswas, Taxon 29 (1980) 169; Seidenf., Op. Bot. 89 (1986) 32; Averyanov, Prelim. List Vietn. Orch. 2 (1988) 88; Misra, J. Orch. Soc. Ind. 3 (1989) 65. – *Ascotainia hookeriana* (King & Pantl.) Ridley, Mater. Fl. Mal. Pen. 1 (1907) 116; Schltr., Fedde Rep. Beih. 4 (1919) 246 ('*Ascotaenia*'). – *Ania hookeriana* (King & Pantl.) Tang & Wang ex Summerh., Bot. Mag. 161 (1939) t. 9553; Tang & Wang, Acta Phytotax. Sin. 1 (1951) 46, 89; A. Hawkes, Enc. Cult. Orch. (1965) 50; S.Y. Hu, Q. J. Taiwan Mus. 25, 1+2 (1972) 48; Anon., Ic. Corm. Sin. 5 (1976) 726, t. 8282; Anon., Fl. Hain. 4 (1977) 233, fig. 1111; Senghas in Schltr., Orch. 1, ed. 3 (1984) 862. – Type: Pantling 204 (holo BM, iso FI, LE, W).

Ascotainia siamensis Rolfe ex Downie, Kew Bull. (1925) 378. – *Tainia siamensis* (Downie) Seidenf. & Smitin., Orch. Thail. 2, 1 (1959) 100. – Type: Kerr 214 (holo K).

Tainia latilingua Seidenf. & Smitin. (non Hook.f.), Orch. Thail. 2, 1 (1959) 101, fig. 75 (p.p.).

Stem of sterile shoot with c. 8 internodes, c. 51 mm long, c. 2 mm diam. (herb.). *Pseudobulb* consisting of several internodes, erect, conical, 30–52 by 5–29 mm, scale of sub-terminal node more or less persistent, 114–250 mm long, torn open at the base. *Petiole* 149–358 mm long, with an articulation in the upper half. *Leaf blade* elliptic, 30.2–49 by 3.5–9.2 cm, index 5.3–8.7, acute to acuminate; margin not undulate; thin, 99–283-veined (3–7 thickened abaxially). *Inflorescence* arising from the base of the pseudobulb, 41.7–116.4 cm long, 5–15-flowered. Peduncle 30.5–74.6 cm long, 3–5 mm diam. Peduncle scales 4–6, the longest 22–41 mm long, acute. Rhachis 11.2–41.8 cm long, 1–3 mm diam. *Floral bracts* patent to spreading, 3–24 mm long, acute. *Flowers* most open simultaneously. *Pedicel and ovary* 9–23 mm long, about as long as to distinctly longer than the bracts. *Median sepal* elliptic, 16–34 by 2.5–6.5 mm, index 3.6–8.5, acute to acuminate, mid-vein not to slightly thickened abaxially. *Lateral sepals* ± elliptic, straight to falcate, 11–36 by 2–6.5 mm, index (1.8) 3–7.3, acute to acuminate, mid-vein not to slightly thickened abaxially. *Petals* obliquely elliptic, slightly falcate, 13–31 by 3–6 mm, index 3–8.9, acute to acuminate, mid-vein not to slightly thickened abaxially. *Lip* with a distinct spur of 2–4 mm long; blade three-lobed, in general outline elliptic to obovate, 11–18 by 7–12 mm, index 1.0–1.9; median lobe ± rhomboid to orbicular (to transversely elliptic), (3.5) 4.5–8 by 4.5–7.5 mm, index (0.5) 0.7–1.2; tip acuminate; margins entire, slightly undulating, glabrous; adaxial surface glabrous to sparsely minutely papillose; lateral lobes obliquely triangular, slightly falcate, 2–4 mm long; tip obtuse; margins entire, glabrous; adaxial surface glabrous to slightly minutely papillose; lip adaxially with 3 keels, the median keel 6.5–13 mm long, starting at 0–6 mm, raised plate-like from slightly beyond the beginning of the keel, sometimes gradually and uninterruptedly, otherwise more steeply, in that case decreasing in height ± half-way the keel, usually abruptly increasing in height on the median lobe of the lip, terminating abruptly, highest distally, rarely half-way, crest straight, entire, glabrous, not thickened towards its distal end; the lateral keels 5.5–12 mm long, starting at 0–5.5 mm, raised plate-like from slightly beyond the beginning of the keel, sometimes

gradually and uninterruptedly, otherwise more steeply, in that case decreasing in height \pm half-way the keel, usually abruptly increasing in height on the median lobe of the lip, terminating abruptly, highest half-way or distally, crest straight, entire, glabrous, not thickened towards its distal end. *Column* 7–10 mm long, stelidia absent; top part \pm truncate to triangular, margin entire to slightly denticulate; wings seam-like, extending up to the tip of the column foot; column foot 0.5–2 mm long. *Anther* 1–2 by 1.5–2 mm, with a distinct tooth on the distal margin, abaxially with 2 crests, sometimes fused to 1 large crest; thecae distinctly 4-celled. Pollinia 8. *Fruit* not observed.

Colours – Stem purplish green. Bracts greenish. Ovary olive green. Tepals greenish brown to yellow, marked purple to brown; lip white to cream coloured with faint purple spots, especially on the lateral lobes, greenish-yellow keels and median lobe, spur brownish; column white to cream coloured flushed purple, sometimes greenish brown in front; anther cream coloured to brownish with two purple spots.

Ecology – In tropical semi-evergreen forest, on forested riverbanks; in tropical valleys. Altitude 600–830 m. Flowering observed in VI (cult. ex. Hort. Trevor Lawrence), X–III.

Distribution – SE Asia: NE India; Sikkim; China [Hainan, according to Tang & Wang (1951)]; Thailand; Vietnam. Malesia: Malay Peninsula.

Notes – 1. There has been much dispute about the status of *A. hookeriana* and *A. penangiana* in the past, Summerhayes (1939) in his description of *A. hookeriana*, noted that “the differences (are) mostly by degree.” Seidenfaden & Smitinand (1959) identified some specimens from Thailand as *A. penangiana*, but later (1961, 1965) corrected this to *A. hookeriana*, after studying the type specimens of both species. In the latter publication they gave several differences between the two. Teuscher (1971) expressed the opinion that the two must be the same; the only difference he could find was the shorter and more distinctly notched spur in *A. penangiana*. Holttum (1972) replied that this difference, together with the fact that they are geographically widely separated, was sufficient for him to believe that they must be kept apart. Finally, Seidenfaden (1986) also preferred to keep them as separate species, although he also conceded that the differences are slight. In his key he gave as the most prominent difference the width/length ratio of the lip: 3/4 in *A. hookeriana* (i.e. index c. 1.3 in my terminology), 3/5 in *A. penangiana* (i.e. index c. 1.6). In his study *A. hookeriana* has a distribution ranging from NE India northward to China (Hainan), eastward to Vietnam and southward to District III in Thailand, while *A. penangiana* ranges from Penang in Malaya northward up to District III, thus not being so widely separated as Holttum believed. After studying all material available to me of the two species (including the type specimens of *A. penangiana* and *A. hookeriana*), I have come to the conclusion that all differences mentioned in the literature do not hold and I have therefore decided to unite the two concepts.

2. *Ascotainia siamensis* is considered by Tang & Wang (1951) to be the same as *A. hookeriana*. I have not seen the type material, but the original description is quite well in agreement with that given above, although the specimen in general seems to be smaller. I therefore have no hesitation in including it here.

3. According to Biswas (1980) $2n = 40$.

4. One of the specimens collected by Curtis on Government Hill (s.n. 1892, SING) had a double inflorescence, the second one arising from the base of the first one.

5. The specimen in AMES (Cult. Hort. Bog. s.n.), according to the label from Ambon, has large lateral lobes and a large rostellum. It is thus undoubtedly *A. penangiana*. However,

J.J. Smith [Fedde Rep. 31 (1932) 76] established that plants from Java and Ambon and originally identified by him as *Tainia penangiana* never had distinct lateral lobes and were always autogamous, lacking the rostellum (at least when cultivated in Bogor). Specimens from New Guinea and Sumatra with a well-developed rostellum but without lateral lobes were described by him *T. malayana* (reduced by me to *A. borneensis*, see there). In his later publications he never again mentioned any occurrence of *A. (T.) penangiana* in the Dutch East Indies. In an earlier publication [Orch. Ambon (1905) 17] J.J. Smith mentioned that plants of the real *T. penangiana* imported from Singapore flowered in Bogor at that time. I therefore believe that it is safest for the time being to suppose that the specimen in AMES is really *A. penangiana*, and to regard the locality given on the label as a result of an error in the records kept in BO. I have therefore not included this locality in the distribution given above.

6. Reichb. Orch. Herb. 29885 is a mixtum: the loose lips and most of the more or less complete flowers belong to *A. viridifusca*, but one flower (put in a separate folder labelled 1) is *A. penangiana*.

7. Senaratna 898 differs from the other specimens presented here in the broad petals and the transversely elliptic median lobe of the lip. Its flowers are also more orange-reddish in colour than usual. I include it tentatively here, because it is certainly more similar to the present species than to any other in this study. I have decided not to give it separate status because the differences are small, the specimen is very incomplete (only a few flowers in alcohol), and its collection locality is unknown. Wherever its measurements differ from those of the other specimens, they are given in parentheses.

8. Some collectors note that this species has a sharp scent.

6. *Ania ponggolensis* A. Lamb in H. Turner, *spec. nov.* – Fig. 30; Plate 5d.

Ania ponggolensis a aliis *Aniis* pseudobulbo ampulliforme, scapo sepalisque pilosis et labello ecalcarato differt. – Typus: Lamb 204/84, Borneo, Sabah, Batu Ponggol (holo K, iso L).

Stem of sterile shoot c. 5 mm long, c. 2 mm diam. (herb.), creeping. *Pseudobulb* consisting of one internode, erect, gourd-shaped, 9–14 by 8–16 mm, scale of subterminal node decaying, 15–30 mm long. *Petiole* 29–37 mm long, with an articulation \pm half-way. *Leaf blade* elliptic, 9.0–10.5 by 1.9–3.5 cm, index 2.8–4.7, acuminate; margin not undulate; thin, 51–77-veined (3–5 thickened). *Inflorescence* probably lateral, erect, c. 20.5 cm long, c. 2-flowered, slightly pilose, especially in the upper part. *Peduncle* 13–17.2 cm long, 1 mm diam. *Peduncle scales* c. 2, tubular, the longest c. 7 mm long, acute, abaxial surface slightly pilose. *Rhachis* c. 3.3 cm long, c. 1 mm diam. *Floral bracts* patent, triangular to ovate, 7–8 mm long, acute, abaxial surface pilose. *Flowers* most open simultaneously, resupinate. *Pedicel and ovary* 14–18 mm long, longer than the bracts, pilose. *Median sepal* triangular, 14.5–16 by 4.5–8 mm, index 2–3.2, acute, tip slightly hooded, abaxial surface slightly pilose, mid-vein distinctly thickened abaxially. *Lateral sepals* triangular, slightly falcate, 12–16 by 7–8 mm, index 1.7–2, acute, abaxial surface slightly pilose, mid-vein distinctly thickened abaxially. *Petals* obliquely elliptic, slightly falcate, 12–14 by 5–6 mm, index 2.3–2.4, slightly acuminate, abaxial surface glabrous, mid-vein not thickened abaxially. *Lip* without spur; blade three-lobed to entire with a distinct sinus, in general outline elliptic, 9.5–13 by 5.5–8 mm, index 1.7; median lobe orbicular, 3–5 by 3.5–4.5 mm, index 0.9; tip obtuse; margins crenate, undulating, minutely papillose; adaxial surface

minutely papillose; abaxial surface slightly pilose; lateral lobes where present obliquely triangular, c. 1 mm long; tip obtuse; margins entire, glabrous; adaxial and abaxial surfaces glabrous; lip adaxially with 3 keels, the median keel 7.5–10 mm long, starting at c. 1.5 mm, raised plate-like from the basal part of the lip, decurrent towards the tip of the lip, highest half-way, crest slightly undulating, entire, glabrous, slightly thickened towards its distal end; the lateral keels 5.5–7.5 mm long, starting at c. 3 mm, raised plate-like from the basal part of the lip, decurrent towards the tip of the lip, highest proximally, crest slightly undulating, entire, glabrous, slightly thickened towards its distal end. *Column* c. 10 mm long, stelia absent; top part triangular, margin \pm entire; wings seam-like, extending up to the base of the column; column abaxially with a distinct longitudinal ridge; column foot c. 4 mm long, slightly broadened and thickened near the tip, adaxial surface minutely papillose, especially towards the base, abaxial surface slightly pilose. *Anther* without crests. Pollinia 8, unequal. *Fruit* not observed.

Colours – Leaves liver-coloured when young. Petiole magenta. Inflorescence with purple blotches. Ovary and pedicel dark greenish purple; floral bracts purple. Sepals translucent greenish yellow with green veins, sometimes with purplish spots; petals translucent yellow, sometimes with purplish spots. Lip yellow, sometimes with purplish spots laterally and towards the tip, keels greenish yellow. Patch of purple spots at base of column. Anther cap purple.

Ecology – On top of limestone peak, terrestrial in shady places among the rocks.

Distribution – Borneo: Sabah (Batu Ponggol).

Note – The generic position of this species is not very clear: on the one hand, the absence of a spur indicates an affinity with *Tainia*, on the other, the articulated petiole points to a relation with *Ania*, as do the shape of the pseudobulb and the probably lateral inflorescence. However, a lateral inflorescence also occurs in *Tainia paucifolia*. To complicate matters further, this is the only species within the genera treated in this paper which is not entirely glabrous. I include it provisionally in *Ania*.

7. *Ania ruybarrettoi* S.Y. Hu & Barretto – Fig. 31; Plate 6a.

Ania ruybarrettoi S.Y. Hu & Barretto, *Chung Chi J.* 14 (1975) 25, t. 12; S.Y. Hu, *Gen. Orch. Hong Kong* (1977) 65; Senghas in *Schltr., Orch.*, 1, ed. 3 (1984) 863 ('*ruiybarrettioi*'). — Type: S.Y. Hu 13098A (holo K).

Stern of sterile shoot with c. 5 internodes, c. 38 mm long, c. 3 mm diam. (herb.). *Pseudobulb* consisting of one internode, erect, conical, 25–27 by 11–13 mm, scale of subterminal node more or less persistent, c. 178 mm long, torn open at the base. *Petiole* c. 270 mm long, with an articulation \pm half-way. *Leaf blade* elliptic, c. 40.5 by c. 4.9 cm, index c. 8.3, slightly acuminate; margin not undulate; thin, c. 173-veined (c. 7 thickened abaxially). *Inflorescence* arising from the base of the pseudobulb, c. 79.7 cm long, c. 5-flowered. *Peduncle* c. 62.5 cm long, c. 3 mm diam. *Peduncle scales* c. 3, the longest c. 30 mm long, acute. *Rhachis* c. 17.2 cm long, c. 1 mm diam. *Floral bracts* patent to spreading, 7–10 mm long, acute. *Flowers* most open simultaneously. *Pedicel and ovary* 11–18 mm long, distinctly longer than the bracts. *Median sepal* elliptic, c. 31 by c. 5 mm, index c. 6.2, acuminate, mid-vein not thickened abaxially. *Lateral sepals* \pm obliquely elliptic, slightly falcate, c. 31 by c. 6 mm, index c. 5.1, acuminate, mid-vein not thickened abaxially. *Petals* obliquely elliptic, slightly falcate, c. 31 by c. 5 mm, index c. 6.2, acuminate, mid-vein not thickened

abaxially. *Lip* with a distinct spur of c. 3 mm long; blade three-lobed, in general outline elliptic to obovate, c. 20 by c. 10 mm, index c. 1; median lobe \pm orbicular, c. 8 by c. 7 mm, index c. 1.1; tip acuminate; margins entire, minutely papillose proximally, glabrous distally; adaxial surface minutely papillose; lateral lobes obliquely triangular, c. 4.5–5 mm long; tip obtuse; margins entire, inner margin minutely papillose, outer margin glabrous; adaxial surface minutely papillose; lip adaxially with 5 keels, the median keel c. 13 mm long, starting at c. 1.5 mm, raised plate-like from the basal part of the lip, abruptly increasing in height at the base of the lateral lobes, terminating abruptly, highest distally, crest straight, entire, glabrous, not thickened towards its distal end; the lateral keels 12–12.5 mm long, starting at c. 1.5 mm, raised plate-like from the basal part of the lip, abruptly increasing in height at the base of the lateral lobes, terminating abruptly, highest distally, crest straight, entire, glabrous, not thickened towards its distal end; the outer keels c. 12.5 mm long, starting at c. 1 mm, raised plate-like from the basal part of the lip, abruptly increasing in height at the base of the lateral lobes, terminating abruptly, highest distally, crest straight, entire, glabrous, not thickened towards its distal end. *Column* c. 11.5 mm long, stelidia absent; top part triangular, margin \pm entire; rostellum triangular with a rounded lobe; wings seam-like, extending up to the tip of the column foot; column foot c. 2 mm long. *Anther* c. 1 by c. 1.5 mm, abaxially without crests; thecae distinctly 4-celled. Pollinia 8. *Fruit* not observed.

Colours – Sepals and petals dull red-yellow, well mixed; lip white, maculated purple on lateral and median lobes; column dark violet.

Ecology – Flowering observed in III.

Distribution – Hong Kong.

8. *Ania viridifusca* (Hook.) Tang & Wang ex Summerh. – Fig. 32.

Ania viridifusca (Hook.) Tang & Wang ex Summerh., Bot. Mag. 161 (1939) t. 9553 (in note); Tang & Wang, Acta Phytotax. Sin. 1 (1951) 46, 89; S.Y. Hu, Q. J. Taiwan Mus. 25, 1+2 (1972) 49; *ibid.* 28, 1+2 (1975) 169; Senghas in Schltr., Orch. 1, ed. 3 (1984) 863. – *Calanthe viridifusca* Hook., Bot. Mag. 78 (1852) t. 4669. – *Tainia viridifusca* (Hook.) Benth. & Hook.f., Gen. Pl. 3 (1883) 515; Hook.f., Fl. Br. Ind. 5 (1890) 820; B. Grant, Orch. Burma (1895) 157; J.J. Smith, Bull. Jard. Bot. Buit. II, 8 (1912) 6; Mitra, Fl. Pl. E. Ind. 1 (1958) 301; Seidenf. & Smitin., Orch. Thail. 2, 1 (1959) 100, fig. 74 ('*viridifusca*'); *ibid.* 4, 2 (1965) 737, fig. 548; Seidenf., Contr. Orch. Cambodia, Laos, Vietnam 1 (1975) 106; Mehra & Sehgal, Taxon 25 (1976) 646; Pradhan, Ind. Orch. 2 (1979) 241; Seidenf., Nord. J. Bot. 2 (1982) 214; Op. Bot. 89 (1986) 28, fig. 9a, 11; Averyanov, Prelim. List Vietn. Orch. 2 (1988) 89. – *Ascotainia viridifusca* (Hook.) Schltr., Orch. (1914) 317; Fedde Rep. Beih. 4 (1919) 246 ('*Ascotaenia*'). – Type: Simon s.n. (not seen).

Tainia fuerstenbergiana Schltr., Orchis 1 (1906) 4 [according to Seidenf. (1986), not seen]; J.J. Smith, Bull. Jard. Bot. Buit. II, 8 (1912) 6; Senghas in Schltr., Orch. 1, ed. 3 (1984) 854. – *Ascotainia fuerstenbergiana* (Schltr.) Schltr., Fedde Rep. Beih. 1 (1911) 100. – Type: unknown, probably lost (see note 1).

Ascotainia elata Schltr., Fedde Rep. Beih. 4 (1919) 70; *ibid.* 246 (both '*Ascotaenia*'); Senghas in Schltr., Orch. 1, ed. 3 (1984) 863. – *Tainia elata* (Schltr.) P. Hunt, Kew Bull. 26 (1971) 181. – *Ania elata* (Schltr.) S.Y. Hu, Q. J. Taiwan Mus. 25, 1+2 (1972) 48. – Type: Maire s.n. (not seen, see note 2). *Calanthe eberhardtii* Gagnepain, Bull. Soc. Bot. Fr. 79 (1932) 162. – Syntypes: Eberhardt 4673 (lecto P, here chosen), 3984 (P).

Stem of sterile shoot with c. 5–6 internodes, c. 37 mm long, c. 6 mm diam. (herb.) *Pseudobulb* consisting of several internodes, \pm erect to \pm prostrate, obliquely ovoid to ellip-

soid, 22–50 by 32–100 mm, scale of subterminal node more or less persistent, 230–317 mm long, torn open at the base. *Petiole* c. 390 mm long, without an articulation. *Leaf blade* elliptic, 46.4–55 by 4.3–8.2 cm, index 6.2–10.8, acute to slightly acuminate; margin not undulate; thin, 93–251-veined (3–8 thickened abaxially). *Inflorescence* seemingly arising laterally from the pseudobulb (see note 4), 68.8–156.5 cm long, 20–30-flowered. Peduncle 30.4–102.5 cm long, 5–8 mm diam. Peduncle scales 6–7, the longest 30–46 mm long, acute. Rhachis 23–54.5 cm long, 3–5 mm diam. *Floral bracts* patent to reflexed, 4–24 mm long, acute. *Flowers* most open simultaneously. *Pedicel and ovary* 11–23 mm long, longer than the bracts. *Median sepal* elliptic to obovate, 21–32 by 4–5 mm, index 4.4–8, acute to acuminate, mid-vein not thickened abaxially. *Lateral sepals* ± elliptic to obovate, falcate, 20–29 by 4.5–5.5 mm, index 3.6–6.4, acuminate, the mid-vein sometimes extending keel-like beyond the tip abaxially, mid-vein not thickened abaxially. *Petals* ± obliquely elliptic to obovate, slightly falcate, 18–27 by 4–5 mm, index 3.8–6.8, acuminate, mid-vein not thickened abaxially. *Lip* with a more or less distinct spur of 1–3 mm long; blade three-lobed, in general outline elliptic to obovate, 11–14 by 8–9 mm, index 1.2–1.7; median lobe elliptic to slightly transversely elliptic, 3.5–6 by 3–5.5 mm, index 0.8–1.7; tip acuminate; margins entire, glabrous to minutely papillose; adaxial surface glabrous to minutely papillose; lateral lobes obliquely triangular to slightly elliptic, slightly falcate, 1.5–4.0 mm long; tip obtuse; margins entire, lateral margin glabrous, median margin glabrous to minutely papillose; adaxial surface minutely papillose; lip adaxially with 5–7 keels, the median keel 9.5–12.5 mm long, starting at 0 mm, raising plate-like from the base of the lip, sometimes slowly and uninterruptedly increasing in height up to between the lateral lobes, else descending to a low keel half-way between the base and the base of the lateral lobes and raising plate-like again near the base of the lateral lobes, descending to a low ridge at the base of the median lobe, raising plate-like on the median lobe, terminating abruptly, highest distally or half-way, crest straight to slightly undulating, sometimes double-crested from 6–6.5 to 8–8.5 mm, entire proximally, denticulate on median lobe, glabrous, not thickened towards its distal end; the first pair of lateral keels 9–12 mm long, starting at 0 mm, raising plate-like from the base of the lip, sometimes slowly and uninterruptedly increasing in height up to between the lateral lobes, else descending to a low keel half-way between the base and the base of the lateral lobes, raising plate-like near the base of the lateral lobes, descending to a low ridge at the base of the median lobe, raising plate-like on the median lobe, terminating abruptly, highest distally or half-way, crest straight to slightly undulating, sometimes double-crested from 6–6.5 to 8–8.5 mm, entire proximally, denticulate on median lobe, glabrous, not thickened towards its distal end; the second (and when present, the third) pair of lateral keels 1–4 mm long, starting at 6–9 mm, the third pair when present starting more distally and shorter than the second pair, raising plate-like on the median lobe, terminating abruptly, highest distally, crest straight to slightly undulating, slightly denticulate, glabrous, not thickened towards its distal end. *Column* 8–10 mm long, stelidia absent; top part triangular, margin entire to denticulate; wings seam-like, extending up to the tip of the column foot; abaxially sometimes with a distinct longitudinal ridge from the base up to half-way the column; adaxially sometimes with a longitudinal ridge from the tip of the column foot up to 4 mm along the column; column foot 1–2 mm long. *Anther* 1.5–2 by 2 mm, abaxially with one crest; thecae distinctly 4-celled. Pollinia 8. *Fruit* not observed.

Colours – Pseudobulbs dull blue-green, sheath straw-coloured; peduncle green, peduncle

scales straw-coloured; rhachis lighter green; floral bracts light green; pedicel and ovary bright green; tepals drab purplish brown to pale green with a red mid-vein; lip cream, median lobe yellow adaxially, sometimes faintly spotted lila near base, spur yellow; column cream abaxially, suffused red adaxially, column foot yellow adaxially, sometimes spotted lila; anther cap greenish to white with red crest; pollen yellow.

Ecology – Evergreen forest; on open bank. Altitude 1200–1500 m. Flowering observed in I–IV.

Distribution – NE India; Burma; China (Yunnan); Thailand; Vietnam.

Notes – 1. Schlechter (1915) considered his *T. fuerstenbergiana* conspecific with the present species. So does Seidenfaden (1986), who states that its “origin (...) is unknown, and the type material must be considered lost.” I include it here on the authority of these authors, not having been able to find the original description or a drawing from which to ascertain its identity properly.

2. I have seen no material of *A. elata*, but according to the original description it is a large plant (inflorescence c. 100 cm long) with large flowers (tepals 1.9–2.3 cm long; three-lobed lip c. 11 by c. 7 mm with a 2 mm long spur and 3 keels starting from the base of the lip, with 2 additional keels starting at the base of the median lobe). The description fits the present species reasonably well, although it might also apply to a small-flowered *A. ruy-barrettoii*. Since the latter is endemic to Hong Kong, whereas *A. elata* is described from Yunnan in China, where the present species is also known, I tentatively include it here. *Ania elata* is reported to grow at an elevation of up to 2000 m.

3. According to Mehra & Sehgal (1976) $2n = 40$.

4. Due to the fact that the pseudobulb is more or less prostrate, the inflorescence seems to arise from the side of the pseudobulb; in fact, it arises in the same place as in the other *Anias*, namely at the base of the pseudobulb (see fig. 32).

5. Reichb. Orch. Herb. 29885 is a mixtum of the present species and one flower of *A. penangiana* (see note 6 under that species).

INCOMPLETELY KNOWN SPECIES

9. *Ania hennisiana* (Schltr.) Senghas

Ania hennisiana (Schltr.) Senghas in Schltr., Orch. 1, ed. 3 (1984) 863. – *Ascotainia hennisiana* Schltr., Orch. (1914) 317; Fedde Rep. Beih. 4 (1919) 246 ('*Ascotaenia*'); Fedde Rep. Beih. 74 (1934) t. 54, 213. – *Tainia hennisiana* (Schltr.) P. Hunt, Kew Bull. 26 (1971) 182. – Type: Hennis s.n. 1911 (not seen).

Distribution – Burma.

Note – I have seen no material of this species. From the original description and the figure given by Schlechter (1934), it might be *A. angustifolia*.

EXCLUDED SPECIES

E1. *Ania maculata* Thwaites, Enum. Pl. Zeyl. (1861) 301. – See E18. *Tainia maculata* (p. 97).

2. HANCOCKIA

Hancockia Rolfe in Forbes & Hemsley, J. Linn. Soc. Bot. 36 (1903) 20; Senghas in Schltr., Orch. 1, ed. 3 (1984) 849. – Type species: *Hancockia uniflora* Rolfe.

Chrysoglossella Hatusima, Sci. Rep. Yokosuka City Mus. 13 (1967) 29. – Type species: *Chrysoglossella japonica* Hatusima.

Plant glabrous, creeping, sympodial. *Roots* 1–2 mm diam., not branched, villous with root hairs, predominantly arising from the nodes. *Shoots* arising from the base of the terminal or subterminal internode, with a more or less persistent, tubular, acute, membranaceous scale on each node; the sterile shoots with 1 terminal leaf, alternating with the fertile shoots, the terminal internode not differentiated. *Leaf* petiolate. *Leaf blade* ovate, tip acute, margin undulate to crenulate, usually more so on one side than the other, slightly thickened, base decurrent along the petiole; thin, midvein slightly protruding abaxially, somewhat mottled. *Inflorescence* terminal, erect, arising from the base of the terminal internode of the previous shoot, one-flowered. *Floral bracts* morphologically indistinguishable from the peduncle scales. *Flowers* resupinate. *Sepals and petals* entire, lateral sepals more or less decurrent along the column foot. *Lip* adnate to the column at its base, with a slender tubular spur more than 15 mm long. *Column* semiterete, alate. *Anther* without crests, the two thecae 4-celled. Pollinia 8; stipes present (according to Rolfe, l.c.).

Ecology – Terrestrial.

Cultivation – Unknown.

Distribution – See description of the type species.

Note – Monotypic genus (but see note 3 under *H. uniflora*).

1. *Hancockia uniflora* Rolfe in Forbes & Hemsley – Fig. 33.

Hancockia uniflora Rolfe in Forbes & Hemsley, J. Linn. Soc. Bot. 36 (1903) 20; Ic. Pl. 30 (1911) t. 2945; Schltr., Orch. (1914) 130; Fedde Rep. Beih. 4 (1919) 182; Gagnepain, Fl. Gén. I.-C. 6 (1933) 338; Garay & Sweet, Orch. S. Ryukyu Isl. (1974) 167; S. Y. Hu, Q. J. Taiwan Mus. 27 (1974) 174; Seidenf., Contr. Orch. Fl. Cambodia, Laos, Vietnam (1975) 70; Anon., Ic. Corm. Sin. 5 (1976) 683, t. 8196; Senghas in Schltr., Orch. 1, ed. 3 (1984) 849. – Type: Henry 11112 (holo K, iso NY).

Chrysoglossella japonica Hatusima, Sci. Rep. Yokosuka City Mus. 13 (1967) 29. – *Hancockia japonica* (Hatusima) F. Maek., Wild Orch. Jpn. Col. (1973) 73; Senghas in Schltr., Orch. 1., ed. 3 (1984) 849. – Type: Hatusima & Sako 29680 (holo KAG) (see note 3).

Stem of sterile shoot with 1–3 internodes, 12–23 mm long, 2 mm diam. (herb.), creeping. *Pseudobulb* ± erect, cylindrical to ovoid, 5–14 by 1–2 mm; scales up to 26 mm long. *Petiole* 5–20 mm long, channelled. *Leaf blade* ovate, 3.2–5.6 by 1.5–2.6 cm, index 1.9–3.0, 11–15-veined. *Inflorescence* 1–3 cm long, 3–4 mm diam. Peduncle scales 4–5, tubular, the longest 19–33 mm long, with very pronounced veins, acute. *Pedicel and ovary* 19–30 mm long. *Median sepal* elliptic, 23–24 by 2 mm, index 12, acuminate, mid-vein not thickened abaxially. *Lateral sepals* ± obliquely elliptic, 21–23 by 3–3.5 mm, index 7, acute, mid-vein not thickened abaxially. *Petals* elliptic, 20–24 by 3 mm, index 7–8, acute, mid-vein not thickened abaxially. *Lip* with a slender, tubular spur of 16–18 mm long; blade three-lobed (but see note 3), in general outline elliptic, 19–20 by 9–9.5 mm, index 2.1; median lobe rhomboid, 6–6.5 by 7.5–8.0 mm, index 0.8, tip rounded, margins entire, slightly undulate in the more distal part, glabrous, adaxial surface glabrous; lateral lobes obliquely triangular, 2–3 mm long, tip rounded, margins entire, slightly undulate, gla-

brous, adaxial surface glabrous; keels absent from the lip, spur with a well developed, double-crested keel on the mid-vein inside, 11–15 mm long, starting at 5 mm from the ovary, gradually raising and plate-like, highest \pm half-way to distally, crest straight, entire, glabrous. *Column* c. 15 mm long, steldia absent; top part semiorbicular to truncate, margin denticulate to erose; wings seam-like, extending up to the base of the column. *Anther* c. 1.5 by c. 2 mm, abaxially without crests; thecae indistinctly 4-celled. Pollinia not observed. *Fruit* not observed.

Colours – Flowers pink.

Ecology – On very moist slope of valley, altitude 1400–1600 m. Flowering observed in VII, VIII.

Distribution – China (Yunnan); Vietnam (Tonkin); Japan (Mt. Motchon, Yakushima, according to Hatusima; Osumi Gunto, Ryukyu, according to Garay & Sweet).

Notes – 1. Herbarium specimens display typical minute wart-like spots on the leaves, the origin of which is not clear.

2. Occasionally (e.g. Pételot 3561, P) the bracts on the shoot may assume a leaf-like appearance.

3. I have not seen material of *Hancockia japonica* (Hatusima) F. Maek. From the description it seems to differ from the continental species only in the lip being entire. Until I have seen more material from the islands, I tend to agree with Garay & Sweet in classifying it as a synonym of *H. uniflora*.

3. MISCHOBULBUM

Mischobulbum Schltr., Fedde Rep. Beih. 1 (1911) 98; Rolfe, Orch. Rev. 20 (1912) 127; Schltr., Orch. (1914) 128 ('*Mischobulbon*'); Senghas in Schltr., Orch. 1, ed. 3 (1984) 849; Seidentf., Op. Bot. 89 (1986) 24. – *Tainia* Blume sect. *Mischobulbum* (Schltr.) J.J. Smith, Bull. Jard. Bot. Buit. II, 8 (1912) 6. – Lectotype species: *Mischobulbum scapigerum* (Hook. f.) Schltr. (see Senghas, l.c.).

Plants glabrous, creeping, sympodial, usually not branched. *Roots* 1–2 mm diam., not branched, villous with root hairs, predominantly arising from the nodes of the shoots. *Shoots* arising from the basal part of the last pseudobulb, with a persistent or decaying, tubular, acute, membranaceous scale on each node; the sterile shoots with 1 terminal leaf, alternating with the fertile shoots, pseudobulb consisting of one internode, erect, cylindrical, (slightly) swollen towards the base, petiole-like. *Leaf* sessile. *Leaf blade* cordate, tip acute to acuminate, margins straight to undulate, thin, 3–5 veins slightly protruding abaxially, somewhat mottled to distinctly marbled. *Inflorescence* terminal, erect, arising from the basal part of the pseudobulb. Peduncle scales tubular, acute. *Floral bracts* triangular, acute. *Flowers* most open simultaneously, resupinate. *Sepals and petals* entire. Lateral sepals \pm obliquely triangular, decurrent along the column foot. *Lip* usually very slightly saccate. *Column* semiterete, alate. *Anther* with 2 crests abaxially, the two thecae usually not divided. Pollinia 8, in 4 pairs, subequal, 1 smaller pair proximally and 1 larger pair distally in each theca; stipes present. *Fruit* ellipsoid.

Ecology – Terrestrial.

Cultivation – According to Hawkes (1965) these plants should be treated in the same way as the species of *Tainia* (see there).

Distribution – SE Asia: Sikkim; China (Guangxi, Guangdong); Taiwan; Thailand. Maleisia: Malay Peninsula; Sumatra; Borneo; Sulawesi; New Guinea. Pacific: Solomon Islands.

Note – The spelling *Mischobulbon* was first used by Schlechter in “Die Orchideen” and has reappeared regularly in the literature ever since. Schlechter never gave a reason for changing the spelling, therefore the name *Mischobulbon* should be considered a nom. illeg.

KEY TO THE SPECIES OF MISCHOBULBUM

It is advisable to consult the chapter on Materials and Methods before using the key for the first time.

- 1a. Lateral keels on the lip distinctly and regularly undulating, especially towards the tip of the lip 2
- b. Lateral keels on the lip at most slightly undulating 4
- 2a. Lip c. 11.5 mm long, the keels thickened towards the tip of the lip
7. *M. scapigerum* (Hook. f.) Schltr.
- b. Lip 16–24 mm long, the keels equally thin along their entire length 3
- 3a. Leaves with well over 20 veins, uniformly green, margins straight
6. *M. papuanum* (J.J. Smith) Schltr.
- b. Leaves with less than 20 veins, with spots of different colour, margins slightly undulate
4. *M. marmoratum* (J.J. Smith) H. Turner
- 4a. Lip distinctly 3-lobed, with 2 keels . . . 3. *M. longiscapum* Seidenf. in H. Turner
- b. Lip entire or at most very slightly 3-lobed, with 3 keels 5
- 5a. Lateral keels on the lip thickened towards the tip of the lip *and* tip of the lip rounded, fleshy 2. *M. crassum* H. Turner
- b. Lateral keels on the lip equally thin along their entire length or at most slightly thickened towards the tip of the lip, but then tip of the lip acute, thin 6
- 6a. Lateral keels on the lip extending almost to the tip of the lip; lip gradually narrowed towards the tip, without lateral lobes 5. *M. megalanthum* Tang & Wang
- b. Lateral keels on the lip not extending further than c. 2/3 of the length of the lip; lip slightly but abruptly narrowed \pm halfway towards the tip, sometimes developing true lateral lobes 7
- 7a. Length of the lip 14.5–18 mm; number of veins in leaf < 10
8. *M. wrayanum* (Hook. f.) Rolfe
- b. Length of the lip 23–29 mm; number of veins in leaf > 20
1. *M. cordifolium* (Hook. f.) Schltr.

1. *Mischobulbum cordifolium* (Hook. f.) Schltr. – Fig. 34; Plate 6b.

Mischobulbum cordifolium (Hook. f.) Schltr., Fedde Rep. Beih. 1 (1911) 98; Rolfe, Orch. Rev. 20 (1912) 127; Schltr., Fedde Rep. Beih. 4 (1919) 180; Tso, Sunyatsenia 1 (1933) 143; Hsieh, Q. J. Taiwan Mus. 8 (1955) 256; S. Y. Hu, Q. J. Taiwan Mus. 27 (1974) 438; Lin, Native Orch. Taiwan (1975) 212, t. 133, 134, fig. 48; Anon., Ic. Corm. Sin. 5 (1976) 681, t. 8191; S. Y. Hu, Gen. Orch. Hong Kong (1977) 65, t. 32; Liu & Su, Fl. Taiwan 5 (1978) 1064, t. 1624; Senghas in Schltr., Orch. 1, ed. 3 (1984) 852, fig. 653; Cheng, Form. Orch. (no date) 58, 59. – *Tainia cordifolia* Hook. f., Ic. Pl. 19 (1889) t. 1861; Rolfe, J. Linn. Soc. Bot. 36 (1903) 20; J.J. Smith, Bull. Jard. Bot. Buit. II, 8 (1912) 4; Hayata, Ic. Pl. Form. 4 (1914) 61; Sasaki, Cat. Gov. Herb. (1930) 152; S. Y. Hu, Q. J. Taiwan Mus. 28 (1975) 167. – Type: Ford 56 (holo K, iso BM, K, W).

Non *Tainia cordifolia* Hook. f. (non Hook. f.), Ann. R. Bot. Gard. Calcutta 5 (1895) 24, t. 36 (= *T. latifolia* subsp. *latifolia*).

Non *Tainia cordifolia* Gagnepain, Bull. Mus. Natl. Hist. Nat. sér. 2, 4 (1932) 706. [= *Nephelaphyllum cordifolium* (Lindley) Blume].

Taenia fauriei Schltr., Fedde Rep. 9 (1911) 282. – Type: Faurie 536 (holo P).

Nephelaphyllum simondii Gagnepain, Bull. Mus. Natl. Hist. Nat. sér. 2, 22 (1950) 504. – *Mischobulbum simondii* (Gagnepain) Seidenf. ex Averyanov, Vasc. Pl. Syn. Vietn. Fl. 1 (1990) 122. – Type: Ic. Simond 106 (holo P).

Stem of sterile shoot with 2–4 internodes, 30–95 mm long, 2–7 mm diam. (herb.). *Pseudobulb* 25–80 by 2–7 mm, scale of subterminal node decaying, 35–65 mm long. *Leaf blade* (2.0–)9.1–14.1 by (1.0–)4.3–8.8 cm, index 1.5–2.3 (2.7), acuminate; margin sometimes slightly undulate; (13–)21–29-veined. *Inflorescence* arising from the base of the pseudobulb, 19–35 cm long, 2–7-flowered. Peduncle 16.5–27.5 cm long, 3–4 mm diam. Peduncle scales 2–4, the longest 47–56 mm long. Rhachis 2.5–8 cm long, 1–2 mm diam. *Floral bracts* patent, 6–12 mm long. *Pedicel and ovary* 9–13 mm long, as long as to longer than the bracts. *Median sepal* ovate, 21.5–24.5 by 3.5–5.5 mm, index 6.1–7, acute, mid-vein slightly thickened abaxially. *Lateral sepals* 26–29.5 by 10–13 mm, index 2–2.6, acute, mid-vein slightly thickened abaxially. *Petals* obliquely ovate, 23–24 by 3.5–7 mm, index 3.3–4.0, acute, mid-vein not thickened abaxially. *Lip* blade entire with a marked sinus, in general outline ovate, 23–29 by 16–19.5 mm, index 1.4–1.5; tip acute, thin; margins entire, glabrous; adaxial surface glabrous; lip adaxially with 3 keels, the median keel 17–20 mm long, starting at 0 mm, forming a low ridge only, highest proximally to half-way, crest straight, entire, glabrous, not thickened towards its distal end; the lateral keels 13–20 mm long, starting at 0 mm, raised plate-like from the basal part of the lip, highest half-way, crest slightly curved, entire, glabrous, somewhat thickened towards its distal end. *Column* 8–10 mm long, stelia absent; top part triangular, margin entire to slightly denticulate; wings seam-like, extending up to the base of the column; column foot 11–17 mm long. *Anther* 3–4 by 2.5–3.5 mm; thecae not divided to very indistinctly 4-celled. *Fruit* 18–22 mm long; stalk 5–6 mm long.

Colours – Flowers yellow or brown; labellum yellow at tip, white spotted with pink towards the base. Fruit cream-coloured.

Ecology – Terrestrial; on silt, sandy soil, rock; in swamps and thickets, also on steep slopes. Flowering observed in V–VII, fruit observed in VII.

Distribution – China (Guangxi, Guangdong); Taiwan; Vietnam (Tonkin).

Notes – 1. The type material of *N. simondii* consists of a single drawing, together with a description, of which I have seen only a photocopy, kindly supplied by Dr. Seidenfaden. From these it is nonetheless clear that it is the same as the present species.

2. Tsang 22260 is remarkably small; where the ranges of its measurements are very different from those of the other specimens, they have been included in parentheses. Tsang 21097 is in fruit; it is included here provisionally on the basis of the remains of the flowers.

3. Reichb. Orch. Herb. 12203 is a mixtum of the present species (the single leaf, probably from Ford 56) and a species unknown to me, of which only some flowers are present.

2. *Mischobulbum crassum* H. Turner, *spec. nov.* – Fig. 35.

Mischobulbum crassum a *M. wrayano* et *M. cordifolio* apice labelli carnosio integerrimo sine sinu, carinis versus apicem labelli incrassatis, pseudobulbis longioribus differt. A *M. megalantho* distinguitur

characteribus carinarum pseudobulborumque (ut supra) et carinis apicem labelli non attingentibus. – Typus: Burt & Woods B1609, in horto botanico Edinensi cultivatus (holo E).

Stem of sterile shoot with c. 5 internodes, c. 125 mm long, c. 4 mm diam. (herb.). *Pseudobulb* c. 120 by c. 4 mm, scale of subterminal node decaying, not observed. *Leaf blade* c. 16 by c. 13 cm, index c. 1.2; acuminate; margin not undulate; 17-veined. *Inflorescence* arising c. 4 mm above the base of the pseudobulb, c. 25 cm long, c. 10-flowered. Peduncle c. 17 cm long, c. 5 mm diam. Peduncle scales c. 4, the longest c. 55 mm long. Rhachis c. 8 cm long, c. 1.5 mm diam. *Floral bracts* patent, 5–6 mm long. *Pedicel and ovary* c. 13 mm long, longer than the bracts. *Median sepal* elliptic, c. 20 by c. 5 mm, index c. 4, acute, mid-vein not thickened abaxially. *Lateral sepals* c. 22.5 by c. 9.5 mm, index c. 2.4, acute, mid-vein not thickened abaxially. *Petals* elliptic, c. 19 by c. 8 mm, index c. 2.4, acute, mid-vein slightly thickened abaxially. *Lip* blade entire, in general outline ovate, 18–23 by 18–19 mm, index 1.0–1.2; tip rounded, fleshy; margins entire, glabrous; adaxial surface glabrous; lip adaxially with 3 keels, the median keel 13–18 mm long, starting at c. 5 mm, forming a low ridge only, highest distally, crest straight proximally, slightly undulating distally, ± entire, glabrous, thickened towards its distal end; the lateral keels 14.5–15.5 mm long, starting at c. 0 mm, raised plate-like from the basal part of the lip, highest proximally, crest slightly curved proximally, slightly undulating distally, entire, glabrous, thickened towards its distal end. *Column* c. 10 mm long, stelia inconspicuous; top part triangular, margin ± entire; wings seam-like, extending ± up to the base of the column; column foot c. 11 mm long. *Anther* and pollinia not observed. *Fruit* not observed.

Colours – Tepals brownish red, spotted magenta at base; labellum spotted magenta.

Ecology – Altitude 450 m. Flowering observed in IV.

Distribution – Malay Peninsula.

Note – Only known from the type specimen.

3. *Mischobulbum longiscapum* Seidenf. in H. Turner, *spec. nov.* – Fig. 36.

Mischobulbum longiscapum forte *M. scapigeri* borneensi simillimum, a quo pseudobulbis basin multo crassioribus, scapo longissimo, labelli bicarinati lobis lateralibus falcatis acutis differt. – Typus: Seidenfaden & Smitinand GT 9684, Thailand, locus incognitus (holo C, iso L).

Pseudobulb strongly 4-angled, c. 70 mm by c. 25 mm (live material!), scale of subterminal node probably persistent. *Leaf blade* 6–10 by 3.5–6.5 cm, index 1.5–1.7, acute to slightly acuminate, margin not undulate, somewhat fleshy. *Inflorescence* arising from the base of the pseudobulb, 6–8-flowered. Peduncle 25–35 cm long. Peduncle scales c. 3, the longest c. 25 mm long. Rhachis c. 8 cm long. *Floral bracts* patent, 14–18 mm long. *Pedicel and ovary* c. 12 mm long, somewhat shorter than the bracts. *Median sepal* triangular to ovate, c. 18 by 3–4 mm, index 4.5–6, acute, mid-vein not thickened abaxially. *Lateral sepals* c. 18 by 3.5–4 mm, index 4.5–5, acute, mid-vein not thickened abaxially. *Petals* obliquely ovate, c. 19 by c. 5 mm, index c. 4.8, acute, mid-vein not thickened abaxially. *Lip* blade three-lobed, in general outline ovate when spread, c. 15 by 11–12 mm, index c. 1.3; median lobe triangular to ovate, 8–9 by 9–10 mm; tip rounded to somewhat acute, thin; margins slightly irregular, slightly papillose; adaxial surface slightly minutely papillose; lateral lobes obliquely triangular, falcate, 2–2.5 mm long; tip acute; margins entire, minutely papillose; adaxial surface minutely papillose; lip adaxially with two keels, 7–8 mm long, starting at 0 mm, raised plate-like from the basal part of the lip, highest half-

way, crest slightly curved, entire, glabrous, doubled along the highest portion, gradually decreasing in height distally. *Column* c. 4 mm long, stelidia absent; top part truncate, margin slightly denticulate; wing seam-like, extending up to 1/2 of the column foot; column foot 6–7 mm long. *Anther* c. 1–1.5 by c. 2 mm; thecae indistinctly 4-celled. *Fruit* not observed.

Colours – Leaf glossy dark green above, brownish purple below. Peduncle and rhachis brown. Floral bracts drying brown. Ovary with six brown lines. Sepals and petals green with weak brownish veins. Lip greenish yellow, especially above turning more yellow; keels yellow. Column and column foot with tiny red dots adaxially. Crests on anther cap with a red marking.

Ecology – Unknown.

Distribution – Thailand, locality unknown.

Note – Only known from the type specimen grown by Seidenfaden in Copenhagen.

4. *Mischobulbum marmoratum* (J.J. Smith) H. Turner, *stat. nov.* – Fig. 37.

Tainia papuana J.J. Smith var. *marmorata* J.J. Smith, Bot. Jahrb. 665 (1933) 461. – Type: Kjellberg 2939 (holo S, iso BO, L).

Stem of sterile shoot with 4–8 internodes, 55–85 mm long, 1–3 mm diam. (herb.). *Pseudobulb* 40–60 by 1–3 mm, scale of subterminal node somewhat persistent, 30–40 mm long. *Leaf blade* 4.3–9.3 by 2.1–3.0 cm, index 2.1–3.0, acute to acuminate; margin slightly undulate; 11–19-veined. *Inflorescence* arising from the base of the pseudobulb, 17.5–24.5 cm long, 2–5-flowered. Peduncle 12–20 cm long, 2–4 mm diam. Peduncle scales 4–6, the longest 25–45 mm long. Rhachis 4.5–5.5 cm long, 1 mm diam. *Floral bracts* patent to spreading, 4–8 mm long. *Pedicel and ovary* 6–12 mm long, longer than the bracts. *Median sepal* ovate to elliptic, 15–16 by 3–3.5 mm, index 4.3–5.3, acute, mid-vein not thickened abaxially. *Lateral sepals* 15–19 by 5.5–7 mm, index 2.4–3.5, acute, mid-vein not thickened abaxially. *Petals* ± obliquely elliptic, 14–15.5 by 4–5.5 mm, index 2.8–3.8, acute, mid-vein not thickened abaxially. *Lip* blade entire, in general outline ovate, 16–20 by 6.5–10.5 mm, index 1.9–2.5; tip acute, thin; margins entire, minutely papillose; adaxial surface ± glabrous; lip adaxially with 3 keels, the median keel 13–16 mm long, starting at 0 mm, forming a low ridge, raised plate-like in the distal part of the lip only, highest distally, crest straight proximally, slightly to distinctly undulating distally, entire, glabrous, not thickened towards its distal end; the lateral keels 12–15 mm long, starting at 0 mm, highest half-way to distally, crest distinctly undulating, entire, glabrous, not thickened towards its distal end. *Column* 7–7.5 mm long, stelidia absent; top part truncate, margin dentate; wings seam-like, extending up to 1/3 of the column foot; column foot 7–8 mm long. *Anther* c. 2 by c. 2 mm; thecae not divided. Pollinia not observed. *Fruit* not observed.

Colours – Leaves marbled. Flowers olive green; adaxial side of lip and column spotted with purple.

Ecology – In humid soil. Altitude 700 m. Flowering observed in XII.

Distribution – Sulawesi.

Note – This species differs from *M. papuanum* mainly in the leaves: these are mottled, with undulate margin and fewer veins. Since it is also allopatric with *M. papuanum*, I have decided to give it specific status. Only known from the type specimen.

5. *Mischobulbum megalanthum* Tang & Wang – Fig. 38.

Mischobulbum megalanthum Tang & Wang, Acta Phytotax. Sin. 1 (1951) 38, 76. – *Nephelaphyllum grandiflorum* auct. non Hook. f.: King & Pantl., Ann. R. Bot. Gard. Calc. 8 (1898) 104, t. 144. – *Mischobulbum grandiflorum* Rolfe, Orch. Rev. 20 (1912) 127 (nom. illeg.); A. Hawkes, Enc. Cult. Orch. (1965) 302 (nom. illeg.). – Type: Pantling 206 (holo CAL, iso AMES, FI, W).

Tainia wayana auct. non J.J. Smith: Pradhan, Ind. Orch. 2 (1979) 242; Hedge & Rao, J. Econ. Tax. Bot. 4, 2 (1983) 389.

Non *Nephelaphyllum grandiflorum* Hook. f., Fl. Br. Ind. 6 (1890) 192 (= *M. wrayanum* (Hook. f.) Rolfe).

Stem of sterile shoot with 2 (?) internodes, 60–85 mm long, 2.5–5 mm diam. (herb.). *Pseudobulb* 55–75 by 2.5–5 mm, scale of subterminal node decaying, not observed. *Leaf blade* 11.5–13.5 by 5.1–7.2 cm, index 1.8–2.1; acuminate; margin not undulate; 5–7-veined. *Inflorescence* arising from the base of the pseudobulb, 17–30 cm long, 4–8-flowered. Peduncle 12.5–18 cm long, 3–6 mm diam. Peduncle scales 3, the longest 35–60 mm long. Rhachis 4.5–10 cm long, 1–2 mm diam. *Floral bracts* patent, 7–14 mm long. *Pedicel and ovary* 9–10 mm long, about as long as the bracts. *Median sepal* elliptic, c. 17 by c. 3 mm, index c. 5.7, acute, mid-vein not thickened abaxially. *Lateral sepals* c. 18.5 by c. 8 mm, index c. 2.3, acute, mid-vein not thickened abaxially. *Petals* obliquely elliptic, c. 15 by c. 5.5 mm, index c. 2.7, acute, mid-vein not thickened abaxially. *Lip blade* entire, in general outline elliptic, c. 16 by c. 14 mm, index c. 1.1; tip acute, fleshy; margins entire, glabrous, adaxial surface glabrous; lip adaxially with 3 keels, the median keel c. 16 mm long, starting at 0 mm, raised plate-like from the basal part of the lip, highest distally, crest straight, entire, glabrous, not thickened towards its distal end; the lateral keels c. 15 mm long, starting at 0 mm, raised plate-like from the basal part of the lip, highest half-way, crest slightly curved, entire, glabrous, not thickened towards its distal end. *Column* c. 6.5 mm long, stelidia absent; top part semiorbicular, margin slightly denticulate; wings seam-like, extending up to the base of the column; column foot c. 9.5 mm long. *Anther* c. 2 by c. 2 mm; thecae very indistinctly 4-celled. *Fruit* c. 17 mm long; stalk c. 5 mm long.

Ecology – Altitude 300 m. Flowering observed in III, fruit observed in VII.

Distribution – NE India, Sikkim.

Notes – 1. Pantling 206 includes several differently labelled sets.

2. This taxon was originally misidentified by King & Pantling as *Nephelaphyllum grandiflorum* Hook. f. Rolfe (1912) corrected this and proposed as a new name *M. grandiflorum*. However, this combination was already made by Schlechter (1911) (see *M. wrayanum*). Therefore Tang & Wang (1951) proposed as a new name *M. megalanthum*.

6. *Mischobulbum papuanum* (J.J. Smith) Schltr. – Fig. 39.

Mischobulbum papuanum (J.J. Smith) Schltr., Fedde Rep., Beih. 1 (1911) 98; Rolfe, Orch. Rev. 20 (1912) 127; Senghas in Schltr., Orch. 1, ed. 3 (1984) 852. – *Tainia papuana* J.J. Smith, Bull. Dep. Agric. Ind. Neerl. 39 (1910) 21; Nova Guinea 8 (1911) 528, t. 77B; Bull. Jard. Bot. Buit. II, 8 (1912) 5, 6; Senghas in Schltr., Orch. 1, ed. 3 (1984) 854 (?). – Syntypes: Von Römer 944, 966 (BO, not seen). Non *Tainia papuana* Gagnepain, Bull. Mus. Natl. Hist. Nat. sér. 2, 4 (1932) 706 [= *Collabium papuanum* (Schltr.) Schltr.].

Mischobulbum lancilabium Schltr., Fedde Rep., Beih. 1 (1911) 99; ibid. Beih. 21 (1923) t. 134; Senghas in Schltr., Orch. 1, ed. 3 (1984) 852. – *Tainia lancilabium* (Schltr.) J.J. Smith, Bull. Jard. Bot. Buit. II, 8 (1912) 6. – *Mischobulbum lancifolium* Rolfe, Orch. Rev. 20 (1912) 127. – Syntypes: Schlechter 17469, 19522, 20127 (not seen, probably destroyed during World War II).

Stem of sterile shoot with 2–4 internodes, 60–150 mm long, 2–4 mm diam. (herb.). *Pseudobulb* 40–105 by 2–4 mm, scale of subterminal node somewhat persistent, 30–70 mm long. *Leaf blade* 6.5–16.8 by 3.0–9.1 cm, index 1.4–2.2, acuminate; margin not undulate; 23–47-veined. *Inflorescence* arising 0–14 mm above the base of the pseudobulb, 14.8–33.8 cm long, 3–9-flowered. Peduncle 11.6–22.5 cm long, 3–6 mm diam. Peduncle scales (3) 4 (5), the longest 36–52 mm long. Rhachis 3.0–8.5 cm long, 1–2 mm diam. *Floral bracts* patent, 3–14 mm long. *Pedicel and ovary* 8–16 mm long, longer than the bracts. *Median sepal* elliptic, 15–22 by 2.5–5 mm, index 4.2–6, acute, mid-vein sometimes thickened abaxially. *Lateral sepals* 15.5–24 by 5–9 mm, index 2.1–4, acute, mid-vein usually not thickened abaxially. *Petals* elliptic, 14.5–20 by 4–7.5 mm, index 2.5–4, acute, mid-vein usually thickened abaxially. *Lip blade* entire, in general outline ovate, 17–24 by 9–13 mm, index 1.6–2.2; tip acute to acuminate, thin; margins entire, slightly to distinctly undulating distally, minutely papillose; adaxial surface glabrous to minutely papillose; lip adaxially with 2 or 3 keels, the median keel absent to 18 mm long, starting at 0–15 mm, raised plate-like from the basal part of the lip or so much further up the lip as the keel starts, highest half-way to distally, crest straight to distinctly undulating, entire, sometimes interrupted, glabrous, not thickened towards its distal end; the lateral keels 12–18 mm long, starting at 0 mm, raised plate-like from the basal part of the lip, highest half-way to distally, crest distinctly undulating, entire, glabrous, not thickened towards its distal end. *Column* 6.5–8.5 mm long, stelia absent; top part truncate to slightly triangular, margin \pm entire to denticulate; wings seam-like, extending up to the base of the column, sometimes decurrent up to 1/3 of the column foot; column foot 6–7 mm long. *Anther* 2–2.5 by 2–2.5 mm; thecae not divided to indistinctly 4-celled, sometimes only a filament remaining where the dividing septa meet. *Fruit* 15–20 by 2–4 mm; stalk 4–7 mm long.

Colours – Leaves dark green adaxially, light green abaxially; veins purple. Ovaries dark (purplish) green. Flowers yellowish green to brownish, with brown or red veins; lip yellow, whitish brown or spotted light purple at base, orange at tip, lateral lobes yellow, lateral keels yellow, bordered by a blackish brown edge, veins purple, in some specimens (NGF 13882) entire lip purple; column yellowish green to white, dark spotted purple at base and on back, sometimes entirely purple; anther yellow. Fruit dark green.

Ecology – Lowland to montane forest (among others *Castanopsis*–*Quercus* forest with *Himantandra* and *Araucaria*), on humus-rich soils, altitude 60–1900(–2400) m. Terrestrial. Flowering throughout the year.

Distribution – Malesia: New Guinea. Pacific: Solomon Islands.

Note – The median keel on the lip of this species is rather variable. In some specimens it is rudimentary, appearing only in the more distal part of the lip as a low keel, which may even be interrupted. In others it is more pronounced, extending from the base of the lip upward, albeit usually as a thickening of the nerve only in the proximal part. In some specimens the median keel undulates, in others not. These two character states do not seem to be correlated, and may even be found in different combinations within one collection number (e.g. T.G. Hartley 10998). This made me decide to group all the specimens seen (which could not be separated on the basis of other characters anyhow) in the same taxon. In dried specimens the tip of the lip assumes a characteristic dark colour.

7. *Mischobulbum scapigerum* (Hook. f.) Schltr. – Fig. 40.

Mischobulbum scapigerum (Hook. f.) Schltr., Fedde Rep. Beih. 1 (1911) 98; Rolfe, Orch. Rev. 20 (1912) 127; J. Linn. Soc. Bot. 42 (1914) 153; Schltr., Orch. (1914) 129; Ames & C. Schweinf., Orch. 6 (1920) 18; Ames, J. Str. Br. R. As. Soc., Spec. No. (1921) 142; Carr, Gard. Bull. Str. Settl. 8 (1935) 202; Masam., Enum. Phan. Born. (1942) 198; A. Hawkes, Enc. Cult. Orch. (1965) 302; Senghas in Schltr., Orch. 1, ed. 3 (1984) 851. – *Nephelaphyllum scapigerum* Hook. f., Bot. Mag. 89 (1863) t. 5390. – *Tainia scapigera* (Hook. f.) J.J. Smith, Bull. Jard. Bot. Buit. II, 8 (1912) 6; Gagnepain, Bull. Mus. Natl. Hist. Nat. sér. 2, 4 (1932) 706. – Type: Low s.n. (not seen).

Stem of sterile shoot with 4–5 internodes, 90–110 mm long, 3–7 mm diam. (herb.). *Pseudobulb* 65–90 by 2–4 mm, scale of subterminal node somewhat persistent, 57–65 mm long. *Leaf blade* 9.6–13.0 by 5.4–9.5 cm, index 1.4–2.1, acuminate; margin not undulate; 29–43-veined. *Inflorescence* arising 0–8 mm above the base of the pseudobulb, 15–25.5 cm long, 9–16-flowered. Peduncle 11–18 cm long, 3–5 mm diam. Peduncle scales 4, the longest 32–47 mm long. Rhachis 3.3–8 cm long, 1 mm diam. *Floral bracts* patent, 5–9 mm long. *Pedicel and ovary* 9–15 mm long, longer than the bracts. *Median sepal* ovate to elliptic, 10.5–15 by 2.5–4 mm, index 3.5–4.3, acute, mid-vein slightly thickened abaxially. *Lateral sepals* 10.5–16 by 5.5–8 mm, index 1.5–2.9, acute, mid-vein slightly thickened abaxially. *Petals* obliquely elliptic to ovate, 8–12.5 by 3–5.5 mm, index 1.5–3, acute, mid-vein slightly thickened abaxially. *Lip* blade entire, in general outline elliptic, 11–15 by 5.5–7 mm, index 1.7–2.1; tip rounded to slightly acuminate, thin; margins entire, minutely papillose, undulating; adaxial surface minutely papillose; lip adaxially with 3 keels, the median keel 10–11 mm long, starting at 0–1 mm, raised plate-like from \pm half-way the lip, highest distally, crest straight proximally, distinctly undulating distally, entire, glabrous, thickened towards its distal end; the lateral keels 10–11 mm long, starting at 0–1 mm, raised plate-like from the basal part of the lip, highest half-way to distally, crest distinctly undulating, entire, glabrous, thickened towards its distal end. *Column* 5–8 mm long, stelia absent; top part semiorbicular, margin denticulate; wings seam-like, extending up to 1/4–1/2 of the column foot; column foot 7.5–10 mm long. *Anther* c. 1.5 by c. 2 mm; thecae not divided. *Fruit* not observed.

Colours – Pseudobulbs purplish, sheaths straw-coloured. Leaves mottled. Scape light green with reddish brown spots. Flower buds purple. Tepals light brown to dull yellowish, veined purple; lip white with fine purple spots, crests purple, tip orangy yellow, base orangy yellow to purple. Column white with fine purple spots to dark purple; tip of column foot yellow. Anther cap yellow.

Ecology – High forest; in the shade among rocks on ridge, in sandstone soil. Altitude 250–900 m. Flowering observed in I, V–VII, IX, XII.

Distribution – Borneo.

8. *Mischobulbum wrayanum* (Hook. f.) Rolfe – Fig. 41.

Mischobulbum wrayanum (Hook. f.) Rolfe, Orch. Rev. 20 (1912) 127; Ridley, Fl. Mal. Penin. 4 (1924) 115; A. Hawkes, Enc. Cult. Orch. (1965) 302; Senghas in Schltr., Orch. 1, ed. 3 (1984) 852; Seidenf., Op. Bot. 89 (1986) 24. – *Ipsea ? wrayana* Hook. f., Fl. Br. Ind. 5 (1890) 812; Ic. Pl. 21 (1892) t. 2085. – *Tainia wrayana* (Hook. f.) J.J. Smith, Bull. Jard. Bot. Buit. II, 8 (1912) 6; Cumberlege & Cum-

- berlege, Nat. Hist. Bull. Siam Soc. 20 (1963) 159; Holttum, Fl. Malaya 1, ed. 3 (1964) 183; Seidenf. & Smitn., Orch. Thail. 4, 2 (1965) 740, t. 550; Seidenf., Nord. J. Bot. 2 (1982) 214. – Type: Wray 235 (holo SING).
- Non *Tainia wrayana* auct. non J.J. Smith: Pradhan, Ind. Orch. 2 (1979) 242; Hedge & Rao, J. Econ. Tax. Bot. 4, 2 (1983) 389 (= *M. megalanthum* Tang & Wang).
- Mischobulbum grandiflorum* (Hook. f.) Schltr., Fedde Rep. Beih. 1 (1911) 98. – *Nephelaphyllum grandiflorum* Hook. f., Fl. Br. Ind. 6 (1890) 192; Ann. R. Bot. Gard. Calcutta 5, 1 (1895) 23, t. 34. – *Tainia atropurpurea* Ridley, J. Linn. Soc. 32 (1896) 4315 (nom. illeg.); Burkill & Henderson, Gard. Bull. Str. Settl. 3 (1925) 437. – *Tainia grandiflora* (Hook. f.) Gagnepain, Bull. Mus. Natl. Hist. Nat. sér. 2, 4 (1932) 706. – Syntypes: 2 plates: Scortechini and Kunstler (both in CAL, not seen).
- Non *Mischobulbum grandiflorum* Rolfe, Orch. Rev. 20 (1912) 127 (nom. illeg.); Schltr., Orch. (1914) 129. – *Nephelaphyllum grandiflorum* auct. non Hook. f.: King & Pantling, Ann. R. Bot. Gard. Calc. 8 (1898) 104, t. 144 (= *M. megalanthum* Tang & Wang, see note 2 there).
- Tainia sumatrana* J.J. Smith, Bull. Jard. Bot. Buit. III, 5 (1922) 24; ibid. Suppl. 2 (1930) t. 22, 4; Blumea 5 (1943) 318. – Syntypes: Lörzing 7312 (lecto BO, here chosen), Bünnemeijer 4043 (BO).

Stem of sterile shoot with 5 internodes, 70–108 mm long, 2–3 mm diam. (herb.). *Pseudobulb* 65–90 by 2–3 mm, scale of subterminal node decaying, 40–55 mm long. *Leaf blade* (6.8) 10.5–16.2 by (3.5) 6–9.6 cm, index 1.7–2.0; acuminate; margin undulate; 7–9-veined. *Inflorescence* arising \pm from the base of the pseudobulb, 16.5–23 cm long, 2–13-flowered. Peduncle 11.5–20 cm long, 3–6 mm diam. Peduncle scales 3–4, the longest 30–55 mm long. Rhachis (1.5) 4–10 cm long, 1–3 mm diam. *Floral bracts* patent, 6–11 mm long. *Pedicel and ovary* 6–13 mm long, about as long as the bracts. *Median sepal* elliptic, 16–17 by 3–4 mm, index 4.1–5.6, acute, mid-vein thickened abaxially. *Lateral sepals* (14) 17–18.5 by 5.5–9.5 mm, index 1.9–2.5, acute, mid-vein not thickened abaxially. *Petals* elliptic, (10) 14–17 by (4) 6–7.5 mm, index 2.4–3.5, acute, mid-vein thickened abaxially. *Lip* blade entire with a marked sinus to slightly three-lobed, in general outline ovate, 14.5–18 by (8.5) 13–16 mm, index 1.1–1.2 (1.7); median lobe where present triangular, c. 7–8 by c. 11 mm, index c. 1.4–1.6; tip acute to rounded, fleshy; margins entire, glabrous to minutely papillose; adaxial surface glabrous to minutely papillose; lateral lobes where present obliquely triangular, 1–1.5 mm long; tip rounded; margins entire, minutely papillose; adaxial surface glabrous; lip adaxially with 3 keels, the median keel an inconspicuous thickening of the mid-vein; the lateral keels 11–14 mm long, starting at 0 mm, raised plate-like from the basal part of the lip, highest half-way, crest straight to slightly curved, entire, glabrous, not thickened towards its distal end. *Column* (6) 8–9.5 mm long, stelia absent; top part triangular, margin entire to slightly denticulate; wings seam-like, extending up to the tip of the column foot as a very narrow seam; column foot 6–10 mm long. *Anther* 1.5–2 by 1.5–2 mm; thecae not divided to very indistinctly 4-celled. *Fruit* not observed.

Colours – Leaves variegated, light green, but, especially along the major veins, with darker parts; abaxially generally lighter in colour. General colour of flowers wine-red, with wine-red marks on a yellow background towards the base; lip pale carmine abaxially, with carmine marks on a yellow ground adaxially, margins banded with dark brown, bordered centrally with a yellow stripe on both surfaces, tip wine-red, merging abaxially with the prevailing carmine colour; column pale yellow with carmine marks.

Ecology – Upper hill to montane forest, in shaded patches on soils rich in humus. Altitude 850–1750 m. Flowering observed in I, II, IV–VI.

Distribution – SE Asia: Thailand. Malesia: Malay Peninsula; Sumatra.

Note – Shape of the lip quite variable, sometimes with distinct lateral lobes, more usually with only a marked sinus. The specimens from Sumatra have only 2 or 3 flowers in their inflorescences, those from the mainland 6–13. Van Steenis 9216 is much smaller than the other specimens (measurements in parentheses in the description), but otherwise very similar. As the Sumatran specimens are very similar in all other respects to those of the mainland, I have not given them separate status.

INCOMPLETELY KNOWN SPECIES

9. *Mischobulbum emeiensis* Lang

Mischobulbum emeiensis Lang, Acta Phytotax. Sin. 20 (1982) 185. – Type: Lang, Gao & Yang 023 (holo PE, not seen).

Distribution – China (Emei Shan, Sichuan).

Note – I have seen no specimens of this taxon. The description and figure given in the original publication resemble *T. macrantha*, but show a smaller species with a short column and column foot.

4. TAINIA

Tainia Blume, Bijdr. (1825) 354; Tab. Pl. 36 (1825) t. 48; Lindley, Gen. Sp. Orch. (1831) 132; Reichb. f., Bonplandia 5 (1857) 53; Hook. f., Fl. Br. Ind. 5 (1890) 819; *ibid.* 6 (1890) 192; Schltr., Fedde Rep. Beih. 1 (1911) 100; Orch. (1914) 129; Gagnepain, Bull. Mus. Natl. Hist. Nat. sér. 2, 4 (1932) 705; Seidenf. & Smitin., Orch. Thail. 2, 1 (1959) 99; Holttum, Fl. Malaya 1, ed. 3 (1964) 180; A. Hawkes, Enc. Cult. Orch. (1965) 459; P. Hunt, Kew Bull. 26 (1971) 181; Senghas in Schltr., Orch. 1, ed. 3 (1984) 852; Seidenf., Op. Bot. 89 (1986) 27. – *Mitopetalum* Blume, Fl. Jav. (1828) viii (Introduction); Mus. Bot. L.-B. 2 (1856) 185; Fl. Jav. n.s., 1 (1858) 133, t. 50, 51, 54. – Type species: *Tainia speciosa*.

Plant glabrous, creeping, sympodial, usually not branched. Roots 1–3 mm diam., not branched, villous with root hairs. Shoots arising from the basal part of the last pseudobulb, with a persistent or decaying, tubular, acute, membranaceous scale on each node; the sterile shoots with 1 terminal leaf, in principle alternating with the fertile shoots. *Pseudobulb* consisting of one internode, erect, cylindrical to slightly ovoid, rarely somewhat conical, sometimes swollen towards the base. *Leaf* petiolate. *Leaf blade* elliptic to ovate, rarely obovate, tip acute to acuminate, margins straight to slightly undulating to crenulate, base decurrent along the petiole. *Inflorescence* terminal, rarely lateral, erect, arising from the basal part of the terminal internode, rarely from the subterminal internode of the previous shoot. Peduncle scales tubular, acute. *Floral bracts* triangular, rarely ovate. *Flowers* usually most open simultaneously, resupinate. *Sepals and petals* \pm triangular to ovate to elliptic to obovate, entire, lateral sepals slightly decurrent along the column foot, the decurrent part curved downward and around the column foot. *Lip* without a spur, rarely very slightly saccate. *Column* semiterete, alate. *Anther* usually with 2 crests abaxially, the 2 thecae usually 4-celled. Pollinia 8, rarely 6, in 4 pairs, subequal, 1 smaller pair proximally and 1 larger pair distally in each theca; stipes probably always present. *Fruit* ellipsoid.

Ecology – Terrestrial, rarely epiphytic.

Cultivation – According to Hawkes (1965) *Tainias* thrive well in a potting medium of one-third rich loam, one-third well rotted manure, one-sixth shredded osmunda and one-

sixth chopped treefern fibre. Regular additional fertilizing is advisable. A rest period of about three weeks immediately after the new pseudobulbs are formed will improve the quality of the inflorescences. Temperatures should be fairly high throughout the year, and a brightly lighted place seems to give the best results, although care should be taken that the rather thin foliage does not become burnt. The plants are best repotted immediately after flowering. Separating the pseudobulbs into small clumps seems to result in a more vigorous inflorescence the next season.

Distribution – SE Asia: Sri Lanka; India; Sikkim; Burma; China (Yunnan, Guangdong); Hong Kong; Japan (Yakusima; Ryukyu Islands, acc. to Garay & Sweet); Thailand; Vietnam. Malesia: Malay Peninsula; Sumatra; Java; Borneo; Ternate; New Guinea. Australia (N Queensland, acc. to Dockrill). Pacific: Bougainville.

Note – Chromosome numbers of $2n = 30-40$ have been reported in *Tainia*. In three of the four species investigated thus far, a complement of 0–4 B-chromosomes has been found. Radhamoni et al. (1985) surmise that this might be a special feature of the genus.

KEY TO THE SPECIES OF TAINIA

It is advisable to consult the chapter on Materials and Methods before using the key for the first time.

- 1a. Lip three-lobed 2
- b. Lip entire 13
- 2a. Lateral keels on the lip \pm straight or (distally) slightly undulating, simple lamellae with at most a thickened or doubled crest 3
- b. Lateral keels on the lip either distinctly undulating over their entire length, or ending in a disc-like flap, or ending among a dense mass of laciniate flaps 10
- 3a. Inflorescence arising directly from a node 4
- b. Inflorescence arising at least 2 mm above a node 7
- 4a. Mature plant less than c. 15 cm high excluding the inflorescence; leaves mottled

4. *T. laxiflora* (Ito ex Makino) Makino
- b. Mature plants usually well over 25 cm high, rarely smaller; leaves uniformly coloured 5
- 5a. Leaf blade index less than 3; lip longer than 15 mm

1. *T. bicornis* (Lindley) Reichb. f.
- b. Leaf blade index higher than 4; lip shorter than 15 mm 6
- 6a. Median lobe of the lip transversely elliptic to slightly cuneate; column longer than 6 mm

2. *T. dunnii* Rolfe
- b. Median lobe of the lip triangular; column c. 3 mm long 11. *T. sessilifolia* Fraser
- 7a. Lip with five keels 7. *T. minor* Hook. f.
- b. Lip with three (rarely two) keels 8
- 8a. Column c. 3 mm long 11. *T. sessilifolia* Fraser
- b. Column longer than 5 mm 9

- 9a. Lip elliptic to ovate, shorter than 20 mm; column foot shorter than 3 mm
3. *T. latifolia* (Lindley) Reichb. f.
b. Lip rhomboid-hastate, longer than 30 mm; column foot longer than 10 mm
5. *T. macrantha* Hook. f.
- 10a. Lateral keels on the lip distinctly undulating 11
b. Lateral keels on the lip straight or at most slightly undulating 12
- 11a. Inflorescence terminal; lip obpandurate, rarely \pm ovate in general outline when spread
8. *T. obpandurata* H. Turner
b. Inflorescence lateral; lip elliptic in general outline when spread
9. *T. paucifolia* (Breda) J.J. Smith
- 12a. Tepals distinctly caudate; keels extending up to \pm two-thirds the length of the lip, ending among a dense mass of lacinate flaps covering the adaxial surface between the lateral lobes 6. *T. maingayi* Hook. f.
b. Tepals obtuse; keels extending almost to the tip of the lip, ending in a disc-like flap
13. *T. trinervis* (Blume) Reichb. f.
- 13a. Lip pandurate to obpandurate when spread 14
b. Lip ovate, elliptic or rhomboid-hastate when spread 16
- 14a. Keels on the lip distinctly undulating; pseudobulbs longer than 5 cm
8. *T. obpandurata* H. Turner
b. Keels on the lip \pm straight or at most slightly undulating; pseudobulbs shorter than 2 cm 15
- 15a. Lip no more than c. 4 mm wide, with 3 keels 4–5 mm long
10. *T. purpureifolia* Carr
b. Lip at least 7 mm wide, with 2 keels 1.5–2.5 mm long
14. *T. vegetissima* Ridley
- 16a. Tepals distinctly caudate 12. *T. speciosa* Blume
b. Tepals slightly acuminate to obtuse 17
- 17a. Lip \pm elliptic, shorter than 15 mm; column foot shorter than 3 mm
3a. *T. latifolia* subsp. *latifolia*
b. Lip \pm rhomboid-hastate, longer than 30 mm; column foot longer than 10 mm
5. *T. macrantha* Hook. f.

Tainia bicornis (Lindley) Reichb. f., Bonplandia 5 (1857) 54; Hook. f., Fl. Br. Ind. 5 (1890) 820; Trimen, Fl. Ceyl. 4 (1898) 169; J.J. Smith, Bull. Jard. Bot. Buit. II, 8 (1912) 6; C. Fischer, Fl. Pres. Madras 3 (1928) 1427; Rao, Bull. Bot. Surv. Ind. 8 (1966) 226; Rathakr., Bull. Bot. Surv. Ind. 13 (1971) 5; Ind. Forest. 98 (1972) 31; Jayaw. in Dassan. & Fosb., Fl. Ceyl. 2 (1981) 147; Seidenf., Nord. J. Bot. 2 (1982) 214 (p.p.); Radhamoni et al., N. Bot. 12, 2-4 (1985) 78, figs. 4-9; Vajravelu et al., J. Econ. Tax. Bot. 10 (1987) 297; Vajravelu, J. Econ. Tax. Bot. 11 (1987) 283. — *Ania bicornis* Lindley, Bot. Reg. (1847) Misc. 37; Senghas in Schltr., Orch. 1, ed. 3 (1984) 863. — *Mitopetalum bicorne* (Lindley) Blume, Mus. Bot. L.-B. 2 (1856) 185; Fl. Jav. n.s., 1 (1858) 134. — *Eria bicornis* (Lindley) Reichb. f., Walp. Ann. 6 (1861) 269. — Type: Clowes s.n. (holo K, not seen; see under *A. latifolia* Wight below). Non *Tainia bicornis* Seidenf. & Smitin., Orch. Thail. 2, 1 (1959) 104; ibid. 4, 2 (1965) 743, fig. 552; Seidenf., Nord. J. Bot. 2 (1982) 214 (p.p.) (= *T. latifolia* subsp. *latifolia*).

Ania latifolia Wight (non Lindley), Ic. Pl. 3 (1852) t. 914 (nom. nud.). – *Mitopetalum wightii* Blume, Mus. Bot. L.-B. 2 (1856) 185; Fl. Jav. n.s., 1 (1858) 134. – *Eria wightii* (Blume) Reichb. f., Walp. Ann. 6 (1861) 270. – Type: Clowes s.n. (1844) (holo K) (possibly the same as the type specimen of *A. bicornis* Lindley).

Stem of sterile shoot with 4 internodes, 72–81 mm long, 2–5 mm diam. (herb.). *Pseudobulb* cylindrical, swollen towards the base, 45–69 by 4–10 mm, scale of subterminal node somewhat decaying, 74–90 mm long. *Petiole* 70–130 mm long. *Leaf blade* broadly elliptic, 14–17 by 6.9–7.5 cm, index 2–2.4, acuminate; margin not undulate; thin, 41–65-veined (3 thickened). *Inflorescence* terminal, 45.4–60.4 cm long, arising from the base of the pseudobulb, 10–17-flowered. Peduncle 31.1–37.5 cm long, 2–3 mm diam. Peduncle scales 4, the longest 31–52 mm long. Rhachis 7.9–29.3 cm long, 2 mm diam. *Floral bracts* patent to spreading, triangular, 6–18 mm long. *Flowers* most open simultaneously. *Pedicel and ovary* 5–18 mm long, shorter or slightly longer than the bracts. *Median sepal* elliptic, 19.5–25 by 2–2.5 mm, index 9.8–10, obtuse to acute, mid-vein not thickened abaxially. *Lateral sepals* ± elliptic, slightly falcate, 18–25 by 2–2.5 mm, index 7.2–10, ± obtuse to acute, mid-vein not to slightly thickened abaxially. *Petals* obliquely elliptic, slightly falcate, 19–23 by 2.5–3 mm, index 6.7–7.6, obtuse, mid-vein not to slightly thickened abaxially. *Lip* blade three-lobed, in general outline obovate, 15–19 by 10–12 mm, index 1.4–1.6; median lobe transversely elliptic, 4–6 by 10–12 mm, index 0.4–0.5; tip slightly retuse to slightly acuminate; margins entire to slightly erose, glabrous to minutely papillose; adaxial surface glabrous to minutely papillose; lateral lobes obliquely triangular, 1–2.5 mm long; tip obtuse; margins entire, glabrous; adaxial surface minutely papillose proximally, glabrous distally; lip adaxially with 3 keels, the median keel 4–18 mm long, starting at 0–9 mm, sometimes interrupted, forming a low ridge only, sometimes increasing in height somewhat distally, then terminating abruptly and highest half-way to distally, crest straight, entire, glabrous, usually thickened towards its distal end; the lateral keels 12–16.5 mm long, starting at 0–1 mm, raised plate-like from the basal part of the lip, highest half-way, sometimes increasing in height again somewhat distally, terminating abruptly, crest ± straight, entire, glabrous, doubled along the highest portion, usually thickened towards its distal end. *Column* 8.5–9 mm long, stelidia absent; top part semiorbicular, margin ± entire to slightly denticulate; wings seam-like, extending up to the tip of the column foot; column foot 1.5–2.5 mm long, with an abaxial ridge. *Anther* c. 2 by 2 mm, abaxially with 2 crests; thecae indistinctly 3- to 4-celled. Pollinia 8. *Fruit* not observed.

Colours – Tepals green; lip yellow at apex, dotted red along margin; column liberally dotted red.

Ecology – In shade in wet deciduous forest; in evergreen high forest. Altitude 900–1300 m. Flowering observed in I.

Distribution – Sri Lanka; S India.

Notes – 1. Radhamoni et al. (l.c.) found that *T. bicornis* possesses $2n = 30+3B$ chromosomes.

2. The type specimen of *Ania latifolia* Wight, Clowes s.n. 1844, from the Lindley herbarium in Kew, has a somewhat more elongate leaf (9.8 by 2.2 cm) with less veins (29) than found in the other specimens. Also, the bracts are distinctly shorter than the pedicel + ovary. I did not analyse a flower from the sheet, but based on the accompanying drawing and the fact that the present species is the only *Tainia* occurring in Sri Lanka, I tentatively include it here. I have not, however, included its measurements in the description.

2. *Tainia dunnii* Rolfe – Fig. 43.

Tainia dunnii Rolfe, J. Linn. Soc. Bot. 38 (1908) 368; Schltr., Fedde Rep. Beih. 4 (1919) 180; S. Y. Hu, Q. J. Taiwan Mus. 28, 1+2 (1975) 167; Anon., Ic. Corm. Sin. 5 (1976) 682, fig. 8193; S. Y. Hu, Gen. Orch. Hong Kong (1977) 65, fig. 33; Senghas in Schltr., Orch. 1, ed. 3 (1984) 854. – Type: Dunn 3542 (holo K).
Tainia shimadai Hayata, Ic. Pl. Form. 6 (1916) 75, fig. 11, t. 12; Schltr., Fedde Rep. Beih. 4 (1919) 181; Hsieh, Q. J. Taiwan Mus. 5 (1955) 271; S. Y. Hu, Q. J. Taiwan Mus. 28, 3+4 (1975) 167; Liu & Su, Fl. Taiwan 5 (1978) 1109, fig. 1643; Senghas in Schltr., Orch. 1, ed. 3 (1984) 854, fig. 654. – *Tainia laxiflora* (Makino) Makino var. *shimadai* (Hayata) Miroc, Orch. Fl. 2 (1971) 89. – *Kittigorchis shimadai* (Hayata) F. Maek., Wild Orch. Jpn. Col. (1971) 469. – Type: Shimada 1915 (not seen).
Tainia gracilis Tso [non Gagnepain (1932)], Sunyatsenia 1 (1933) 145 (nom. illeg.). – *Tainia procera* Senghas in Schltr., Orch. 1, ed. 3 (1984) 854. – Type: Tso 22754 (not seen).
Tainia quadriloba Summerh., Kew Bull. (1939) 189; Senghas in Schltr., Orch. 1, ed. 3 (1984) 854. – Type: To & Tsang 12246 (holo K, iso AMES).

Stem of sterile shoot with 4–5 internodes, 19–80 mm long, 2–4 mm diam. (herb.). *Pseudobulb* cylindrical, slightly swollen towards the base, 15–72 by 2–5 mm, scale of subterminal node somewhat decaying, 66–120 mm long. *Petiole* 7–90 mm long. *Leaf blade* elliptic, 12.7–34 by 1.5–3.9 cm, index 5.1–13.5, acute to slightly acuminate; margin not undulate; thin, 23–55-veined (3–5 thickened). *Inflorescence* terminal, arising from the base of the pseudobulb, 38.7–78.8 cm long, 8–20-flowered. Peduncle 19–60 cm long, 2–5 mm diam. Peduncle scales 2–3, the longest 32–91 mm long. Rhachis 7.0–21.6 cm long, 1–2 mm diam. *Floral bracts* patent, triangular, 2–10 mm long. *Flowers* most open simultaneously. *Pedicel and ovary* 5–15 mm long, longer than the bracts. *Median sepal* ± triangular to elliptic, 11.5–16 by 1.5–2 mm, index 6.8–9, obtuse to acute, mid-vein not to slightly thickened abaxially. *Lateral sepals* ± obliquely elliptic to obovate, falcate, 8.5–14 by 1.5–2.5 mm, index 4.3–7.3, obtuse to slightly acuminate, mid-vein not to slightly thickened abaxially. *Petals* obliquely ovate to slightly obovate, falcate, 9–15 by 2–2.5 mm, index 3.6–6.5, obtuse, mid-vein not to slightly thickened abaxially. *Lip* blade three-lobed, in general outline obovate, 9–11 by 6.5–8.5 mm, index 1.2–1.5; median lobe transversely elliptic to somewhat cuneate, 2–4 by 5–7.5 mm, index 0.3–0.7; tip retuse-acuminate to obtuse; margins entire, sometimes slightly undulating, glabrous; adaxial surface glabrous to minutely papillose; lateral lobes obliquely triangular, slightly falcate to falcate, 0.5–2.5 mm long; tip ± acute to slightly obtuse; margins entire, glabrous; adaxial surface densely minutely papillose, sometimes glabrous distally; lip adaxially with 3 keels, the median keel 3–10.5 mm long, starting at 0–7 mm, forming a low ridge only, sometimes increasing in height somewhat distally, then terminating abruptly and highest half-way to distally, crest ± straight, entire, glabrous, thickened towards its distal end; the lateral keels 7–10 mm long, starting at 0–0.5 mm, raised plate-like from the basal part of the lip, highest half-way, sometimes increasing in height again somewhat distally, terminating abruptly, crest ± straight, entire, glabrous, doubled along the highest portion, thickened towards its distal end. *Column* 6–7 mm long, stelia absent; top part semiorbicular to truncate, margin entire to slightly denticulate; wings seam-like, extending very narrowly up to the tip of the column foot; column foot 1–2 mm long. *Anther* 1 by 1–2 mm, abaxially with 2 crests; thecae not divided to indistinctly 3- to 4-celled. Pollinia 8. *Fruit* ellipsoid, c. 12 by c. 4 mm; stalk c. 10 mm long.

Colours – Tepals yellow suffused purple to entirely purple; lip yellow suffused purple, especially on the lateral lobes; column yellow; crests on anther cap bright reddish purple.

Ecology – In swampy thicket; on wet riverbank; in ravine on rock; in forest. Altitude 550–850 m. Flowering observed in III–VI.

Distribution – China (Guangdong; Fujian); Hong Kong; Taiwan (*T. shimadai*).

Notes – 1. I have seen no specimens of *T. shimadai* and *T. gracilis*, but the published descriptions and figures fit the present species well. I therefore include them here. However, Miroe (l.c.) is of the opinion that *T. shimadai* is a variety of *T. laxiflora*, which I have kept as a separate species. Maybe with new collections *T. laxiflora* and *T. dunnii* will turn out to be the same.

2. The flowers are recorded to be fragrant.

3. *Tainia latifolia* (Lindley) Reichb. f. – Fig. 44; Plate 6c.

Literature: see under the subspecies.

Stem of sterile shoot with 4–5 internodes, 51–148 mm long, 2–6 mm diam. (herb.). *Pseudobulb* cylindrical to slightly ovoid, slightly swollen towards the base, 27–92 by 3–12 mm, scale of subterminal node more or less persistent, 49–130 mm long. *Petiole* 33–250 mm long. *Leaf blade* elliptic to ovate, rarely obovate, 8.4–42.0 by 2.2–9.7 cm, index 2.3–6.3, acute to acuminate; margin not undulate; thin, 27–113-veined. *Inflorescence* terminal, 35.1–114.4 cm long, arising 4–23 mm above the base of the pseudobulb, (3)7–38-flowered. Peduncle 29.3–64 cm long, 1–5 mm diam. Peduncle scales 4–5, the longest 26–90 mm long. Rhachis 5.8–29 cm long, 1–2 mm diam. *Floral bracts* patent to reflexed, triangular, 2–12 mm long. *Flowers* most open simultaneously. *Pedicel and ovary* 6–19 mm long, longer than the bracts. *Median sepal* elliptic to obovate, 10–18.5 by 1–2.5 mm, index 5.4–12, acute to obtuse, mid-vein sometimes thickened abaxially. *Lateral sepals* ± elliptic to triangular, not falcate to falcate, 9–17 by 1.5–3 mm, index 4–10, acute to obtuse, mid-vein sometimes thickened abaxially. *Petals* obliquely elliptic to obovate, not falcate to falcate, 9–18 by 1.5–3 mm, index 3.8–8, slightly acuminate to obtuse, mid-vein sometimes thickened abaxially. *Lip* blade three-lobed, sometimes entire with a distinct sinus, in general outline elliptic to ovate, 8.5–18.5 by 3.5–9 mm, index 1.3–3.1; median lobe ± orbicular to transversely elliptic, 2–5.5 by 3.5–6 mm, index 0.4–1.1; tip slightly retuse to slightly acuminate; margins entire, usually slightly undulating, glabrous to minutely papillose; adaxial surface glabrous to minutely papillose; lateral lobes obliquely triangular, not falcate to falcate, 0.25–2 mm long; tip obtuse to slightly acuminate; margins entire, glabrous to minutely papillose; adaxial surface glabrous to distinctly minutely papillose; lip adaxially with (2) 3 keels, the median keel (0) 3.5–18.5 mm long, starting at 0–7 mm, raising slightly plate-like from the basal part of the lip, sometimes increasing in height somewhat distally, terminating abruptly, highest half-way to distally, crest straight proximally, straight to slightly undulating distally, entire, glabrous, sometimes thickened towards its distal end; the lateral keels 6–15 mm long, starting at 0–1.5 mm, raised plate-like from the basal part of the lip, highest half-way, sometimes increasing in height again somewhat distally, terminating abruptly, crest straight proximally, straight to slightly undulating distally, entire, glabrous, sometimes doubled along the highest part, rarely thickened towards its distal end. *Column* 5–9 mm long, stelidia absent; top part truncate to triangular, margin entire to denticulate; wings seam-like, extending up to the tip of the column foot; column foot 1–2.5 mm long. *Anther* 1–1.5 by 1–2 mm, abaxially without or with 2 crests; thecae indistinctly 4-celled. Pollinia 8. *Fruit* not observed.

KEY TO THE SUBSPECIES

- 1a. Plant stout, to c. 60 cm high; inflorescence more than c. 70 cm high, more than 20-flowered; pseudobulbs longer than 60 mm; leaves with more than c. 50 veins; margin of top part of column entire to slightly denticulate **a. subsp. *latifolia***
- b. Plant smaller, to c. 30 cm. high; inflorescence up to c. 75 cm high, less than 30-flowered; pseudobulbs less than 60 mm long; leaves with less than c. 60 veins; margin of top part of column denticulate to slightly erose **b. subsp. *elongata* (J.J. Smith) H. Turner**

a. subsp. *latifolia*

- Tainia latifolia* (Lindley) Reichb. f., Bonplandia 5 (1857) 54; Hook. f., Fl. Br. Ind. 5 (1890) 820; *ibid.* 6 (1890) 192; Ann. R. Bot. Gard. Calc. 5, 1 (1895) 23, t. 35; B. Grant, Orch. Burma (1895) 156; King & Pantling, Ann. R. Bot. Gard. Calc. 8 (1898) 103, t. 142; J.J. Smith, Bull. Jard. Bot. Buit. II, 8 (1912) 6; Mitra, Fl. Pl. E. Ind. 1 (1958) 301; Seidenf. & Smitin., Orch. Thail. 4, 2 (1965) 743, figs. 553, 554; Anon., Ic. Corm. Sin. 5 (1976) 682, t. 8194; Vij et al., Taxon 25 (1976) 641; Anon., Fl. Hain. 4 (1977) 215, fig. 1099; Biswas, Proc 65th Ind. Sci. Congr. 3 (1978) 93; Pradhan, Ind. Orch. (1979) 243; Seidenf., Nord. J. Bot. 2 (1982) 214; Senghas in Schltr., Orch. 1, ed. 3 (1984) 854, 856, fig. 655; Seidenf., Op. Bot. 89 (1986) 35, fig. 15; Averyanov, Prelim. List Vietn. Orch. 2 (1988) 89. – *Ania latifolia* Lindley, Gen. Sp. Orch. (1831) 130. – *Mitopetalum latifolium* (Lindley) Blume, Mus. Bot. L.-B. 2 (1856) 185; Fl. Jav. n.s., 1 (1858) 134. – Type: Bruce s.n. (Wall. Herb. 3741) (holo K). Non *Ania latifolia* Wight, Ic. Pl. Ind. Or. 3 (1852) t. 914 (= *Tainia bicornis*).
- Cymbidium* sp. Griffith, Notul. 3 (1851) 343; Ic. Pl. As. 3 (1851) t. 319. – Type: Griffith s.n., 17 March 1837 (= Griffith 5288? K).
- Eulophia hastata* Lindley, J. Proc. Linn. Soc. Bot. 3 (1859) 25. – *Tainia hastata* (Lindley) Hook. f., Fl. Br. Ind. 5 (1890) 821; *ibid.* 6 (1890) 193; Ic. Pl. 21 (1892) 2092; J.J. Smith, Bull. Jard. Bot. Buit. II, 8 (1912) 6; Mitra, Fl. Pl. E. Ind. 1 (1958) 302. – Type: Griffith s.n., 1844 (holo K).
- Eria ania* Reichb. f., Walp. Ann. 6 (1861) 270.
- Eria hologlossa* Parish & Reichb. f., Trans. Linn. Soc. Bot. 30 (1874) 148. – *Tainia hologlossa* (Parish & Reichb. f.) Hook. f., Fl. Br. Ind. 5 (1890) 822; B. Grant, Orch. Burma (1895) 156; P. Hunt, Kew Bull. 26 (1972) 182. – Type: Parish 253 (holo K, iso W).
- Tainia khasiana* Hook. f., Fl. Br. Ind. 5 (1890) 821; *ibid.* 6 (1890) 193; Ic. Pl. (1892) t. 2090; Biswas, Taxon 29 (1989) 169. – Type: Hooker f. & Thomson (Orch. 217, holo K).
- Tainia cordata* Hook. f., Fl. Br. Ind. 6 (1890) 193. – *Tainia cordifolia* Hook. f. (non Hook. f., 1889), Ann. R. Bot. Gard. Calc. 5 (1895) 24, t. 36. – Type: Ic. Hort. Calc. (not seen).
- Tainia bicornis* Seidenf. & Smitin. (non Reichb. f.), Orch. Thail. 4, 2, (1965) 743, fig. 552. – Type: Kerr 295 (holo K, iso AMES).
- Tainia longipetiolata* Seidenf. ex Averyanov, Vasc. Pl. Syn. Vietn. Fl. 1 (1990) 156. – Type: Poilane 32787 (P, not seen) (nom. nud.; see also note 6).

Stem of sterile shoot 90–148 mm long, 3–6 mm diam. (herb.). *Pseudobulb* 63–92 by 3–12 mm, scale of subterminal node 81–130 mm long. *Petiole* 65–250 mm long. *Leaf blade* 15.5–42.0 by 4.6–9.7 cm, index 2.3–6.3, 51–113-veined, 3 (7) thickened. *Inflorescence* (57) 72.8–114.4 cm long, arising 7–23 mm above the base of the pseudobulb, 21–38-flowered. *Peduncle* (44) 52.3–64 cm long. *Peduncle scales* the longest 53–73 mm long. *Rhachis* 13–29 cm long. *Sepals and petals* mid-vein sometimes thickened abaxially. *Lip* blade three-lobed, sometimes entire with a distinct sinus, in general outline elliptic, 8.5–12 by 4–9 mm, index 1.3–2.2. *Column* margin of top part entire to slightly denticulate.

Colours – Tepals greenish with dark red veins to dark chocolate-brown, lip pale cream to white.

Ecology – In forest. Altitude 500–1500 m. Flowering observed in II–IV, VII.

Distribution – NE India; Sikkim; Bhutan; Burma; China (Yunnan); Thailand; Laos; Vietnam.

Notes – 1. According to Biswas (1978, 1980) $2n = 32$ (*T. latifolia* and *T. khasiana*); however, Vij et al. (1976) counted $2n = 40$ (*T. latifolia*).

2. The specimen from China has a longitudinal ridge on the abaxial side of the column.

3. Parish 253 and the specimen from Reichenbach's Orchid Herbarium have an entire lip with a distinct sinus. However, since they are incomplete and very similar to the other specimens in all other characters, I decided not to give them separate status.

4. Kingdon-Ward 20617 differs from the other specimens in having seven thickened veins on the underside of the leaf blade. Of these, three are more pronounced.

5. The holotype of *T. khasiana* (Hook. f. & Thomson s.n., Khasia Hills) has only two keels on the lip and a smaller inflorescence than usual in subsp. *latifolia*. It conforms to the description of this subspecies in all other characters and I therefore decided not to give it separate status. Wherever its measurements are substantially different, they are included in parentheses.

6. Seidenfaden presently regards Poilane 32787 as an aberrant specimen of *T. latifolia* (pers. comm.). I therefore tentatively sink *T. longipetiolata* into synonymy here.

b. subsp. *elongata* (J.J. Smith) H. Turner, stat. nov. – Fig. 44; Plate 6c.

Tainia elongata J.J. Smith, Bull. Dep. Agric. Ind. Neerl. 43 (1910) 18; Koord., Exk. Fl. Jav. 1 (1911) 368; J.J. Smith, Bull. Jard. Bot. Buit. II, 8 (1912) 6; Bakh. f., Blumea Suppl. 1 (1937) 50; Backer & Bakh. f., Fl. Java (1968) 291; Senghas in Schltr., Orch. 1, ed. 3 (1984) 854; Comber, Orch. Java (1990) 108. – Type: Joseph s.n. 1910 (BO).

Tainia tenera J.J. Smith, Bull. Jard. Bot. Buit. III, 5 (1922) 25; *ibid.* III, Suppl. 2 (1930) t. 22, 5; Fedde Rep. 32 (1933) 161; Senghas in Schltr., Orch. 1, ed. 3 (1984) 854. – Type: Jacobson 198 (BO).

Stem of sterile shoot 51–81 mm long, 2–4 mm diam. (herb.). *Pseudobulb* 27–56 by 3–8 mm, scale of subterminal node 49–74 mm long. *Petiole* 33–88 mm long. *Leaf blade* 8.4–20.6 by 2.2–6.0 cm, index 2.6–5.8, 27–55-veined (3 thickened). *Inflorescence* 35.1–72.5 cm long, arising 4–12 mm above the base of the pseudobulb, (3) 7–27-flowered. *Peduncle* 29.3–58.6 cm long. *Peduncle scales* the longest 26–63 mm long. *Rhachis* 5.8–18.2 cm long. *Sepals and petals* mid-vein not thickened abaxially. *Lip blade* three-lobed, in general outline elliptic to obovate, 8.5–18.5 by 4.5–7 mm, index 1.7–3.1. *Column* margin of top part denticulate to slightly crose.

Colours – *Peduncle* purplish; *rhachis* green to purplish; *pedicel* brownish; *ovary* green; *tepals* greenish-brown to dark purple; *lip* white to pinkish, sometimes purple at base; *column* white to yellow to pinkish, sometimes with purple spot near base adaxially.

Ecology – In forest. Altitude 550–1250 m. Flowering observed in IV, VI–IX, XII.

Distribution – Sumatra; Java.

Notes – 1. According to Comber (1990) in W Java a variety exists with very long persistent bracts 80 by 7 mm.

2. The type specimen of *T. tenera* is badly damaged. However, from J.J. Smith's original description and figure it is clear that it must be the same as the present species.

3. Sometimes the column has a low abaxial ridge.

4. Some collectors note that this species has a fetid smell.

5. The specimen from Sumatra (Sarkat Danimihardja SD2318) has leaves with a very slightly undulating margin.

6. According to Bakhuizen van den Brink (1937), the name *Angkrèk malati* is used for this species in Sundaland (Sumatra).

4. *Tainia laxiflora* (Ito ex Makino) Makino – Fig. 45; Plate 6d.

Tainia laxiflora (Ito ex Makino) Makino, Bot. Mag. Tokyo 23 (1909) 138; Schltr., Fedde Rep. Beih. 4 (1919) 180; Miduno, Cytologia 11 (1940) 335 (not seen); Masam., Sci. Rep. Kanazawa Univ. 9 (1964) 132; Ohwi, Fl. Jpn. (1965) 351; R. Tanaka, J. Jpn. Bot. 40 (1965) 65; Nackej., Enum. Orch. Ryukyus 1 (1971) 15, t. 19; F. Maek., Wild Orch. Jpn. Col. (1971) 376, t. 151; R. Tanaka & Matsuda, Bot. Mag. Tokyo 85 (1972) 43; Garay & Sweet, Orch. Ryukyu Isl. (1974) 15, 107, fig. 10a, b; Senghas in Schltr., Orch. 1, ed. 3 (1984) 854. – *Calanthe laxiflora* Makino, Ind. Pl. Jpn. 2, 1 (1905) 231 [according to Makino (1909) nom. nud., not seen]. – *Oreorchis laxiflora* Ito ex Makino, Bot. Mag. Tokyo 23 (1909) 138 (as synonym). – *Ascotainia laxiflora* (Makino) C. Darl. & Wylie, Chrom. Atl. ed. 2 (1955) 406. – Syntypes: Tashiro s.n. 1887, Imai s.n. 1909, Shinagawa s.n., Hara s.n. 1907, Tashiro s.n. 1909, Makino s.n. 1909 (none seen).

Tainia piyananensis Fukuyama, Bot. Mag. Tokyo 49 (1935) 294; Hsieh, Q. J. Taiwan Mus. 8 (1955) 271; S. Y. Hu, Q. J. Taiwan Mus. 28, 1+2 (1975) 167; Liu & Su, Fl. Taiwan 5 (1978) 1108; Senghas in Schltr., Orch. 1, ed. 3 (1984) 854. – *Tainia laxiflora* (Makino) Makino var. *piyananensis* (Fukuyama) Masam., J. Geobot. 21 (1974) 14. – Type: Fukuyama 4148 (not seen).

Stem of sterile shoot with 4–7 internodes, 17–23 mm long, c. 2 mm diam. (herb.). *Pseudobulb* cylindrical, slightly swollen towards the base, 10–13 by 2–5 mm, scale of subterminal node more or less persistent, c. 42–45 mm long. *Petiole* 10–35 mm long. *Leaf blade* elliptic, 6.7–11.1 by 1.3–2.0 cm, index 4.4–6.5, slightly acuminate; margin sometimes slightly undulate; thin, 11–17-veined (1–3 thickened). *Inflorescence* terminal, arising from the base of the pseudobulb, 11.7–35.9 cm long, 2–6-flowered. Peduncle 9.5–27.6 cm long, 1–2 mm diam. Peduncle scales 2–3, the longest 17–41 mm long. Rhachis 2.2–8.3 cm long, 1 mm diam. *Floral bracts* patent, triangular, 3–8 mm long. *Flowers* most open simultaneously. *Pedicel and ovary* 6–11 mm long, longer than the bracts. *Median sepal* elliptic to obovate, 11.5–14 by 1.5 mm, index 7.7–9.3, acute to obtuse, mid-vein not thickened abaxially. *Lateral sepals* c. elliptic to triangular, strongly falcate, 11 by 2 mm, index 5.5, acute to obtuse, mid-vein not thickened abaxially. *Petals* obliquely elliptic to obovate, strongly falcate, 11–13 by 2 mm, index 5.5–6.5, \pm acute, mid-vein not thickened abaxially. *Lip blade* three-lobed, in general outline slightly obovate, 8–9 by 6.5–7 mm, index 1.2–1.4; median lobe transversely elliptic, 3 by 6–7 mm, index 0.4–0.5; tip slightly acuminate; margins entire, glabrous; adaxial surface glabrous; lateral lobes obliquely triangular, falcate, 1–1.5 mm long; tip obtuse; margins entire, glabrous; adaxial surface minutely papillose proximally, glabrous distally; lip adaxially with 3 keels, the median keel 6.5–7 mm long, starting at 0 mm, forming a low ridge only, sometimes raised plate-like distally, then terminating abruptly and highest distally, crest straight, entire, glabrous, not thickened towards its distal end; the lateral keels 4.5–8 mm long, starting at 0 mm, highest half-way, sometimes increasing in height again distally, terminating abruptly, crest straight, entire, doubled along the highest part, glabrous, not thickened towards its distal end, slightly converging distally. *Column* 5.5–6 mm long, stelidia absent; top part truncate to semiorbicular, margin entire to denticulate; wings seam-like, extending up to the tip of the column foot; column foot 1–1.5 mm long. *Anther* and pollinia not observed. *Fruit* not observed.

Colours – Leaf variegated.

Ecology – In thick forest. Flowering observed in III, V.

Distribution – Taiwan; Japan (Kyushu, Yakushima, Ryukyu).

Notes – 1. See note 1 to *T. dunnii*.

2. According to R. Tanaka (1965) $2n = 36 + 1 - 4B$; however, R. Tanaka & Matsuda (1972) give $2n = 36 + 0 - 9B$.

3. I have not seen material of *T. piyananensis*, but from the description it seems clear that it is the same as the present species. Masamune (l.c.) already reduced it to variety level of this species.

5. *Tainia macrantha* Hook. f. – Fig. 46.

Tainia macrantha Hook. f., Ic. Pl. 19 (1889) t. 1860; Rolfe, J. Linn. Soc. Bot. 36 (1903) 21; J.J. Smith, Bull. Jard. Bot. Buit. II, 8 (1912) 6; Dunn & Tutchter, Kew Bull. Add. Ser. 10 (1912) 264; Schltr., Fedde Rep. Beih. 4 (1919) 181; Gagnepain, Fl. Gén. I.-C. 6 (1933) 378; S.Y. Hu, Q. J. Taiw. Mus. 28, 1+2 (1975) 167; Seidenf., Contr. Orch. Fl. Laos, Cambodia, Vietnam 1 (1975) 106. – *Mischobulbum macranthum* (Hook. f.) Rolfe, Orch. Rev. 20 (1912) 127; Anon., Ic. Corm. Sin. 5 (1976) 681, t. 8192; Senghas in Schltr., Orch. 1, ed. 3 (1984) 852; Averyanov, Prelim. List Vietnam. Orch. 2 (1988) 8. – Type: Ford 153 (holo K).

Stem of sterile shoot with 5 internodes, 91–120 mm long, 3–5 mm diam. (herb.). *Pseudobulb* cylindrical, slightly swollen towards the base, 71–95 by 3–5 mm, scale of subterminal node decaying, 60–105 mm long. *Petiole* 22–50 mm long. *Leaf blade* elliptic, 12.2–24.5 by 4.0–6.6 cm, index 2.4–6.0, acuminate; margin not undulate; thin, 45–59-veined (3 thickened). *Inflorescence* terminal, c. 2-flowered, arising c. 3 mm above the base of the pseudobulb. Peduncle 22.7–27.1 cm long, 2–3 mm diam. Peduncle scales c. 2, the longest 40–53 mm long. Rhachis more than c. 3 cm long, c. 1 mm diam. *Floral bracts* patent to spreading, triangular, 4–9 mm long. *Flowers* most open simultaneously. *Pedicel and ovary* 8–11 mm long, longer than the bracts. *Median sepal* elliptic, 35–36 by 5–13 mm, index 2.8–7, acute, mid-vein (slightly) thickened abaxially. *Lateral sepals* ± elliptic to triangular, slightly falcate, 34–41 by 10–12 mm, index 2.8–4.1, acute, mid-vein thickened abaxially. *Petals* obliquely ovate to elliptic, 34 by 10–22 mm, index 1.5–3.4, acute, mid-vein thickened abaxially. *Lip* blade three-lobed, in general outline rhomboid-hastate, 30–32 by 21–22 mm, index 1.4–1.5; margins entire, ± glabrous to minutely papillose proximally; median lobe triangular, 18–20 by 12.5–13 mm, index 1.4–1.5; tip acute to acuminate; margins entire, glabrous; adaxial surface glabrous; lateral lobes triangular, 4–5 mm long; tip obtuse; margins entire, incurved, glabrous; adaxial surface glabrous; lip adaxially with 3 keels, the median keel 17–29 mm long, starting at 0–11 mm, forming a low ridge only, crest straight, entire, glabrous, rarely thickened throughout; the lateral keels 20–26 mm long, starting at 0–7 mm, raising plate-like from the basal part of the lip, highest proximally to half-way, gradually decreasing in height towards the tip of the lip, crest straight, entire, glabrous, sometimes slightly thickened proximally and distally. *Column* 10–11 mm long, stelidia absent; top part semiorbicular to truncate, margin denticulate; the wings seam-like, extending very narrowly up to the tip of the column foot; column foot 11–15 mm long. *Anther* 2–2.5 by 3.5–4 mm, abaxially with 1–2 crests; thecae undivided. Pollinia 8. *Fruit* not observed.

Colours – Flowers reddish to dark purple.

Ecology – In the shade in dark gorges. Altitude 950–1050 m. Flowering observed in VIII.

Distribution – China (Guangdong); Vietnam.

Note – The lip of this species is rather fleshy. In one flower a small fourth keel could be noted forming a low ridge at 10–13 mm from the base of the lip.

6. *Tainia maingayi* Hook. f. – Fig. 47; Plate 7a.

Tainia maingayi Hook. f., Fl. Br. Ind. 5 (1890) 822; *ibid.* 6 (1890) 193; Ic. Pl. 21 (1892) t. 2094; Ridley, J. Linn. Soc. 32 (1896) 316; Mater. Fl. Mal. Penin. 1 (1907) 115; J.J. Smith, Bull. Jard. Bot. Buit. II, 8 (1912) 6; Schltr., Orch. (1914) 129; Ridley, Fl. Mal. Penin. 4 (1924) 114; M.R. Henderson, J. Mal. Br. R. As. Soc. 5 (1927) 270; J.J. Smith, Blumea 5 (1943) 313; Holttum, Fl. Malaya 1, ed. 3 (1964) 182; Senghas in Schltr., Orch. 1, ed. 3 (1984) 854. – Type: Maingay 1668 (holo K).

Stem of sterile shoot with 3–5 internodes, 33–35 mm long, 4–5 mm diam. (herb.). *Pseudobulb* cylindrical to conical, swollen towards the base, 13–25 by 2–4 mm, scale of subterminal node decaying, with persistent veins giving the shoot a bristly appearance, 35–105 mm long. *Petiole* 15–35 mm long. *Leaf blade* elliptic, 13.9–22.7 by 3.2–4.5 cm, index 4.2–5.5, acute; margin not undulate; thin, 47–67-veined. *Inflorescence* terminal, 27–36 cm long, 3–10-flowered, arising from the base of the pseudobulb. Peduncle 24.5–28.5 cm long, 4–5 mm diam. Peduncle scales 4, the longest 26–39 mm long. Rhachis 2.5–7.5 cm long, 1 mm diam. *Floral bracts* patent, ovate to triangular, 12–24 mm long. *Flowers* most open simultaneously. *Pedicel and ovary* 14–19 mm long, shorter than or as long as the bracts. *Median sepal* ovate, 50–61 (85) by 4–5.5 mm, index 9.1–12.2 (15.5), caudate, mid-vein usually thickened abaxially. *Lateral sepals* ± ovate to triangular, 45–66 (> 87) by 4–6 mm, index 8.2–12.3 (> 17.4), caudate, mid-vein usually thickened abaxially. *Petals* obliquely ovate, 29–38 by 4–6 mm, index 5.6–6.8 (9.5), caudate, mid-vein usually thickened abaxially. *Lip* blade three-lobed, in general outline rhomboid, 12–14 by 8.0–11 mm, index 1.2–1.8, margins of basal part entire, glabrous, base with auricles; adaxial surface of the basal part minutely papillose proximally, densely packed with a mass of lacinate flaps between the lateral lobes among which the keels end; median lobe rhomboid, 6.5–7.5 by 5–7 mm, index 1–1.5; tip acuminate to rounded; margins lacinate to dentate proximally, entire distally, glabrous; adaxial surface densely packed with a mass of lacinate flaps proximally, glabrous distally; lateral lobes obliquely trapezoidal (to triangular), 2–3.5 mm long; tip truncate (to acute); lateral margins entire proximally, lacinate to dentate distally, glabrous; adaxial surface densely packed with a mass of lacinate flaps; lip adaxially with 3–5 keels, the median keel 6–7 mm long, starting at 0–1.5 mm, raised plate-like on the median lobe, highest distally, crest straight, entire, densely papillose proximally, glabrous distally, thickened proximally, ending in a thin lacinate flap; the lateral keels 5–7.5 mm long, starting at 0–1.5 mm, raised plate-like on the median lobe, highest distally, crest straight, entire, densely papillose proximally, glabrous distally, thickened proximally, ending in a lacinate flap; the outer keels when present c. 2 mm long, starting at 6 mm, highest distally, crest straight, glabrous, thickened proximally, ending in a lacinate flap distally. *Column* (6.5) 9–12 mm long, stelidia absent, abaxially with a longitudinal ridge; top part truncate to semiorbicular, margin denticulate; wings narrowly seam-like, extending up to the base of the column; column foot 2–4 mm long, with double callus on tip. *Anther* in bud c. 1.5 by c. 1.5 mm, abaxially without crests; thecae not divided (?). Pollinia 6, unequal, 2 smaller, lateral ones and 1 larger, median one to each theca; stipes present (?). *Fruit* ellipsoid, 23–24 by 4 mm; stalk 6–8 mm long.

Colours – Leaves rather pale green. Inflorescence dark purple to violetish; bracts lighter with slightly darker veins; flower buds dark purple, greenish at the base; sepals and petals violetish purple with cream-coloured margin and tip; lip cream-coloured with violetish purple base, keels with violetish purple blotches; column cream-coloured.

Ecology – Terrestrial. In mossy forest on white, acid sands, and in dry, rather low and open forest with small open patches with grasses and *Gleichenia* on soil probably derived from sandstone and shales. Altitude (180–240) 600–1500 m. Flowering observed in II, V–XII.

Distribution – Malay Peninsula; Sumatra; Java; Borneo.

Notes – 1. Bakhuizen van den Brink 7156 has no flowers, but was identified by the collector as *T. speciosa*. It has the much shorter petiole of the present species, however, and since *T. speciosa* can hardly be mistaken for any other species than *T. maingayi*, this specimen is tentatively included here.

2. O'Brien Nov. 1905 deviates considerably from the other specimens in the much more caudate tepals, the more or less triangular median lobe of the lip and the papillose keels. Wherever its measurements fall outside the range set by the other specimens, I have added them in parentheses.

7. *Tainia minor* Hook. f. – Fig. 48.

Tainia minor Hook. f., Fl. Br. Ind. 5 (1890) 821; *ibid.* 6 (1890) 193; Ic. Pl. 21 (1892) t. 2091; King & Pantl., Ann. R. Bot. Gard. Calc. 8 (1898) 102, t. 141; J.J. Smith, Bull. Jard. Bot. Buit. II, 8 (1912) 6; Mitra, Fl. Pl. E. Ind. 1 (1958) 302; S.Y. Hu, Q. J. Taiwan Mus. 28, 1+2 (1975) 167; Sharma & Chatterjee, Nucleus 9 (1966) 177 (not seen); Pradhan, Ind. Orch. 2 (1979) 241; Senghas in Schltr., Orch. 1, ed. 3 (1984) 854. – Type: Clarke 35517 (holo K, iso G).

Stem of sterile shoot with (4) 5 internodes, 74–112 mm long, 3–4 mm diam. (herb.). *Pseudobulb* cylindrical, slightly swollen towards the base, 25–66 by 3–6 mm, scale of subterminal node more or less persistent, 71–104 mm long. *Petiole* 45–75 mm long. *Leaf blade* elliptic, 13–23 by 2.6–5.6 cm, index 3.3–5, acuminate; margin not undulate; thin, 37–63-veined (3–5 thickened). *Inflorescence* terminal, 22–48.6 cm long, arising 2–8 mm above the base of the terminal internode, 5–16-flowered. *Peduncle* 15–32.5 cm long, 2–4 mm diam. *Peduncle scales* 3–4, the longest 39–87 mm long. *Rhachis* 7–18.3 cm long, 1–2 mm diam. *Floral bracts* patent, triangular, 3–18 mm long. *Flowers* most open simultaneously. *Pedicel and ovary* 5–20 mm long, longer than the bracts. *Median sepal* elliptic to obovate, 12.5–18 by 1.5–2.5 mm, index 5.2–7.3, obtuse to slightly acute, mid-vein usually thickened abaxially. *Lateral sepals* ± elliptic, falcate, 10.5–17 by 1.5–2.5 mm, index 5.4–8, obtuse to slightly acute, mid-vein usually thickened abaxially. *Petals* obliquely elliptic to obovate, slightly falcate to falcate, 11.5–17 by 2–3.5 mm, index 4.3–7.5, obtuse, mid-vein usually thickened abaxially. *Lip* blade three-lobed, in general outline elliptic, 9.5–14 by 6–8 mm, index 1.6–1.9; median lobe ± orbicular to transversely elliptic to slightly cuneate, 3–5.5 by 4–6 mm, index 0.7–1.1; tip obtuse; margins entire, glabrous, sometimes undulating; adaxial surface minutely papillose, sometimes glabrous distally; lateral lobes obliquely triangular, slightly falcate, 1.5–2.5 mm long; tip obtuse to slightly acute; margins entire, glabrous; adaxial surface minutely papillose proximally, glabrous distally; lip adaxially with 5 keels, the median keel 9–13.5 mm long, starting at 0 mm, raised plate-like from the basal part of the lip, increasing in height monotonically,

terminating abruptly, highest distally, rarely proximally, then decreasing in height towards the base of the median lobe, increasing somewhat in height again distally, crest straight, entire, glabrous, thickened towards its distal end; the lateral keels 9–13.5 mm long, starting at 0 mm, raised plate-like from the basal part of the lip, decreasing in height at the base of the median lobe, sometimes even interrupted, then increasing in height somewhat again, terminating abruptly, highest half-way, crest straight, entire, glabrous, doubled along the highest portion, thickened towards its distal end; the outer keels 1–4 mm long, starting at 7–10.5 mm, raised plate-like from the base of the median lobe, highest half-way to distally, crest straight, entire, glabrous, thickened throughout. *Column* 6.5–8 mm long, stelidia absent; top part semiorbicular to truncate, margin entire; wings seam-like, extending up to the tip of the column foot; column foot 1.5–2 mm long. *Anther* 1 by 1–2 mm, abaxially with 2 cornute crests; thecae not divided. Pollinia 8. *Fruit* not observed.

Colours – Tepals yellow to dull brownish green, lip yellow.

Ecology – Shady places in deep forest and on the margins of thickets. Altitude 1800–2400 m. Flowering observed in V–VIII.

Distribution – NE India; Sikkim; Burma; China (Yunnan).

Notes – 1. Pantling 210 has a distinct longitudinal ridge on the abaxial side of the column.

2. Sharma & Chatterjee (l.c.) have reported a chromosome number of $2n = 36$ or 40 . According to Radhamoni et al. (see under *T. bicornis*) this is probably $2n = 36+0-4B$.

8. *Tainia obpandurata* H. Turner, *spec. nov.* – Fig. 49.

Tainia obpandurata a *T. paucifolia* petiolo brevior, inflorescentia terminali (non laterali) et labello panduriformi differt. – Typus: Rahmat si Boeea 10356, Sumatra, Dolok Parhorasan, Asahan (holo L, iso AMES).

Stem of sterile shoot with 4–5 internodes, 112–145 mm long, 2–3 mm diam. (herb.). *Pseudobulb* cylindrical, 51–75 by 2–3 mm, scale of subterminal node more or less persistent, 70–84 mm long. *Petiole* 22–67 mm long. *Leaf blade* elliptic, 13.7–21 by 2.3–5.2 cm, index 2.9–6.8, acuminate; margin not undulate; thin, 25–45-veined (3 thickened). *Inflorescence* terminal, 26–34.5 cm long, 10–12-flowered, arising 14–25 mm above the base of the pseudobulb. *Peduncle* 18.5–24 cm long, 2–4 mm diam. Peduncle scales 4–6, the longest 24–41 mm long. Rhachis 8.5–16 cm long, 1 mm diam. *Floral bracts* patent to reflexed, triangular, 5–27 mm long. *Flowers* most open simultaneously. *Pedicel and ovary* 5–22 mm long, somewhat shorter than the bracts. *Median sepal* elliptic, 20–25 by 2 mm, index 10–12.5, acute to acuminate, mid-vein thickened abaxially. *Lateral sepals* ± elliptic, slightly falcate, 22–25 by 2–2.5 mm, index 9.2–12.5, acute, mid-vein thickened abaxially. *Petals* obliquely elliptic to triangular, slightly falcate, slightly decurrent along column foot, 18.5–22 by 2.5–3 mm, index 6.2–8.8, acute, mid-vein thickened abaxially. *Lip* blade entire to minutely three-lobed, in general outline obpandurate, 12–13.5 by 3.5–6 mm, index 2.3–3.4; median lobe ovate, c. 9 by c. 5.5 mm, index c. 1.6; tip acuminate; margins slightly erose, undulating, glabrous; adaxial surface glabrous to sparsely minutely papillose; lateral lobes when present obliquely triangular, 0.25–1 mm long; tip obtuse; margins entire, glabrous; adaxial surface glabrous; lip adaxially with 3 keels, the median keel 9.5–11 mm long, starting at 0–1 mm, forming a low ridge only, highest proximally, crest distinctly undulating, entire, glabrous, not thickened towards its distal end; the lateral keels 8.5–11.5 mm long, starting at 0–1.5 mm, raised plate-like from the basal part

of the lip, highest proximally, crest distinctly undulating, entire, glabrous, not thickened towards its distal end. *Column* 7.5–8.5 mm long, stelia absent; top part semiorbicular, margin slightly denticulate; wings seam-like, extending up to the tip of the column foot; column foot 2 mm long. *Anther* 1 by 1.5 mm, abaxially with 2 crests; thecae indistinctly 4-celled. Pollinia 8. *Fruit* ellipsoid, c. 22 by c. 7 mm; stalk c. 11 mm long.

Colours – Stem purplish. Flower buds pale greenish streaked purplish.

Ecology – Montane rain forest. Altitude 500–1000 m. Flowering observed in III, VI, VII, X–XII.

Distribution – Sumatra.

Notes – 1. The holotype is unusual in that its only pseudobulb has three terminal leaves instead of the usual one. The specimen from AMES, however, is normal in this respect.

2. Vernacular names: Si gapang tano, Hapias dalan.

9. *Tainia paucifolia* (Breda) J.J. Smith – Fig. 50; Plate 7b.

Tainia paucifolia (Breda) J.J. Smith, Bull. Jard. Bot. Buit. II, 8 (1912) 5; Backer & Bakh. f., Fl. Java 3 (1968) 291; P. Hunt, Kew Bull. 26 (1971) 182; Comber, Orch. Java (1990) 108 ('*pauciflora*'). – *Octomeria paucifolia* Breda, Gen. Sp. Orch. 3 (1829) t. 5. – *Mitopetalum plicatum* Blume, Mus. Bot. L.-B. 2 (1856) 185; Fl. Jav. n.s., 1 (1858) 134, t. 51; Miq., Fl. Ind. Bat. 3 (1859) 741. – *Mitopetalum rubescens* Blume, Fl. Jav. n.s., 1 (1858) t. 51 (errore). – *Dendrobium paucifolium* (Breda) Reinw. ex Blume, Mus. Bot. L.-B. (1856) 185 (as synonym). – *Eria paucifolia* (Breda) Reichb. f., Walp. Ann. (1861) 270. – *Tainia plicata* (Blume) Ridley, J. Linn. Soc. Bot. 31 (1896) 285; J.J. Smith, Orch. Java (1905) 184; Orch. Java Fig. Atl. (1909) t. 139; Koord., Exk. Fl. Java 1 (1911) 368; Ames, J. Str. Br. R. As. Soc., Spec. No. (1921) 142; Carr, Gard. Bull. Str. Settl. 8, 3 (1935) 199; Masam., Enum. Phan. Born. (1942) 217; Senghas in Schltr., Orch. 1, ed. 3 (1984) 854 ('*plicatum*'). – Type: Ic. Breda.

Tainia fimbriata Teijsm. & Binnend., Natk. Tijdschr. Ned. Ind. 5 (1853) 492; Ned. Kruidk. Arch. 3 (1854) 400 ('*Taenia*'); Reichb. f., Bonplandia 5 (1857) 54; Witte, Ann. Horticult. Bot. Pays-Bas 5 (1862) 187; Senghas in Schltr., Orch. 1, ed. 3 (1984) 854. – *Mitopetalum fimbriatum* (Teijsm. & Binnend.) Miq., Fl. Ind. Bat. 3 (1859) 674. – Type: not designated.

Tainia latilingua Hook. f., Fl. Br. Ind. 5 (1890) 822; *ibid.* 6 (1890) 193; Ic. Pl. 21 (1892) t. 2093; Ridley, J. Linn. Soc. Bot. 32 (1896) 315; Mater. Fl. Mal. Penin. 1 (1907) 115; J.J. Smith, Bull. Jard. Bot. Buit. II, 8 (1912) 6; Schltr., Orch. (1914) 129; Ridley, Fl. Mal. Penin. 4 (1924) 114; Seidenf. & Smitin., Orch. Thail. 2, 1 (1959) 101, fig. 75 (p.p.!); Holttum, Fl. Malaya 1, ed. 3 (1964) 183; A. Hawkes, Enc. Cult. Orch. (1965) 459; Seidenf., Op. Bot. 89 (1986) 37, fig. 9f, 16; Senghas in Schltr., Orch. 1, ed. 3 (1984) 854. – Type: Scortechini (759b?) (holo CAL).

Non *Tainia latilingua* Seidenf. & Smitin., Orch. Thail. 2, 1 (1959) 101, fig. 75 (p.p.!) (= *Ania penangiana*).

Stem of sterile shoot with 4–5 internodes, 53–260 mm long, 2–4 mm diam. (herb.). *Pseudobulb* cylindrical, 31–83 by 2–5 mm, usually arising from the subterminal internode, rarely from the upper internode or from one of the internodes lower down, scale of subterminal node more or less persistent to decaying, 50–140 mm long. *Petiole* 100–350 mm long. *Leaf blade* elliptic, rarely ovate or obovate, 10–27 by 3.0–8.8 cm, index 2.3–4.7, acuminate; margin not undulate; thin, 37–175-veined (3–9 thickened). *Inflorescence* lateral, 26.5–67 cm long, 4–40-flowered, arising from 0–43 mm above the base of the pseudobulb, rarely from the subterminal internode of the sterile shoot. Peduncle 15.8–40.2 cm long, 1–4 mm diam. Peduncle scales 4, the longest 21–40 mm long. Rhachis 4.3–28.5 cm long, 1–2 mm diam. *Floral bracts* patent to reflexed, triangular, 4–23 mm long. *Flowers* most open simultaneously. *Pedicel and ovary* 10–20 mm long, about as long as the bracts. *Median sepal* elliptic to obovate, 13–25 by 2–2.5 mm, index 4.8–12.5, acute to

acuminate, mid-vein not to slightly thickened abaxially. *Lateral sepals* \pm (obliquely) triangular to elliptic, slightly to strongly falcate, 11–21 by 2–3.5 mm, index 4–8.5, acute to acuminate, mid-vein not to slightly thickened abaxially. *Petals* obliquely ovate to obovate, not to slightly falcate, 12–24.5 by 2.5–3.5 mm, index 3.7–8.2, acute to acuminate, mid-vein not to slightly thickened abaxially. *Lip* blade three-lobed, in general outline elliptic, 9–14.5 by 6.5–11 mm, index 1.0–1.6; median lobe variable in shape, orbicular, elliptic to rhomboid, obovate or transversely elliptic, 3.5–7.5 by 3.5–8.5 mm, index 0.6–1.2; tip obtuse to acuminate; margins entire proximally, entire to erose distally, slightly undulating distally, glabrous to minutely papillose; adaxial surface glabrous to minutely papillose; lateral lobes obliquely triangular, slightly falcate to falcate, 1.5–3.5 mm long; tip acute to slightly obtuse; margins entire, sometimes slightly undulating, glabrous to minutely papillose; adaxial surface glabrous to slightly minutely papillose; lip adaxially with 3 keels, the median keel (6) 8–13 mm long, starting at 0–1 mm, raised plate-like from the basal part of the lip, highest half-way, crest straight to slightly undulating proximally, slightly to distinctly undulating distally, entire, glabrous, sometimes slightly thickened, especially towards its distal end; the lateral keels (5) 7.5–12 mm long, starting at 0–1 mm, raised plate-like from the basal part of the lip, highest proximally to half-way, crest distinctly undulating, entire, glabrous, sometimes slightly thickened, especially towards its distal end. *Column* 7–10 mm long, stelidia absent or inconspicuous; top part truncate to slightly triangular, margin \pm entire; wings seam-like, extending narrowly up to 1/3 up the column foot to up to the tip of the column foot; column foot 1.5–4 mm long. *Anther* 1.5–2 by 1.5–2.5 mm, abaxially with 2 crests; thecae not divided to distinctly 4-celled. Pollinia 8. *Fruit* not observed.

Colours – Leaves glossy bright green; pedicel and ovary greenish speckled with crimson; tepals pale yellow-green to pale pink spotted with crimson, rarely dark red (Java), lip white to yellow marked reddish near base, sometimes suffused pink on side-lobes; column pale yellow, sometimes with a bright crimson patch near the base adaxially.

Ecology – Primary forest, in rich soil in shady places, sometimes in swampy areas. Altitude 30–1200 m. Flowering observed in I, III–VII, X, XII.

Distribution – SE Asia: Thailand; Vietnam (according to Averyanov). Malesia: Malay Peninsula; Sumatra; Java; Borneo:

Notes – 1. In one specimen two leaves were found on the same shoot; in another, two inflorescences emanated from the same internode.

2. According to Backer & Bakhuizen f. (l.c.) the flowers are fetid.

10. *Tainia purpureifolia* Carr – Fig. 51; Plate 7c.

Tainia purpureifolia Carr, Gard. Bull. Str. Setul. 8, 3 (1935) 199; Masam. Enum. Phan. Born. (1942) 217; Senghas in Schltr., Orch. 1, ed. 3 (1984) 854. – Type: Carr 3150 (= SF 26597) (holo AMES).

Stem of sterile shoot with 3–4 internodes, 14–22 mm long, 2–4 mm diam. (herb.). *Pseudobulb* cylindrical, slightly swollen towards the base, 9–16 by 2–4 mm, scale of sub-terminal node persistent, c. 28 mm long. *Petiole* 3–14 mm long. *Leaf blade* elliptic to ovate, 4.2–4.9 by 1.3–2.3 cm, index 1.9–3.5, acute; margins somewhat thickened, right margin strongly crenulate, left margin not or only slightly crenulate; somewhat fleshy, 13–15-veined (midvein thickened). *Inflorescence* terminal, 11–17.5 cm long, 1–2-flowered, arising from the base of the pseudobulb. Peduncle 10.3–13 cm long, 1–2 mm diam. Peduncle scales c. 3, the longest c. 22 mm long. Rhachis 0.7–4.5 cm long, 0.5–1 mm diam. *Floral bracts*

patent, triangular, 4–10 mm long. *Flowers* most open simultaneously. *Pedicel and ovary* c. 3–10 mm long, as long as the bracts. *Median sepal* elliptic to triangular, 7–13.5 by 1–2 mm, index 5.6–6.7, \pm obtuse, mid-vein distinctly thickened abaxially. *Lateral sepals* \pm elliptic to triangular, \pm straight to falcate, 7.5–11.5 by 1–2 mm, index 5.7–6, acute to slightly acuminate, mid-vein distinctly thickened abaxially. *Petals* obliquely elliptic to ovate, slightly to distinctly falcate, 2–10.5 by 2–4 mm, index 4–4.2, obtuse to slightly acuminate, mid-vein distinctly thickened abaxially. *Lip* blade entire, in general outline (ob)pan-durate, 8–11 by 3–4 mm, index 2.7–2.8; tip acute to slightly acuminate; margins entire, glabrous; adaxial surface glabrous; lip adaxially with 3 keels, the median keel 4–4.5 mm long, starting at 0–1.5 mm, raised plate-like from the basal part of the lip, highest half-way, crest straight to slightly undulating, entire, glabrous, not thickened towards its distal end; the lateral keels 4.5 mm long, starting at 0–1 mm, raised plate-like from the basal part of the lip, highest half-way, crest straight to slightly undulating, entire, glabrous, not thickened towards its distal end. *Column* 2.5–5.5 mm long, stelia absent; top part truncate, margin entire; wings seam-like, extending narrowly up to the tip of the column foot; column foot 0–0.5 mm long. *Anther* 1.25 by 0.75–1.25 mm, abaxially without or with 2 small crests; thecae indistinctly 2-celled. Pollinia 8. *Fruit* ellipsoid, c. 12 by 2.5 mm; stalk c. 10 mm long.

Colours – Leaves dark green above, purple beneath, or entirely blackish purple with pinkish margins and paler purple midvein. Peduncle and rhachis amethyst-purple. Tepals greenish-yellow suffused purple. Lip greenish-yellow to white, tip pale purple, suffused purple towards the base. Column salmon-pink or white with a large dark purple spot abaxially near the apex. Anther cream.

Ecology – Lower montane forest, in leaf litter and moss. Altitude 1250–1350 m. Flowering observed in III, X.

Distribution – Borneo.

11. *Tainia sessilifolia* Fraser – Fig. 52.

Tainia sessilifolia Fraser, Gard. World 7 (1890) 187. – Type: Charlesworth et al. s.n. (holo K).

Stem of sterile shoot and petiole not observed. *Leaf blade* elliptic, c. > 28 by c. 5.9 cm, index c. > 4.7, acuminate; margin not undulate; thin, c. 35-veined (c. 9 thickened). *Inflorescence* erect (?), c. 34-flowered. Peduncle and peduncle scales not observed. Rhachis c. 43 cm long, c. 3 mm diam. *Floral bracts* patent, ovate, c. 8–10 mm long, acuminate. *Flowers* most open simultaneously. *Pedicel and ovary* c. 9–10 mm long, about as long as the bracts, with 3 distinct, undulating wings. *Median sepal* triangular, c. 30 by 4 mm, index c. 7.5, acuminate, margin slightly undulating, mid-vein not thickened abaxially. *Lateral sepals* \pm obliquely triangular, falcate, c. 23 by c. 5.5 mm, index c. 4.2, acuminate, margin slightly undulating, mid-vein slightly thickened abaxially. *Petals* obliquely ovate, c. > 24 by c. 3 mm, index c. > 8, acuminate, mid-vein not thickened abaxially. *Lip* blade three-lobed, in general outline ovate, c. 15 by c. 5 mm, index c. 3; median lobe triangular, c. 5 by c. 3 mm, index c. 1.7; tip acute; margins entire, glabrous, slightly undulating, incurved near the tip; adaxial surface glabrous; lateral lobes obliquely triangular, falcate, c. 1.2–1.5 mm long; tip obtuse; margins entire, glabrous; adaxial surface glabrous; lip adaxially with 5 keels, all forming a low ridge only, the median keel c. 12 mm long, starting at c. 1 mm, crest straight to slightly undulating, entire, glabrous, thickened throughout; the lateral keels c. 12 mm

long, starting at c. 1 mm, crest straight to slightly undulating, entire, glabrous, thickened throughout; the outer keels c. 7 mm long, starting at c. 4 mm, crest straight to slightly undulating, entire, glabrous, thickened throughout. *Column* c. 3 mm long, stelia absent; top part triangular, margin entire; wings seam-like, extending up to \pm half-way the column foot; column foot c. 3 mm long. *Anther* c. 1.5 by c. 1.5 mm, abaxially without crests; thecae indistinctly 4-celled. Pollinia not observed. *Fruit* not observed.

Colours – Leaves dark green; flowers greenish white, keels on lip brown.

Distribution – Unknown.

Note – Only known from the type specimen.

12. *Tainia speciosa* Blume – Fig. 53; Plate 7d.

Tainia speciosa Blume, Bijdr. (1825) 354; Tab. + Pl. (1825) t. 48; Lindley, Gen. Sp. Orch (1831) 132; Reichb. f., Bonplandia 5 (1857) 54; Benth. & Hook. f., Gen. Pl. 3 (1883) 515; Hook. f., Fl. Br. Ind. 5 (1890) 822; Ridley, J. Linn. Soc. Bot. 32 (1896) 316; J. Str. Br. R. As. Soc. 35 (1901) 23; J.J. Smith, Orch. Java (1905) 181; Ridley, Mat. Fl. Mal. Pen. 1 (1907) 114; J. Linn. Soc. Bot. 38 (1908) 328; J.J. Smith, Orch. Java Fig. Atl. 2 (1909) t. 137; Bull. Jard. Bot. Buit. II, 8 (1912) 3; Ridley, Fl. Mal. Pen. 4 (1924) 114; M.R. Henderson, J. Mal. Br. R. As. Soc. 5 (1927) 270; J.J. Smith, Fedde Rep. 32 (1933) 160; Smitin., Thail. Forest. Bull. (Bot.) 2 (1955) 25 ('*Tainea*'); Holtum, Fl. Malaya 1 (1957) 182; Seidenf. & Smitin., Orch. Thail. 2, 1 (1959) 104, t. 77; Smitin., Nat. Hist. Bull. Siam Soc. 20 (1961) 60 ('*Tainea*'); Seidenf. & Smitin., Orch. Thail. 4, 2 (1965) 737; Backer & Bakh. f., Fl. Java 3 (1968) 290; Soepadmo, Nat. Mal. 1, 1 (1976) 30; Senghas in Schltr., Orch. 1, ed. 3 (1984) 856, t. 656; Seidenf., Op. Bot. 89 (1986) 28, t. 10; Comber, Orch. Java (1990) 107. – *Mitopetalum speciosum* (Blume) Blume, Mus. Bot. L.-B. 2 (1856) 185; Fl. Jav. n.s., 1 (1858) 134, t. 50; Miq., Fl. Ind. Bat. 3 (1859) 674, 741. – *Eria speciosa* (Blume) Reichb. f., Walp. Ann. 6 (1861) 269. – Type: Blume s.n. (holo L.).

Stem of sterile shoot with 4–6 internodes, (32) 50–100 mm long, (2) 4–7 mm diam. (herb.). *Pseudobulb* cylindrical, slightly swollen towards the base, (19) 40–82 by 2–7 mm, scale of subterminal node more or less persistent, 35–98 mm long. *Petiole* (39) 145–300 mm long. *Leaf blade* ovate to elliptic, (5.7) 7.9–18.5 by (1.2) 1.8–5.4 cm, index 2.6–9.0, acute to slightly acuminate; margin not undulate; thin, 21–51-veined. *Inflorescence* terminal, (14) 17.5–63.5 cm long, (1) 4–10-flowered, arising 0–7 mm above the base of the pseudobulb. Peduncle 12.5–44 cm long, 2–4 mm diam. Peduncle scales 3–4, the longest 17–57 mm long. Rhachis 3.6–22 cm long, 1–3 mm diam. *Floral bracts* spreading to reflexed, triangular, 15–45 mm long. *Flowers* most open simultaneously. *Pedicel and ovary* (4) 9–18 mm long, shorter than the bracts. *Median sepal* ovate to triangular, 35–58 by 2–4.5 mm, index 10–29, caudate, mid-vein thickened abaxially from base up to \pm half-way, rarely up to tip. *Lateral sepals* ovate to triangular, 45–68 by 2.5–4 mm, index 14.1–21.3, caudate, mid-vein thickened abaxially from base up to \pm half-way. *Petals* ovate to triangular, 24–46 by 3–7 mm, index 6.7–13, caudate, mid-vein usually thickened abaxially from base up to \pm half-way. *Lip* slightly saccate; blade entire, in general outline ovate, 18–27 by 6–15 mm, index 1.8–3.8; tip acuminate; margins entire, undulate, minutely papillose proximally, glabrous distally; adaxial surface usually minutely papillose proximally, glabrous distally; lip adaxially with 1–3 keels, all forming a low ridge only, the median keel 14–20 mm long, starting at 0–1.5 mm, crest straight to slightly undulating, entire, usually minutely papillose proximally, glabrous distally, not thickened towards its distal end; the lateral keels when present 6–16.5 mm long, starting at 1.5–7 mm, crest

straight, entire, usually minutely papillose proximally, glabrous distally, not thickened towards its distal end. *Column* 5–9 mm long, steldia absent; top part truncate, margin \pm entire; wings seam-like, extending up to the tip of the column foot, sometimes minutely papillose distally; column foot 2.5–5 mm long, sometimes minutely papillose distally. *Anther* 1.5–2.5 by 1.5–2.5 mm, abaxially with 2 large crests; thecae not divided to indistinctly 2-celled. Pollinia 6 or 8 (see note 1). *Fruit* not observed.

Colours – Stalks and pseudobulbs dull purple. Leaves dull grass green. Flowers white to greenish to dull cream yellow ground with crimson veins; sepals and petals greenish with purple lines; tip of lip yellow. Column pale yellow. Anther cap yellow with two bluish purple crests.

Ecology – Terrestrial, on tertiary granodiorite, in leaf litter, rarely (SAN 83237, Sands 1249) epiphytic. In evergreen forest, upper montane forest. Altitude 400–1700 m. Flowering observed in IV–VIII.

Distribution – SE Asia: Thailand. Malesia: Malay Peninsula; Sumatra (according to Seidenfaden); Java; Borneo.

Notes – 1. Usually only 6 pollinia are found: each theca contains a smaller proximal one and a larger distal one laterally and a single, large one with a transverse groove medially. The groove probably indicates that it is formed by the fusion of a pair of pollinia similar to the lateral one. In one case this median pollinium was indeed found to be split in two.

2. One specimen from Malaya (Ridley s.n. 1911, Gunong Tahan) was unusually small. Wherever its measurements fall outside the range set by the other specimens, I have added them in parentheses.

3. Anon. s.n. Jan 1936 (SING) is probably a mixtum: the inflorescence is the present species, but the leaves are much larger than in the other material I have seen (up to 35 by 8.6 cm) and seem to have only short petioles. The label gives the species as *T. maingayi* and adds 'fls. purple', but even for *T. maingayi* the leaves are very large.

13. *Tainia trinervis* (Blume) Reichb. f. – Fig. 54.

Tainia trinervis (Blume) Reichb. f., Bonplandia 5 (1857) 54. – *Mitopetalum trinerve* Blume, Mus. Bot. L.-B. 2 (1856) 185; Fl. Jav. n.s., 1 (1858) 135 ('*trinervium*'); Miq., Fl. Ind. Bat. 3 (1959) 741 ('*trinervium*'). – *Mitopetalum parviflorum* Blume, Fl. Jav. n.s., 1 (1858) t. 54G (errore). – Type: Korthals s.n. (holo L).

Tainia parviflora Schltr., Fedde Rep. Beih. 1 (1911) 100; J.J. Smith, Nova Guinea 12, 3 (1915) 197; Schltr., Fedde Rep. Beih. 21 (1923) t. 39, no. 135; Cloud & Dockr., N. Queensl. Natur. 120 (1958) 1; Dockr., N. Queensl. Natur. Club (1966) 7; Austr. Indig. Orch. 1 (1969) 260, fig.; Senghas in Schltr., Orch. 1, ed. 3 (1984) 854; Clements, Austr. Orch. Res. 1 (1989) 136. – Type: Schlechter 20132 (not seen, probably lost during World War II).

Stem of sterile shoot with 2–5 internodes, 38–73 mm long, 3–6 mm diam. (herb.). *Pseudobulb* cylindrical, slightly swollen towards the base, 30–68 by 3–6 mm, scale of subterminal node decaying to somewhat persistent, 70–97 mm long. *Petiole* 30–135 mm long. *Leaf blade* elliptic, 9.5–26.7 by 2.9–8.1 cm, index 2.3–7.2, acute; margin not undulate; thin, 33–61-veined (3 thickened). *Inflorescence* terminal, 28.0–69.6 cm long, 11–25-flowered, arising from the base of the pseudobulb. Peduncle 24–41.5 cm long, 1–4 mm diam. Peduncle scales 3–4, the longest 28–66 mm long. Rhachis 8.1–29.6 cm long, 1–3 mm diam. *Floral bracts* patent to spreading, triangular, 4–11 mm long. *Flowers*

several open simultaneously. *Pedicel and ovary* 7–18 mm long, as long as to longer than the bracts. *Median sepal* elliptic to triangular, 9–12.5 by 1.5–2 mm, index 5.5–8.3, obtuse, mid-vein not thickened abaxially. *Lateral sepals* elliptic to triangular, slightly falcate, 8–11 by 1.5–3 mm, index 3.3–5, obtuse, mid-vein usually not thickened abaxially. *Petals* obliquely elliptic to triangular, slightly falcate to falcate, 8.5–11 by 1.5–2 mm, index 4.3–7.3, obtuse, mid-vein usually not thickened abaxially. *Lip* blade three-lobed, in general outline elliptic, 6.5–8 by 5–6.5 mm, index 1.2–1.6; median lobe \pm triangular to orbicular, 2–3.5 by 4–5 mm, index 0.4–0.8; tip acuminate; margins entire, glabrous, rarely minutely papillose, adaxial surface usually minutely papillose; lateral lobes obliquely triangular, 1–2 mm long; tip acute to slightly obtuse; margins entire, minutely papillose, rarely glabrous; adaxial surface usually minutely papillose; lip adaxially with 3 keels, the median keel 3–7 mm long, starting at 1–5 mm, raised plate-like from the basal part of the lip, abruptly increasing in height distally, forming a disc-like flap, highest distally, crest straight, entire, glabrous, thickened throughout, sometimes doubled distally; the lateral keels 5–7 mm long, starting at 0.5–1.5 mm, raised plate-like from the basal part of the lip, forming a \pm triangular fleshy callus over c. 1 mm, then decreasing in height, abruptly increasing again on the median lobe, forming a disc-like flap, highest distally, crest straight to slightly undulating proximally, straight distally, entire, glabrous, thickened throughout, sometimes doubled proximally and distally. *Column* 3.5–5 mm long, steldia absent; top part truncate to semiorbicular, margin entire; wings seam-like, extending up to the tip of the column foot; column foot 0.5–2 mm long. *Anther* 1–1.5 by 1–1.5 mm, abaxially with 2 crests; thecae distinctly 2–4-celled. Pollinia 8. *Fruit* ellipsoid, c. 28 by c. 10 mm; stalk c. 8 mm long.

Colours – Leaves dull dark green above, sometimes mottled, green below. Sepals and petals olive-yellow, the petals with a broad crimson streak. Lip base yellow, rarely red, median lobe yellow heavily suffused purple, lateral lobes purple, rarely streaked yellow, lower keels yellow tipped purple, upper keels purple. Column yellow. Anther cream, crests purple.

Ecology – Montane ridges, *Castanopsis*, *Lithocarpus* and *Syzygium* dominated rain forest, and *Araucaria* forest, growing in leaf litter and peat in deep shade. Altitude 450–1200 m. Flowering observed in VII–XI.

Distribution – Malesia: Moluccas (Ternate); New Guinea; Bougainville. Australia (North Queensland, according to Cloud & Dockrill).

Notes – 1. In some specimens a slight to distinct longitudinal ridge can be seen to extend both abaxially and adaxially along the column. Sometimes the lip appears rather fleshy. In one specimen (LAE 64078) two very small, minutely papillose calluses could be observed at 1.5–2 mm from the base of the lip, at c. 0.5 mm from and parallel to the margin. In this specimen, the keels were also minutely papillose near the base of the lip.

2. The label of the probable type specimen of *Mitopetalum trinerve* Blume (Korthals s.n., L!) states that the specimen was found on Java ‘in sylvis Tandite’ [see also Blume, Fl. Jav. n.s., 1 (1858) 135]. J.J. Smith has added: “Waarschijnlijk is bedoeld de berg Tandiki op Sumatra (Tandike, Korthals, top. schets Sumatra).” [“Probably the mountain Tandiki on Sumatra is intended.”] No other specimen of this species has ever been collected from Java or Sumatra. The most westerly occurrence hitherto recorded reliably is Ternate in the Moluccas. I suspect that an error was made and have therefore not included Sumatra in the distribution of the species.

14. *Tainia vegetissima* Ridley – Fig. 55.

Tainia vegetissima Ridley, J. Linn. Soc. Bot. 38 (1908) 328; Fl. Mal. Penin. 4 (1924) 114; Carr, Gard. Bull. Str. Settl. 8, 2 (1935) 72; Masam., Enum. Phan. Born. (1942) 217; Holttum, Fl. Malaya 1, ed. 3 (1964) 188. – Type: Wray & Robinson 5314 (holo BM).

Stem of sterile shoot with c. 3 internodes, 22–31 mm long, 1–3 mm diam. (herb.). *Pseudobulb* cylindrical to slightly ovoid, 11–17 by 1–2 mm, scale of subterminal node more or less persistent, 16–33 mm long. *Petiole* 5–20 mm long. *Leaf blade* ovate, 2.4–5.8 by 1.1–2.2 cm, index 1.6–2.7, acute; margin somewhat thickened, one margin sometimes strongly crenulate, the other margin not or only slightly crenulate, somewhat fleshy, 11–15-veined. *Inflorescence* terminal, 19–27 cm long, 1–4-flowered, arising c. 4 mm above the base of the pseudobulb. *Peduncle* 13–24.8 cm long, 1 mm diam. *Peduncle scales* 4, the longest 11–18 mm long. *Rhachis* 3.2–5.6 cm long, 1 mm diam. *Floral bracts* patent, triangular, 4–10 mm long. *Flowers* most open simultaneously. *Pedicel and ovary* 8–16 mm long, longer than the bracts. *Median sepal* elliptic, 11–14 by 1.5–2 mm, index 5.5–8.5, acute, mid-vein thickened abaxially. *Lateral sepals* ± obliquely elliptic, slightly falcate, 11.5–13 by 2–2.5 mm, index 5.2–6.5, acute, mid-vein slightly thickened abaxially. *Petals* obliquely elliptic, straight to slightly falcate, 8–12.5 by 2–2.5 mm, index 4–5, acute, mid-vein slightly thickened abaxially. *Lip* blade entire, in general outline pandurate, 10.5–15 by 7.5–9 mm, index 1.4–1.6; tip obtuse; margins entire, glabrous; adaxial surface glabrous; lip adaxially with 2 keels, 1.5–2.5 mm long, starting at 1 mm, raised plate-like from the basal part of the lip, highest half-way, crest straight, entire, glabrous, not thickened towards its distal end. *Column* 3.5–6 mm long, stelia absent; top part truncate, margin entire; wings seam-like, broader near the top part of the column, sometimes broadened towards the base of the column and along the column foot, extending up to the tip of the column foot; column foot 1 mm long. *Anther* c. 1 mm by c. 1.5 mm, abaxially without crests; thecae not observed. Pollinia not observed. *Fruit* not observed.

Colours – Leaves shining purplish brown, petioles crimson. Flowers pale yellow closely lined with crimson; lip edged with yellow, centre crimson.

Ecology – Terrestrial, in moss forest. Altitude 1000–1250 m. Flowering observed in V, VII, IX.

Distribution – Malay Peninsula; Borneo.

INCOMPLETELY KNOWN SPECIES

15. *Tainia angustifolia* Gagnepain — Fig.

Tainia angustifolia Gagnepain (non Benth. & Hook. f.), Fl. Gén. I.-C. 6 (1933) 383. – Syntypes: Eberhardt s.n., Pierre s.n. (not seen).

Distribution – Vietnam (Annam; Cochinchina).

Note – Gagnepain described two collections from Indochina which he referred to *T. angustifolia*. He describes these as having petiole-like pseudobulbs, with the inflorescence arising from the same node as the leaf, and an entire obovate-rhomboid spurred lip with five keels. I agree with Seidenfaden [Op. Bot. 89 (1986) 32] that these cannot be the same as *Ania angustifolia*. However, not having seen these specimens, I cannot tell what their true identity is.

16. *Tainia elliptica* Fukuyama

Tainia elliptica Fukuyama, Bot. Mag. Tokyo 49 (1935) 293. – Type: Fukuyama 4540 (not seen).

Distribution – Taiwan.

Note – I have seen no material of this species; from the description and distribution it might be either *T. dunnii* or *T. latifolia* subsp. *latifolia*.

17. *Tainia flabellilobata* Tso

Tainia flabellilobata Tso, Sunyatsenia 1 (1933) 144; S.Y. Hu, Q. J. Taiwan Mus. 28, 1+2 (1975) 167; Senghas in Schltr., Orch. 1, ed. 3 (1984) 854. – Type: Chun 42727 (not seen).

Distribution – China (Guangdong).

Note – I have seen no material of this species, but the author states: “Near *T. latifolia* Hook. f. and *T. hastata* Hook. f.”, to which it may possibly belong.

18. *Tainia gokanzanensis* Masam.

Tainia gokanzanensis Masam. in Humbert, Not. Syst. 6 (1937) 38; Senghas in Schltr., Orch. 1, ed. 3 (1984) 854. – Type: Masamune s.n. (TI).

Distribution – Taiwan.

Note – I have seen no material of this species. The original description mentions that the inflorescence arises from the tip of the pseudobulb, a character state not present in *Tainia*; further character states are bracts 2 mm long, pedicel and ovary 1–5 cm long, three-lobed ovate-rotund lip 7 by 5 mm, spur 2 mm. This does not resemble any *Tainia* or *Ania* treated in this paper.

19. *Tainia hennisiana* (Schltr.) P. Hunt

Tainia hennisiana (Schltr.) P. Hunt, Kew Bull. 26 (1971) 182. – Type: Hennis s.n. (1911). (See under incompletely known species of *Ania*.)

20. *Tainia parvifolia* Tso

Tainia parvifolia Tso, Sunyatsenia 1 (1933) 146; S.Y. Hu, Q. J. Taiwan Mus. 28, 1+2 (1975) 167; Senghas in Schltr., Orch. 1, ed. 3 (1984) 854. – Type: Ko 51493.

Distribution – China (Guangdong).

Note – I have seen no material of this species, and from the description and distribution it cannot be made out whether it is *T. dunnii* or *T. laxiflora*.

21. *Tainia promensis* (Lindley) Hook. f.

Tainia promensis (Lindley) Hook. f., Ic. Pl. (1889) 1883. – *Eulophia promensis* Lindley, Gen. Sp. Orch. (1833) 181. – *Ascotainia promensis* (Lindley) Schltr., Fedde Rep. Beih. 4 (1919) 246 ('*Ascotaenia*'). – *Ania promensis* (Lindley) Senghas in Schltr., Orch. 1, ed. 3 (1984) 863. – Type: Wallich Herb. 7365.

Distribution – Burma.

Note – I have seen only a microfiche of the type material of this species, but from the drawing given by Hooker f. it does not seem to be a *Tainia*. Hooker f. gives the number of

pollinia as 4; however, he states that he is not sure that the pollinia were complete in the only flower he was able to study. The distinctly spurred spatulate lip carries on the broadest part “a dense granulate cluster of truncate calli” (Hooker f., l.c.) and the pseudobulb is covered with a curious-looking sheath. It might be an *Ania* if the number of pollinia is 8.

EXCLUDED SPECIES

E1. *Tainia (Ania) angulata* (Reichb. f.) Benth. ex Kränzlin

Tainia (Ania) angulata (Reichb. f.) Benth. ex Kränzlin in Engl., Pflanzenr. Orch. Mon. Dendr. 2 (1911) 165; P. Hunt, Kew Bull. 26 (1972) 181. = *Eria angulata* Reichb. f., Flora 55 (1872) 275.– Type: not designated.

Distribution – India.

E2. *Tainia balansae* Gagnepain

Tainia balansae Gagnepain, Bull. Mus. Natl. Hist. Nat. sér. 2, 4 (1932) 706; Fl. Gén. I.–C. 6 (1933) 379; Seidenf., Contr. Orch. Fl. Cambodia, Laos, Vietnam (1975) 105; Senghas in Schltr., Orch. 1, ed. 3 (1984) 854. – Type: Balansa 1998. = *Collabium chinense* (Rolfe) Tang & Wang in Fl. Hain. 4 (1977) 217, fig. 1101.

Distribution – SE Asia: China (Guangdong); Thailand; Vietnam (Tonkin). Malesia: Malay Peninsula.

E3. *Tainia barbata* Lindley

Tainia barbata Lindley, Gard. Chron. (1857) 68. = *Eriodes barbata* (Lindley) Rolfe, Orch. Rev. 23 (1915) 326. – Type: Griffith 5297 (holo K).

Distribution – India, Burma; Vietnam (according to Averyanov).

E4. *Tainia beccarii* (Schltr.) Gagnepain

Tainia beccarii (Schltr.) Gagnepain, Bull. Mus. Natl. Hist. Nat. sér. 2, 4 (1932) 706. = *Nephelaphyllum beccarii* Schltr., Fedde Rep. 9 (1911) 338. – Syntypes: Beccari 1682, 1945; Hewitt s.n. 1908; Brooks s.n. 1910.

Distribution – Borneo.

E5. *Tainia bigibba* (Reichb. f.) Benth. ex Kränzlin in Engl.

Tainia bigibba (Reichb. f.) Benth. ex Kränzlin in Engl., Pflanzenr. Orch. Mon. Dendr. 2 (1911) 165; Ames, J. Str. Br. R. As. Soc., Spec. No. (1921) 142; Masam., Enum. Phan. Born. (1942) 217; P. Hunt, Kew Bull. 26 (1971) 181; Senghas in Schltr., Orch. 1, ed. 3 (1984) 854. = *Eria bigibba* Reichb. f., Gard. Chron. (1884) (II) 680. – Type: Linden s.n., a live plant, probably no herbarium made.

Distribution – Borneo.

E6. *Tainia borneensis* Ridley

Tainia borneensis Ridley, J. Str. Br. R. As. Soc. 49 (1907) 32. – Type: Hewitt 15 (holo K).

Distribution – Borneo (Sarawak).

Note – The material of the type specimen in Kew is very badly deteriorated. However, it is clear from the remains and also from the original description that this is not the same species as *Ania borneensis* (Rolfe) Senghas. It has one-leaved sterile shoots with a cylindrical pseudobulb, as in *Tainia*, but with a velvety inflorescence arising from its base and an obcuneate saccate lip with an elongated acuminate tip. It might belong in *Plocoglottis* sect. *Plocoglottis* [see Seidenf., Op. Bot. 89 (1986) 69].

E7. *Tainia borneensis* (Schltr.) Gagnepain

Tainia borneensis (Schltr.) Gagnepain, Bull. Mus. Natl. Hist. Nat. sér. 2, 4 (1932) 706. – Type: Schlechter 13526. = *Nephelaphyllum pulchrum* Blume, Bijdr. (1825) 373.

Distribution – SE Asia: Bhutan; Burma; Thailand; Vietnam (Tonkin). Malesia: Malay Peninsula; Sumatra; Java; Philippines (Palawan).

Note – Based on *Nephelaphyllum borneense* Schltr. [Bull. Herb. Boiss. sér. 2, 6 (1906) 301], which was shown by Van der Burg (in ms.) to be the same as *N. pulchrum* Blume.

E8. *Tainia chapaensis* Gagnepain

Tainia chapaensis Gagnepain, Bull. Mus. Natl. Hist. Nat. sér. 2, 4 (1932) 707; Fl. Gén. I.-C. 6 (1933) 378. – Syntypes: Pételot 5148, 5165. = *Collabium formosanum* Hayata, J. Coll. Sci. Univ. Tokyo 30 (1911) 319.

Distribution – Burma; Taiwan; Vietnam (Tonkin).

E9. *Tainia chinensis* (Rolfe) Gagnepain

Tainia chinensis (Rolfe) Gagnepain, Bull. Mus. Natl. Hist. Nat. sér. 2, 4 (1932) 706. = *Collabium chinense* (Rolfe) Tang & Wang in Fl. Hain. 4 (1977) 217, fig. 1101. – Type: Hance 17733.

Distribution – China (Guangdong); Thailand; Vietnam (Tonkin).

Note – Based on *Nephelaphyllum chinense* Rolfe [Kew Bull. (1896) 194].

E10. *Tainia cordifolia* (Lindley) Gagnepain

Tainia cordifolia (Lindley) Gagnepain, Bull. Mus. Natl. Hist. Nat. sér. 2, 4 (1932) 706. = *Nephelaphyllum cordifolium* (Lindley) Blume, Fl. Jav. n.s., 1 (1858) t. 61.3. – Type: Wallich s.n. (Wall. Cat. 3750).

Distribution – India; Sikkim; Burma.

Note – Based on *Cytheris cordifolia* Lindley [Gen. Sp. Orch. (1831) 129].

E11. *Tainia cristata* (Rolfe) Gagnepain

Tainia cristata (Rolfe) Gagnepain, Bull. Mus. Natl. Hist. Nat. sér. 2, 4 (1932) 706, 708; Fl. Gén. I.-C. 6 (1933) 382; Seidenf., Contr. Orch. Fl. Cambodia, Laos, Vietnam (1975) 105. = *Nephelaphyllum cristatum* Rolfe, Kew Bull. (1896) 194. – Type: Balansa 2001.

Distribution – Hong Kong; Vietnam (Tonkin).

E12. *Tainia delavayi* Gagnepain

Tainia delavayi Gagnepain, Bull. Mus. Natl. Hist. Nat. sér. 2, 4 (1932) 708; S.Y. Hu, Q. J. Taiwan Mus. 28, 1+2 (1975) 167. = *Collabium delavayi* (Gagnepain) Seidenf., Op. Bot. 72 (1983) 26, fig. 11. – Type: Delavay s.n.

Distribution – China (Yunnan; Guangdong).

E13. *Tainia evrardii* Gagnepain

Tainia evrardii Gagnepain, Bull. Mus. Natl. Hist. Nat. sér. 2, 4 (1932) 709; Fl. Gén. I.-C. 6 (1933) 377, fig. 33: 16–22, 34: 1. = *Diglyphosa evrardii* (Gagnepain) Tang & Wang, Acta Phytotax. Sin. 1 (1951) 77. – Syntypes: Evrard 254, 1250, 1943.

Distribution – Vietnam (Annam).

E14. *Tainia flabellata* (Ames & C. Schweinf.) Gagnepain

Tainia flabellata (Ames & C. Schweinf.) Gagnepain, Bull. Mus. Natl. Hist. Nat. sér. 2, 4 (1932) 706. = *Nephelaphyllum flabellatum* Ames & C. Schweinf. in Ames, Orch. 6 (1920) 19. – Type: Clemens s.n.

Distribution – Borneo.

Note – According to Van der Burg (in ms.) this might be the same species as *Nephelaphyllum pulchrum* Blume.

E15. *Tainia gracilis* (Schltr.) Gagnepain

Tainia gracilis (Schltr.) Gagnepain, Bull. Mus. Natl. Hist. Nat. sér. 2, 4 (1932) 706. = *Nephelaphyllum gracile* Schltr., Bull. Herb. Boiss. sér. 2, 6 (1906) 301. – Type: Schlechter 13523.
Non *T. gracilis* Tso, Sunyatsenia 1 (1933) 145 (= *T. dunnii* Rolfe).

Distribution – Borneo.

Note – According to Van der Burg (in ms.) this might be the same species as *Nephelaphyllum trapoides* J.J. Smith.

E16. *Tainia keentimensis* Chow Cheng

Tainia keentimensis Chow Cheng, Formosan Orch. (no date) 54, t. on p. 55 (nom. nud.).

Distribution – Taiwan.

Note – Only a short diagnosis in English and a colour photograph are provided, from which it can only be made out that this plant is not a *Tainia*, since it has a spurred lip. Whether or not it is an *Ania* I dare not say.

E17. *Tainia latilabra* (Ridley) Gagnepain

Tainia latilabra (Ridley) Gagnepain, Bull. Mus. Natl. Hist. Nat. sér. 2, 4 (1932) 706. = *Nephelaphyllum latilabre* Ridley, Trans. Linn. Soc. II, Bot. 4 (1894) 238. – Type: Haviland 1165.

Distribution – SE Asia: Bhutan; Burma; Thailand; Vietnam (Tonkin). Malesia: Malay Peninsula; Sumatra; Java; Borneo; Philippines.

E18. *Tainia maculata* (Thwaites) Hook. f.

Tainia maculata (Thwaites) Hook. f., Fl. Br. Ind. 5 (1890) 860; *ibid.* 6 (1890) 193. – Type: Thwaites s.n. = *Chrysoglossum ornatum* Blume, Bijdr. (1825) 338.

Distribution – Widespread in South-East Asia, from Sri Lanka eastwards up to the Fiji Islands.

Note – *Tainia maculata* was based on *Ania maculata* Thwaites, Enum. Pl. Zeyl. (1861) 301, and already transferred to *Chrysoglossum* by Hooker f. [Fl. Br. Ind: 6 (1890) 193]. It was shown by Van der Burg (in ms.) to be the same as *Chrysoglossum ornatum* Blume.

E19. *Tainia mindorensis* (Ames) Gagnepain

Tainia mindorensis (Ames) Gagnepain, Bull. Mus. Natl. Hist. Nat. sér. 2, 4 (1932) 706. = *Nephelaphyllum mindorense* Ames, Philip. J. Sci. 2 (1907) Bot. 316. – Type: Merrill 5623.

Distribution – Philippines.

E20. *Tainia ovalifolia* (Ames & C. Schweinf.) Garay & Kittredge

Tainia ovalifolia (Ames & C. Schweinf.) Garay & Kittredge, Mus. Leaflet. Harvard Univ. 30 (1985) 59. – *Eulophia ovalifolia* Ames & C. Schweinf. in Ames, Orch. 6 (1920) 208. – Type: Clermont 93.

Distribution – Borneo.

Note – Ames & Schweinfurth note that there are only two pollinia. Thus, this can hardly be a *Tainia*.

E21. *Tainia papuana* (Schltr.) Gagnepain

Tainia papuana (Schltr.) Gagnepain, Bull. Mus. Natl. Hist. Nat. sér. 2, 4 (1932) 706. = *Collabium papuanum* (Schltr.) Schltr., Fedde Rep. Beih. 1 (1911) 98. – Type: Schlechter 14630.

Distribution – New Guinea.

Note – Based on *Nephelaphyllum papuanum* Schltr. [in K. Sch. & Laut., Nachtr. 2 (1905) 96].

E22. *Tainia pulchra* (Blume) Gagnepain

Tainia pulchra (Blume) Gagnepain, Bull. Mus. Natl. Hist. Nat. sér. 2, 4 (1932) 706; Fl. Gén. I.-C. 6 (1933) 380, fig. 34: 2–5. = *Nephelaphyllum pulchrum* Blume, Bijdr. (1825) 373. – Type: not designated.

Distribution – SE Asia: Bhutan; Burma; Thailand; Cambodia; Vietnam (Tonkin). Malesia: Malay Peninsula; Sumatra; Java; Borneo; Philippines.

E23. *Tainia stellata* (Lindley) Pfitzer

Tainia stellata (Lindley) Pfitzer in Engl. & Prantl, Nat. Pflanzenfam. 2, 6 (1888) 153. = *Eria rugosa* Lindley, Gen. Sp. Orch. (1830) 66.

Note – See J. J. Smith, Orch. Jav. (1905) 378 for full synonymy.

E24. *Tainia tenuiflora* (Blume) Gagnepain

Tainia tenuiflora (Blume) Gagnepain, Bull. Mus. Natl. Hist. Nat. sér. 2, 4 (1932) 706; Fl. Gén. I.-C. 6 (1933) 380. = *Nephelaphyllum tenuiflorum* Blume, Bijdr. (1825) 373. – Type: not designated.

Distribution – SE Asia: Thailand; Vietnam (Tonkin). Malesia: Malay Peninsula; Sumatra; Java; Borneo; Sulawesi.

E25. *Tainia unguiculata* Hayata

Tainia unguiculata Hayata, Ic. Pl. Form. 4 (1914) 61, fig. 28; Schltr., Fedde Rep. Beih. 4 (1919) 181; S. Y. Hu, Q. J. Taiwan Mus. 28, 1+2 (1975) 169. = *Acanthephippium unguiculatum* (Hayata) Fukuyama, Bot. Mag. Tokyo 48 (1934) 301. – Type: Cult. in Taihoku s.n.

Distribution – Formosa.

IDENTIFICATION LIST

In this list, all collections of the genera treated in this study and seen by me, are given, with the exception of those collections for which no proper reference could be given, e.g. the many collections of plants cultivated in the botanical garden in BO. In cases where such collections could be referred to unambiguously, they are included here. The data are given in the order: collector, collection number (if given, else the abbreviation s(ine) n(umero) is used, followed by the date if given and any information on the label that can be used to identify the collection) and in parentheses an abbreviation for the species. Series are given under their series number, followed by the collectors' names in parentheses. L denotes sheets from the herbarium in L. Reichenbach denotes sheets from the Reichenbach Orchid Herbarium. A question mark after a species abbreviation denotes an uncertain identification. The following abbreviations are used:

A	<i>Ania</i> sp.	T	<i>Tainia</i> sp.
Aa	<i>Ania angustifolia</i>	Tb	<i>Tainia bicornis</i>
Ab	<i>Ania borneensis</i>	Td	<i>Tainia dunnii</i>
Ae	<i>Ania elmeri</i>	Tl	<i>Tainia latifolia</i>
Ah	<i>Ania hongkongensis</i>	Tle	<i>Tainia latifolia</i> subsp. <i>elongata</i>
Ape	<i>Ania penangiana</i>	Tll	<i>Tainia latifolia</i> subsp. <i>latifolia</i>
Apo	<i>Ania ponggolensis</i>	Tlx	<i>Tainia laxiflora</i>
Ar	<i>Ania ruybarrettoi</i>	Tmc	<i>Tainia macrantha</i>
Av	<i>Ania viridifusca</i>	Tmg	<i>Tainia maingayi</i>
Hu	<i>Hancockia uniflora</i>	Tmi	<i>Tainia minor</i>
M	<i>Mischobulbum</i> sp.	To	<i>Tainia obpandurata</i>
Mco	<i>Mischobulbum cordifolium</i>	Tpf	<i>Tainia paucifolia</i>
Mcr	<i>Mischobulbum crassum</i>	Tpu	<i>Tainia purpureifolia</i>
MI	<i>Mischobulbum longiscapum</i>	Tse	<i>Tainia sessilifolia</i>
Mma	<i>Mischobulbum marmoratum</i>	Tsp	<i>Tainia speciosa</i>
Mme	<i>Mischobulbum megalanthum</i>	Tt	<i>Tainia trinervis</i>
Mp	<i>Mischobulbum papuanum</i>	Tv	<i>Tainia vegetissima</i>
Ms	<i>Mischobulbum scapigerum</i>		
Mw	<i>Mischobulbum wrayanum</i>		

Anderson 1187 (Tmi), 1217 (Tmi) — Anon. s.n. (L 90484126) (Tle), s.n. (L 903.162.800) (Tle) — Averyanov & Kydraveeva 140 (Ah).

Backer s.n. Jul 1918 (Tle), 14173 (Tsp), 14476 (= 194) (Tle), 15016 (Tle), 25750 (Tle) — Bakhuizen van den Brink 303 (Tle), 307 (Tpf), 1708 (Ab), 2258 (Tsp), 3753 (Tle), 3790 (Tle), 4390 (Tle), 7136 (Tmg) — Bakhuizen van den Brink f. 471 (Tsp), 643 (Tpf), 2766 (Tle?), 3426 (Tle), 3778 (Tle), 3780 (Tle) — Banfield s.n. Jul 1933 (Tsp) — Banziger 559 (Tsp) — Barretto 309 (Ah), 310 (Ah), 311 (Ar) — Beccari PB 2046 (Tpf), PB 2412 (Tsp) — Beddome s.n. ex Coimbatore (Tb) — B.G. 25 (Av) — van Beusekom & Phengkhilai 794 (Tpf), 859 (Tsp), 875 (Tpf) — Birch s.n. May 1902 (Mw) — Blume s.n. (L 903.162.795) (Tpf), s.n. (L 903.162.798) (Tsp), s.n. (L 903.162.799) (Tt) — Bodinier 1100 (Ah) — Brandis s.n. 1879 (Tll) — Brass 3235 (Mp), 3333 (Mp) — Brooke 8616 (Tsp), 10195 (Tpf) — Bruce (Wallich herb.) 3741 (Tll) — Bünnemeijer 4043 (Mw) — Burkill 2401 (Tsp) — Burt & Woods B1609 (Mcr).

Carr s.n. 1928 (Tmg), s.n. Aug 1929 (Tpf), s.n. Nov 1935 (A?), s.n. near Chiengnum (T), 3150 (Tpu), 3158 (Tpf), 3420 (Ms), 10162 (Tt), 10190 (M?), 12025 (Tmg), K177 (Tsp) — Charlesworth s.n. 1890 (Tse) — Cheang s.n. 1968 (Ape) — Chin 5761 (Tll) — Clarke 35517 (Tmi), 42946 (Tll) — Clemens s.n. Dec 1931 (Ms), 1268 (Mp), 1633 (Mp), 30125 (Ab) — Clowes s.n. 1844 (Tb) — Collenette 73 (Ab) — Comber 1259 (Tpf), 1649 (Tle), 1662 (Tsp), 1713 (Mw?) — Comber & Cribb 1773 (Ape) — Cribb 91 (Av), S62 (Tt) — Cult. Hort. BO s.n. ex Tjianpea (Tle), 61 (Tt), 71 (Tt), 94 (Ab), 107 (Ab), 108 (Ape), 109m (Ab), 135 (Tsp), 136 (Tt), 145 (Tpf), 146 (Tt), 398 (Tt) — Cult. Hort. E s.n. Jan 1899 (Av), Feb 1899 (Av), 6387 (Mp) — Cult. Hort. Glasnevin s.n. 1888 (Av) — Cult. Hort. K s.n. Jan 1871 (Av), s.n. 1878 (Av), s.n. 1880 (Av), s.n. 1887 (Av), s.n. 1925 (Ape), 175-1924 (Ape), 400-34/Chandra (Ape), E.N. 032-75.004.04 (Ape), E.N. 730-62 (Mp) — Cumberlege 783 (Ape), 944 (Mw), 1058 (Mw), 1078 (Tll), 1254 (Tll) — Curtis s.n. Oct 1892 (Ape), s.n. Dec 1892 (Ape), 3290 (Tmg), 3291 (Tsp).

van Daalen 145 (T?) — Dalziel s.n. May 1888 (Td) — Danser 6790 (Tle) — Daud 11314 (Tpf) — Day 65 (T) — Docters van Leeuwen s.n. Oct 1921 (Tpf) — Docters van Leeuwen-Reijnvaan 2724 (Tle) — DPB 83-116 (Ape), 83-140 (Ape), 83-293 (Ape) — Dransfield 1713 (Tle) — Dunn s.n. Oct 1907 (Td). E.B. s.n. Jul 1917 (Tsp) — Eberhardt 1975 (Aa?), 3984 (Av), 4673 (Av) — Evrard 1457 (Aa), 2387 (Aa). FMS (Carr) 80 (T), (Carr) 105 (T?), (Carr) 125 (M?), (Carr) 275 (Tpf), (Henderson) 11045 (Mw), (Henderson) 11113 (Tsp), (Henderson) 11294 (Tmg), (Kalong) 22352 (Tsp), (Symington) 24167 (Tsp), (Jamat) 25956 (Tpf) — Faurie 536 (Mco), 539 (Mco) — Feng 11913 (T?) — Forbes 560 (Tle) — Ford 12/79 (Ah), 56 (Mco), 153 (Tmc) — Forrest 17652 (Tmi) — Foxworthy 401 (Tpf) — Franck 1140 (Tsp) — Furet 261 (Aa?) — Furuse 5432 (Tlx).

G.D.H. 38 (Tpf) — Garret 632 (Av) — Gibbs 2884 (Ms), 3420 (Ms), 3958 (Ab) — Gjellerup 1019 (T?), 1043 (Mp) — Gomez (Wallich herb.) 3740 (Aa), 3741 (Tll) — Griffith s.n. 1844 (Tll), 5288 (Tll), 5293 (Tsp) — de Groot 134 (Tpf).

Haines 2839 (Ape) — Hance 1670 (Ah), 19085 (Ah), 22317 (Mco) — Hansen 872 (Tpf) — Hansen & Smitinand 11201 (Tll) — Hartley 10998 (Mp) — Hennipman 3578 (Av) — Henry 11112 (Hu), 11813 (Av), 12078 (Tll), 13615 (Tll) — Hislop s.n. Jul 1952 (Tsp) — Hooker f. & Thomson 217 (Tll) — Hose 68 (T?) — How 73447 (M) — How & Chun 70182 (Ape) — Hu 5236 (Ah), 9853 (Ah), 13098A (Ar) — Hume 7173 (Mw).

Jacobson 144 (Ab), 198 (Tle) — Janowsky 99 (Mp) — Joseph s.n. 1910 (Tle).

Kecnan et al. 3817 (Av) — Kermod 16677 (Av) — Kerr s.n. 1915 (Av), 76 (Tsp), 167 (Mw), 195 (Aa), 214 (Ape), 226, 226A (Av), 295 (Tll?), 297 (Aa), 364 (Ape), 401 (Tll), 588 (Tsp), 596 (Tpf) — Kingdon-Ward 1721, 3229 (Tmi), 20617 (Tll), 20938 (Tmi), 21737 (Av), 22717 (Aa) — Kjellberg 2939 (Mma) — Ko 50384 (Td) — Koorders s.n. Dec 1920 (Tpf) — Kostermans 13057 (Tmg) — Kunstler 196b (Mw?), 4120 (Tpf) — Kurz s.n. ex Sinchul (Tmi).

Lace 5622 (Av) — LAE (Stevens & Martin) 54758 (Mp), (Howcroft) 64078 (Tt), (Katik & Croft) 70751 (Tt), (Sohmer & Katik) 75149 (T?) — Lamb 197/84 (Ms), 204/84 (Apo), 275/84 (Ab), 321/85

(Ab), 1205/90 (Tpu), 1267/90 (Tpf), 1343/91 (Tsp) — Latif s.n. Jul 1939 (Tmg) — Lauche s.n. Feb 1896 (Av) — Lecoufle s.n. 1987 (Ape) — Lei 447 (Ah) — Lewis 165 (Tsp) — Lindquist s.n. 1959 (Av) — Linsley Gressit 1285 (Td) — Lobb 159 (Tsp), 161 (Tle), 187 (Tle) — Loher 541 (Ae) — Lörzing 7312 (Mw), 14942 (Mw) — LX-VN 2219 (Til), 4305 (Tpf?).

Maingay 1642 (Ape), 1667 (Tsp), 1668 (Tmg) — Manantoddy 1284 (Tb) — Mann s.n. Mar 1888 (Til), 21 (Til) — Masamune s.n. 28 May 1925 (Tlx) — Mason 14 (Mp) — Maxwell 87-1002 (Aa), 90-140 (Ape) — Mayr 158 (Ab) — McClure 20231 (Ah) — Menzies & Du Puy 351 (Ape), 427 (Av) — Merrill 11011 (Tmc) — Metcalf 17571 (Tmc) — Micholitz s.n. 1910 (Til).

Nakamura 3454 (Mco) — NGF (Floyd) 5460 (Mp), (Millar & Womersley) 7713 (Mp), (Millar) 9751 (Mp), (Millar) 12292 (Mp), (Millar) 13882 (Mp), (Millar) 18886 (Mp), (van Royen) 20123 (Mp), (Millar) 22513 (Mp), (Millar) 22953 (Mp), (Millar) 23287 (Mp), (Streimann & Kairo) 27612 (Mp), (Streimann & Katik) 28911 (T?), (Lavarack & Ridsdale) 31592 (Ti), (Apo & Umbas for Dockrill) 34017 (Mp), (Apo & Umbas for Dockrill) 34018 (Ti), (Streimann & Kairo) 45249 (Ti) — Nooteboom 1431 (Tpf).

O'Brien s.n. Nov 1905 (Tmg), s.n. Nov 1905 (Tsp) — Oates 85 (Tb), 225 (Tb).

Pantling 106 (Til), 204 (Ape), 206 (Mme), 210 (Tmi) — Parish s.n. May 1868 (Av), 73 (Av), 244 (Av), 253 (Til), 258 (Av) — Parkinson 5133 (Av) — Parry 126 (Til) — Pételot s.n. Jul 1931 (Hu), 3561 (Hu).

Rahmat si Boeea 9710 (To), 9804 (To), 10356 (To), 11412 (To) — Reeve 1148 (Mp), 1150 (Mp), 3933 (Ti), 5393 (Ti), 5570 (Ti) — Reichenbach 11011 (Av), 12203 (p.p. = Ford 56?) (Mco), 20365 (Aa), 21289 (= Parish 253?) (Til), 29885(1) (Ape), 29885(2) (Av), 32988(left) (Av), 41793 (Av), 41794 (A), 43681 (Tle), 43711 (Av), 55292(1) (Ti), 55292(2) (Aa), 55292(4) (Ti?), 55292(5) (T), 55292(6) (Av) — Rensch s.n. Jul? 1917 (Tle) — Ridley s.n. Jun 1893 (Tmg), s.n. May 1896 (Tmg), s.n. 1898 (Tsp), s.n. 1904 (Tsp), s.n. Jul 1911 (Tsp), s.n. Jan 1915 (Ms), s.n. 1915 (T?), 5604 (Tsp) — Rives s.n. Mar 1910 (Av) — van Royen 4955 (Mp) — Rule 1440 (Aa), 1596 (Aa).

S (Chai) 18464 (Tsp), (Othman & Munting) 54360 (Tpf), (Lee) 54799 (Ms) — Saldanha 15953 (Tb) — SAN (Cockburn) 83237 (Tsp), (Cockburn) 88550 (Tpf) — Sander s.n. 1894 (Av) — Sands 1249 (Tsp?) — Sarkat Danimihardja 2318 (Tle) — Scortechini 386b (Tsp), 603 (Mw), 759b (Tpf) — Seidenfaden & Smitinand GT9684 (MI) — Senaratna 898 (Ape?) — SF (Haniff) 613 (Tmg), (Holttum) 10614 (Tpf), (Holttum) 10834 (Tsp), (Kerr & Foxworthy) 12191 (Tmg), (Henderson) 19574 (Tpf), (Haniff) 21094 (Mw), (Henderson) 24818 (Tpf), (= Carr 3150) 26597 (Tpu), (Moysey & Kiah) 31893 (Tsp) — Shah, Shukor & Awang 3288 (Tmg) — Sin 9445 (Td) — Smith 109m (Ab), 744 (Tle), 917 (Tle?), 4132 (T?), BE103 (Tsp) — Soepadmo s.n. May 1977 (Mw) — Sörensen, Larsen & Hansen DB5044 (Aa), DB5169 (Aa), DB5495 (Aa) — van Steenis 5047 (Tle), 8960 (left) (Tpf), 8960 (right) (Ab), 9216 (Mw) — Stevens s.n. Jun 1971 (Mp) — Stone 5568 (Mw).

Tixier s.n. 1960 (Aa), 32D (Ape) — To, Tsang & Tsang 12246 (Td) — Trevor Lawrence s.n. 1900 (Tsp), s.n. 1900 (Ape), s.n. Jul 1900 (Tsp) — Tsang 20457 (Td), 21097 (Mco), 22260 (Mco), 25160 (Td), 28757 (Td) — Tse Shing-Chee s.n. 1975 (Td).

Ulu Bubong 10018 (Tpf).

Vanoverbergh 102 (Ae), 1110 (Ae), 2434 (Ae), 4052 (Ae) — Vermeulen & Duistermaat 911 (Tmg) — de Vogel 8455 (Tmg).

Wang 75882 (Aa) — Watt 6293 (Av) — Wiedemann et al. s.n. 1970 (Tsp) — de Wilde & de Wilde-Duyfjes 15720 (To), 15863 (To) — Wilford 384 (Ah) — Winckel s.n. Apr 1919 (Tsp), 351 (Tsp), 393bis (Tle), 1127bis (Tle), 1485bis (Tle) — Wirawan 290 (Tpf) — Wood 744 (Tpu) — Woods 1075 (Mp) — Wray s.n. 1888 (T?), 235 (Mw), 464 (Tsp), 3938 (Tpf), 4059 (Mw) — Wray & Robinson 5308 (Tsp), 5314 (Tv) — Wright 522 (Ah).

Zollinger 1497 (Tle).