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 Monandraceae. 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. Holtum (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 Acranthea), whereas the Phajinae have lateral inflorescences (series Pleuranthea). 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 Bletiiinae, 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 Bletiiinae 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 ± 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 ± 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°), spreading (angle c. 90°) or reflexed (angle > 90°). 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 results 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 laciniate flaps, and a dense mass of laciniate flaps covers a transverse band between the lateral lobes. The margins of the lateral and median lobes are also laciniate 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 Javae 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 outdrawn 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 intermode, 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 *Chromatophyllum*, 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. *Chromatophyllum*, 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 *Nephalaphyllum*, 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 *Nephalaphyllum*, 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 *Nephalaphyllum*, 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


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 ± halfway (absent in *A. viridifusca*).  

1. **Ania** Lindley

3b. 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**


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 witu. 1 terminal leaf, pseudobulb consisting of one or several internodes, erect, rarely prostrate, **clinal**, 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 ± at the base 8

3a. Keels on lip ± uniformly low over their entire length
   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
   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 ± 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 ± at the base of the median lobe, then increasing in height again 8. A. viridifusca (Hook.) Tang & Wang ex Summerh.
b. Pseudobulb ± conical, erect; petiole with an articulation ± 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 ± 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

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1. Ania angustifolia Lindley – Fig. 25.


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*).


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 ± 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* ± 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* ± 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 ± 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 ± 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 ± 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.


Non Tainia borneensis Ridley, J. Str. Br. R. As. Soc. 49 (1907) 32 (see under excluded species of Tainia).


Tainia steenisii 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 ± 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 ovate, 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 ± 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 ovate, 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 ± ovate, 10–15 by 6–9 mm, index 1.5–2.2; tip acuminate; margins entire, glabrous, slightly undulating distally; adaxial surface ± 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 mixum 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.


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 acuminated; 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, stelidia 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.

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, stelidia 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.


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


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 laitiingua 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. Rhabis 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 undululating, 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 uninterrupted, 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 ± 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 ± 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.


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

*Ania punggolensis* a aliiis *Anis* pseudobulbo ampliflorum, 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 ± 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

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minutely papilllose; 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, stelidia absent; top part triangular, margin ± 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 papilllose, especially towards the base, abaxial surface slightly pilose. Anther without crests. Pollinia 8, unequal. Fruit not observed.


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.


Stem 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 ± 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 ± 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 ± 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 ± 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, maculately 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.


Stem of sterile shoot with c. 5–6 internodes, c. 37 mm long, c. 6 mm diam. (herb.) Pseudobulb consisting of several internodes, ± erect to ± 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 papilllose; adaxial surface glabrous to minutely papilllose; 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 papilllose; adaxial surface minutely papilllose; 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 uninterrupted 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 uninterrupted 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-barrettoi*. 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.


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


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**

2. HANCOCKIA


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, atale. _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.


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 ± half-way to distally, crest straight, entire, glabrous. Column c. 15 mm long, stelidia absent; top part semiobicular 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. Péletot 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


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 ± obliquely triangular, decurrent along the column foot. Lip usually very slightly saccate. Column semi-terete, 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. Malaya: 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 MISCHOBULBUS

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


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


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 ± 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. – Fig. 34; Plate 6b.


*Taenia fauriei* Schltr., Fedde Rep. 9 (1911) 282. – Type: Faurie 536 (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, stelidia 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 carnoso integerrimo sine sinu, carinisi versus apicem labelli incrassatis, pseudobulbis longioribus differt. A *M. megalanthero* distinguisher
characteribus carinarum pseudobulborumque (ut supra) et carinis apicem labelli non attingentibus. – Typus: Burtt & 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, stelidia 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. Mischobulbium longiscapum Seidenf. in H. Turner, spec. nov. – Fig. 36.

Mischobulbium longiscapum forte M. scapigeri borneensi similissimum, a quo pseudobulbis basin multo crassioribus, scapo longissimo, labelli bicornati 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-

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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.


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.


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.


Non *Nepelaphyllum 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 semi-bicribular, margin slightly denticulate; wings semilike, 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 *Nepelaphyllum grandiflorum* Hook. f. Rolfe (1912) corrected this and proposed as a new name *M. grandiflorum*.

Therefore Tang & Wang (1951) proposed as a new name *M. megalanthum*.

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


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 papilllose; 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, stelidia absent; top part truncate to slightly triangular, margin ± entire to denticate; 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.


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.


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 ± 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, stelidia absent; top part semiornicular, margin denticate; 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.

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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 ± 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, stelidia 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 abaxially, 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


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


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. Penduncle scales tubular, acute. *Floral bracts* triangular, rarely ovate. *Flowers* usually most open simultaneously, resupinate. *Sepals and petals* ± 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 ± 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

   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 ± 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 ± two-thirds the length of the lip, ending among a dense mass of laciniate 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
    b. Keels on the lip ± 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
    b. Lip at least 7 mm wide, with 2 keels 1.5–2.5 mm long
   10. T. purpureifolia Carr
16a. Tepals distinctly caudate ............................................................................. 12. T. speciosa Blume
    b. Tepals slightly acuminate to obtuse ............................................................. 17
17a. Lip ± elliptic, shorter than 15 mm; column foot shorter than 3 mm
    3a. T. latifolia subsp. latifolia
    b. Lip ± rhomboid-hastate, longer than 30 mm; column foot longer than 10 mm
   5. T. macrantha Hook. f.

1. Tainia bicornis (Lindley) Reichb. f. – Fig. 42.


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**Ania latifolia** Wight (non Lindley), *Ann. 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. *Pedicel* 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. Rachis 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 semiorbicu- lar, margin ± entire to slightly denticate; 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.


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, stelidia absent; top part semiobicular 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


Non Ania latifolia Wight, l.c. Pl. Ind. Or. 3 (1852) t. 914 (= Tainia bicornis).

Cymbidium sp. Griffith, Notul. 3 (1851) 343; l.c. Pl. As. 3 (1851) t. 319. – Type: Griffith s.n., 17 March 1837 (= Griffith 5288 K).


Tainia khasiana Hook. f., Fl. Br. Ind. 5 (1890) 821; ibid. 6 (1890) 193; l.c. Pl. 1892 t. 2090; Biswas, Taxon 29 (1989) 169. – Type: Hooker f. & Thomson (Orch. 217, holo K).


Tainia bicornis Seidenf. & Smitin. (non Reichb. f.), Orch. Thail. 4, 2, (1965) 743, fig. 552. – Type: Kerr 295 (holo K, iso AMES).


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 denticate.

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

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Ecology – In forest. Altitude 500–1500 m. Flowering observed in II–IV, VII.
Distribution – NE India; Sikkim; Bhutan; Burma; China (Yunnan); Thailand; Laos; Vietnam.

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.


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 erose.

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.

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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.


Stern 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, ± 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, Yakusima, Ryukyu).
Notes – 1. See note 1 to T. diunii.
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.


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 halfway, 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.


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 laciniate 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 laciniate to dentate proximally, entire distally, glabrous; adaxial surface densely packed with a mass of laciniate flaps proximally, glabrous distally; lateral lobes obliquely trapezoidal (to triangular), 2–3.5 mm long; tip truncate (to acute); lateral margins entire proximally, laciniate to dentate distally, glabrous; adaxial surface densely packed with a mass of laciniate 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 laciniate 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 laciniate flap; the outer keels when present c. 2 mm long, starting at 6 mm, highest distally, crest straight, glabrous, thickened proximally, ending in a laciniate 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.

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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.


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, start-
ing 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 semiobtuse 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 col-
umn.

2. Sharma & Chatterjee (I.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 breviore, inflorescentia terminali (non laterali) et labello pandu-
riformi differit. – Typus: Rahmat si Boeea 10356, Sumatra, Dolok Parhorasan, Asahan (holo L, iso AMES).

Stern 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 per-
sistent, 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 thicken-
ed). **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** 22–22 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 2.2–2.5 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 abaxial-
ly. **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 acu-
minate; 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 prox-
imally, 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, stelidia absent; top part semiobicular, 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.


Non *Tainia latilingua* Seidenf. & Smittin., Orch. Thal. 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 ± (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 papillosate; adaxial surface glabrous to minutely papillosate; 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 papillosate; adaxial surface glabrous to slightly minutely papillosate; 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 ± 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 emananated from the same internode.

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

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


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

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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, ± obtuse, mid-vein distinctly thickened abaxially. Lateral sepals ± elliptic to triangular, ± 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)panDurate, 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, stelidia 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 ± 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, stelidia absent; top part triangular, margin entire; wings seam-like, extending up to ± 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.


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 ± 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 ± 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 ± 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, stelidia absent; top part truncate, margin ± 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, axially 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.


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 ± 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 ± 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, stelidia absent; top part truncate to semiornicular, 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.


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, stelidia 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.


Distribution – Vietnam (Annam; Cochin-China).

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


**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; Seghas 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; Seghas 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


**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*.


**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 spathulate 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


Distribution – India.

E2. Tainia balansae Gagnepain


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


Distribution – Borneo.

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


Distribution – Borneo.

E6. Tainia borneensis Ridley

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 (Schlr.) Gagnepain


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

Note – Based on Nephelaphyllum borneense Schlr. [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


Distribution – Burma; Taiwan; Vietnam (Tonkin).

E9. Tainia chinensis (Rolfe) Gagnepain


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

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

E10. Tainia cordifolia (Lindley) Gagnepain


Distribution – India; Sikkim; Burma.

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

E11. Tainia cristata (Rolfe) Gagnepain


Distribution – Hong Kong; Vietnam (Tonkin).
E12. *Tainia delavayi* Gagnepain


Distribution – China (Yunnan; Guangdong).

E13. *Tainia evrardii* Gagnepain


Distribution – Vietnam (Annam).


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


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 keentinensis* Chow Cheng

*Tainia keentinensis* 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


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

*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.


Distribution – Philippines.


Distribution – Borneo.

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

E21. *Tainia papuana* (Schltr.) Gagnepain


Distribution – New Guinea.

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

E22. *Tainia pulchra* (Blume) Gagnepain


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

E23. *Tainia stellata* (Lindley) Pfitzter


E24. *Tainia tenuiflora* (Blume) Gagnepain


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

E25. *Tainia unguiculata* Hayata


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:

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<td>To</td>
<td>Tainia ob pandurata</td>
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<tr>
<td>Mco</td>
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<td>Tpf</td>
<td>Tainia paucifolia</td>
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<td>Tainia purpureifolia</td>
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Anderson 1187 (Tmi), 1217 (Tmi) — Anon. s.n. (L 90484126) (Tle), s.n. (L 903.162.800) (Tle) — Averjanov & Kydraveeva 140 (Ah).

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

Carr s.n. 1928 (Tmg), s.n. Aug Aug 1929 (Tpf), s.n. Nov Aug 1935 (Ah), 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 (Til) — Clarke 35517 (Tmi), 42946 (Til) — Clemens s.n. Dec 1931 (Ms), 1268 (Mp), 1633 (Mp), 30125 (Ab) — Clowes s.n. 1844 (Tb) — Collenette 73 (Ab) — Comber 1259 (Tpf), 1649 (Tie), 1662 (Tsp), 1713 (Mw?) — Comber & Cribb 1773 (Ape) — Cribb 91 (Av), S62 (Tt) — Cult Hort. BO s.n. ex Tianjap (Til), 61 (Tt), 71 (Tt), 94 (Ab), 107 (Ab), 108 (Ape), 109m (Ab), 135 (Tsp), 136 (T), 145 (Tpf), 146 (T), 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 (Mm) — Cumberlege 783 (Ape), 544 (Mw), 1058 (Mw), 1078 (Til), 1254 (Til) — Curtis s.n. Oct 1892 (Ape), s.n. Dec 1892 (Ape), 3290 (Tmg), 3291 (Tsp).

van Daalen 145 (T7?) — Dalziel s.n. May 1888 (Td) — Danser 6790 (Til) — Daud 11314 (Tpf) — Day 65 (T) — Docters van Leeuwen s.n. Oct 1921 (Tpf) — Docters van Leeuwen-Reijnvaan 2724 (Tle) — DBP 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), (Jaamat) 25956 (Tpf) — Fanerie 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 (T7?), 1043 (Mm) — Gomez (Wallich herb.) 3740 (Aa), 3741 (Til) — Griffith s.n. 1844 (Til), 5288 (Til), 5293 (Tsp) — de Groot 134 (Tpf).

Haines 2839 (Ape) — Hance 1670 (Ah), 19085 (Ah), 22317 (Mco) — Hansen 872 (Tpf) — Hansen & Smiunand 11201 (Til) — Hardley 10998 (Mp) — Hennipman 3578 (Av) — Henry 11112 (Hu), 11813 (Av), 12078 (Til), 13615 (Til) — Hislop s.n. Jul 1952 (Tsp) — Hooker f. & Thomson 217 (Til) — Hose 68 (T?) — How 73447 (M) — How & Chun 70182 (Ape) — Hu 5236 (Ah), 9853 (Ah), 13098A (Ah) — Hueme 7137 (Mw).

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

Koenan et al. 3817 (Av) — Kermode 16677 (Av) — Kerr s.n. 1915 (Av), 76 (Tsp), 167 (Mw), 195 (Aa), 214 (Ape), 226, 226A (Av), 295 (Til?), 297 (Aa), 364 (Ape), 401 (Til), 588 (Tsp), 596 (Tpf) — Kingdon-Ward 1721, 3229 (Tmi), 20617 (Tmi), 20938 (Tmi), 21737 (Av), 22717 (Aa) — Kjellberg 2939 (Mm) — 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 (Mm), (Howcroft) 64078 (Tt), (Katik & Croft) 70751 (Tt), (Sohmer & Katik) 75149 (T?) — Lamb 197/84 (Ms), 204/84 (Apo), 275/84 (Ab), 321/85

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