

## CALANTHE SECTION RHODOCHILUS (ORCHIDACEAE) FROM NEW GUINEA, THE SOLOMON ISLANDS AND THE MOLUCCAS

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### SUMMARY

Two sections in the genus *Calanthe*, sect. *Caulodes* and sect. *Rhodochilus* are combined. Six names are reduced to synonymy.

**Key words:** *Calanthe*, New Guinea.

### INTRODUCTION

*Calanthe* R. Br. has a widespread distribution centred in tropical and subtropical Asia and the Pacific. A single species occurs in Africa, *C. sylvatica* (Thouars) Lindl., three in Madagascar and a single species, *C. calanthoides* (A. Rich. & Galeotti) Hamer & Garay is found in Central America. Some 350 species have been proposed in this genus, but the number of accepted species is probably nearer to 200. Recent attempts to identify collections from New Guinea have highlighted difficulties within the sections *Rhodochilus* and *Caulodes*. Further study has suggested these sections are best combined. *Calanthe* sect. *Rhodochilus* contains three species and one variety, a number of taxa being reduced here to synonymy.

### TAXONOMY

The division of *Calanthe* into the subgenera and sections proposed by Schlechter (1912) has been widely followed. Schlechter's division (excluding the American species) can be summarised with the following key.

#### KEY TO SCHLECHTER'S INFRAGENERIC TREATMENT OF CALANTHE

- 1a. Plants with thick fleshy pseudobulbs. Leaves articulate, shedding before flowering  
..... **Subg. Preptanthe**
- b. Plants lacking thick fleshy pseudobulbs. Leaves not articulate, persistent . . . .  
..... **(Subg. Calanthe)** 2
- 2a. Plants with an elongate stem. Inflorescence lateral. Bracts persistent. Lip ligulate,  
  entire . . . . . **Sect. Caulodes**
- b. Plants with a short stem . . . . . 3
- 3a. Bracts persistent . . . . . 4
- b. Bracts caducous . . . . . 5

- 4a. Inflorescence short, dense. Tepals not spreading. Lip entire **Sect. *Rhodochilus***  
 b. Inflorescence long, usually lax. Tepals spreading. Lip usually 3–4-lobed . . . . .  
 . . . . . **Sect. *Calothyrsus***
- 5a. Inflorescence dense. Tepals not spreading, spur present, sometimes only sack-shaped . . . . . **Sect. *Styloglossum***  
 b. Inflorescence lax. Tepals spreading, spur absent . . . . . **Sect. *Aceratochilus***

The floral characteristics of Schlechter's sections *Caulodes* and *Rhodochilus* are very similar. Indeed, the short-stemmed *Calanthe rhodochilus* has often been misidentified as *C. apostasioides* of the section *Caulodes*. A further complication arises from *C. caulodes*, a Sulawesi species described in 1933 by J.J. Smith. Despite its epithet, J.J. Smith placed it into section *Styloglossum* rather than in section *Caulodes*. It has a long stem, but lacks the persistent bracts that help to characterise section *Caulodes*, thus failing to key out there under Schlechter's arrangement. The solution proposed here is to no longer consider the presence or absence of long stems as a sectional character. This allows for the expansion of section *Rhodochilus* to include the long-stemmed species previously considered within section *Caulodes*, and leaves the rest of Schlechter's classification unchanged. *Calanthe caulodes* thereby remains in section *Styloglossum*. However, from this limited study of New Guinea species it appears that Schlechter's infrageneric taxa are rather artificial. The limits of the genus *Calanthe* itself are unclear. Many species have characteristics that are atypical of the genus as a whole, but these species cannot be easily accommodated into other existing genera. For example, a few species have a column that is free at the apex: *C. occidentalis* (Himalayas), *C. densiflora* (Assam), *C. delavayi* (China), *C. fimbriata* (China) and *C. brevicornu* (India). Further studies including molecular analysis of the genus and its allies might clarify the situation.

### Section *Rhodochilus*

*Calanthe* sect. *Rhodochilus* Schltr., Repert. Spec. Nov. Regni Veg. Beih. 1 (1912) 376. — Type species: *Calanthe rhodochila* Schltr.

*Calanthe* sect. *Caulodes* Schltr., Repert. Spec. Nov. Regni Veg. Beih. 1 (1912) 376; P. Royen, Alp. Fl. New Guinea 2 (1979) 128, syn. nov. — Type species: *Calanthe apostasioides* Schltr.

Epiphytic or terrestrial herbs. *Stems* cylindrical, short or long, hidden by leaf bases. *Leaf sheaths* often crenate and pleated. *Leaves* distichous, elliptic to lanceolate, plicate, petiolate. *Inflorescences* short, lateral, 2- to many-flowered; bracts large, persistent. *Flowers* white or green, usually with a red or orange lip, glabrous, the tepals free, hardly spreading. *Dorsal sepal* ovate, concave. *Petals* obliquely ovate. *Lip* simple, entire, ligulate, often with a callus, spurred at the base, adnate to column. *Column* short, fleshy; pollinia 8.

A section of three species and one variety, characterised by short lateral inflorescences, large, persistent floral bracts, small white or pale green flowers with a red or orange ligulate lip and bearing a short cylindrical or conical spur. The floral parts are scarcely spreading. All the species in this section appear to show variation in the development of the callus on the lip. While the lowermost flowers have a callus at the mouth of the spur, apparently fully developed flowers from near the top of the inflorescence may entirely lack a callus or thickening of the lip. When viewed from

the front the mouth of the spur in the upper flowers has a large diameter. However, flowers taken from lower down *on the same inflorescence* often exhibit thickening of the base of the lip into a callus and also thickening of the spur walls around the mouth of the spur. This reduces the diameter of the opening at the mouth, practically closing the mouth in some instances. As this constriction of the mouth of the spur appears to occur in more mature flowers, it may be a post-pollination mechanism. It would be very interesting to study living plants to see if this is so. The variable callus development has led to some problems of identification within this section. The spur appears to elongate somewhat as the flowers mature, again giving rise to problems of identification. The shape of the floral bract, the spur and lip, and ratios of the lengths of the floral parts seem to be more reliable taxonomic indicators. All the species are endemic to New Guinea except for *C. rhodochila* var. *reconditiflora* which is also found in the Solomon Islands and Moluccas.

#### ARTIFICIAL KEY TO SPECIES OF CALANTHE IN SECT. RHODOCHILUS

- 1a. Plants with elongate stems more than 5 cm long ..... 2  
 b. Plants with stems less than 1 cm long ..... **1. *C. rhodochila***  
 2a. Leaves elliptic or lanceolate, mostly over 1 cm wide, not conduplicate .....  
 ..... **2. *C. caulescens***  
 b. Leaves very narrow, less than 5 mm wide, linear, subcoriaceous, mostly conduplicate ..... **3. *C. versteegii***

#### 1. *Calanthe rhodochila* Schltr.

##### KEY TO THE VARIETIES

- 1a. Floral bracts mostly less than 1.5 cm long, acuminate to cuspidate, reflexed at apex, not cucullate ..... **a. var. *rhodochila***  
 b. Floral bracts large, mostly over 4 cm long, caudate, almost hiding flowers, inflexed and cucullate at apex ..... **b. var. *reconditiflora***

#### **a. var. *rhodochila*** — Fig. 1

*Calanthe rhodochila* Schltr. in K. Schum. & Lauterb., Nachtr. Fl. Deutsch. Schutzgeb. Südsee (1905) 143; Repert. Spec. Nov. Regni Veg. Beih. 1 (1912) 376; *ibid.* 21 (1923) t. 133, f. 498. — Type: *Schlechter 14021* (holo B†; iso AMES, BRI), New Guinea.

*Calanthe breviscapa* J.J. Sm., Bull. Jard. Bot. Buitenzorg 2 (1911) 1; Nova Guinea 12 (1913) 12, t. 3, f. 7. — Syntypes: *De Kock 19, 173* (syn BO), New Guinea.

Terrestrial or epiphytic herb 28–45 cm tall; roots long, flexuous, shortly tomentose. *Pseudobulbs* completely hidden by leaf-bases, 2- or 3-leafed. *Leaves* articulate, distichous, narrowly lanceolate, plicate, acuminate, 5-nerved, 15–40 cm long, 1.3–5.5 cm wide; narrowed into a petiole at the base; petiole longitudinally grooved, 4–12 cm long. Young leaf shoots sheathed in bracts c. 12 mm long of which fibrous remnants persist at the base of mature shoots. *Inflorescence* lateral, arising from the base of the pseudobulb, erect, shorter than leaves, 10–28 cm tall, bracteous; raceme densely flowered, cylindrical; bracts persistent, 13–15 mm long, 6.5–9.5 mm wide, erect, amplexicaul, broadly obovate, acuminate, those near the apex more acuminate and

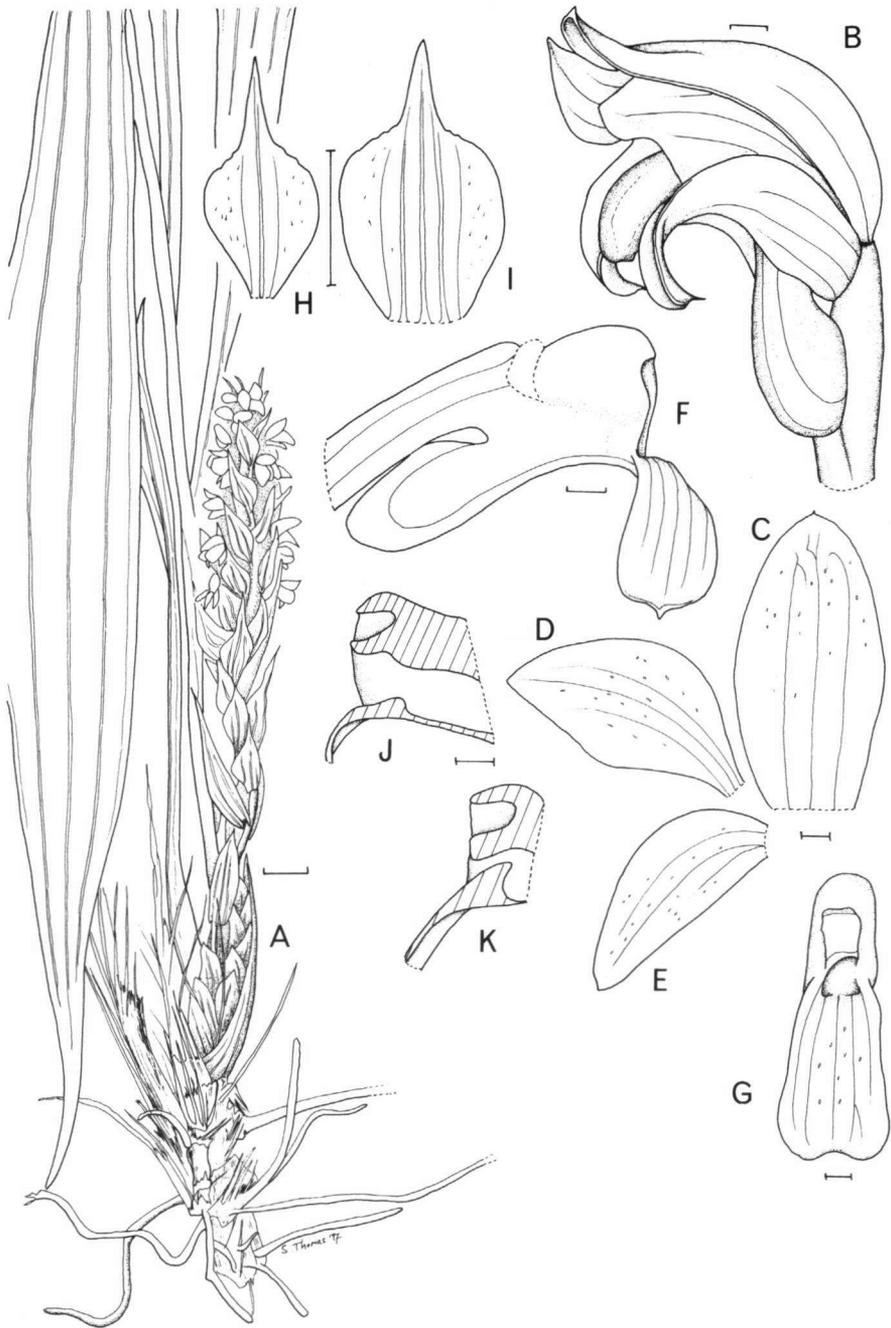


Fig. 1. *Calanthe rhodochila* Schltr. var. *rhodochila*. A. Habit; B. flower; C. dorsal sepal; D. petal; E. lateral sepal; F. column and lip side view; G. column and lip front view, lip apex turned under; H. lower bract; I. upper bract; J. upper flower, cross section of callus; K. lower flower, cross section of callus (all Milliken 1508, K). Scale bars: A, H, I = 1 cm; B-G, J, K = 1 mm.

with more crenulate margins than those near the base, recurved at apex, with 3 thickened nerves, white with thickly marked green nerves and margins. *Flowers* erect, spreading, white with a red to orange lip or with red to orange patch on lip. *Dorsal sepal* erect, incurved, oblong-oval, obtuse, occasionally mucronate, concave, 3-nerved, glands throughout, 9.4–13 mm long, 3.5–5.5 mm wide. *Lateral sepals* oblique, oblong, falcate, obtuse, concave, shortly carinate to minutely aristate, 3-nerved, glands throughout, 8.2–9.5 mm long, 3–4.5 mm wide. *Petals* oblong-elliptic to spatulate, margins sometimes wavy, emarginate or retuse or apiculate, glands throughout or restricted to apical half, 8.2–9 mm long, 2.8–4 mm wide. *Lip* adnate to column; lamina 4–5.5 mm, 2–2.5 mm wide, quadrangular-obovate to oblong, recurved at apex, sparsely glandular, apical margins often turned inwards, obtuse or acute, often apiculate, 5-nerved, young flowers lacking a callus, thickening of the lip at the mouth of the spur eventually producing a basal callus in mature flowers, callus rotund, fleshy, asymmetric in cross section, along with thickened spur walls restricting diameter of spur mouth; spur adpressed to ovary, 4–5 mm long from apex to base of column, 2–3.3 mm diameter in widest part, narrowed towards base. *Column* 3–4 mm long, ovary 8–11 mm long. Fruit capsule ellipsoid, 4–12 mm long, covered by fibrous remnants of floral bracts.

Distribution — Endemic to New Guinea.

Habitat — Terrestrial on forest litter or low epiphyte; altitude 1700–2300 m.

Collections studied: *Craven & Schodde 11001* (K, L); *Croft & Lelean 65812* (K, L); *Henty 20820* (K, LAE); *Hiepko & Schultze-Motel 1372* (L); *Hunt RSS 2955* (K); *Katik LAE 70709* (L); *Milliken 1508* (K); *Reeve 295* (K), *1881* (K, L); *Sinke 21* (L).

**b. var. *reconditiflora*** (J.J. Sm.) S. Thomas, *comb. & stat. nov.* — Fig. 2

*Calanthe reconditiflora* J.J. Sm., Bull. Jard. Bot. Buitenzorg 10 (1928) 108; Reinwardtia 1 (1950) t. 189, f. 5. — Type: *Kornasi 1488* (holo BO; iso L), Moluccas, Seram, Gunong Moerkele.

*Calanthe manis* J.J. Sm., Nova Guinea 14 (1929) 357, t. 47, f. 17, syn. nov. — Type: *Lam 1822* (holo L), New Guinea, Doorman-top, 2700 m.

*Calanthe apostasioides* sensu B. A. Lewis & P.J. Cribb, Orch. Solomon Isl. & Bougainville (1991) 27, f. 12 A–K.

*Calanthe rhodochila* sensu Ormerod, Austral. Orchid Rev. 60, 2 (1995) 35.

*Bracts* almost entirely concealing flowers, 2–6 cm long, 9–12 mm wide, becoming shorter towards apex of raceme, erect, amplexicaul, narrowly triangular, acuminate, incurved and sub-cucullate at apex, 5–9-nerved, pale green with delicate darker green nerves.

Distribution — New Guinea, Moluccas (Seram) and Guadalcanal.

Habitat — Terrestrial amongst Cyperaceae or epiphytic in mossy forest; altitude 1600–2300 m.

Notes — 1. *Calanthe rhodochila* var. *reconditiflora* cannot be separated from *Calanthe rhodochila* by its floral morphology and is therefore accommodated at varietal level. However, the bracts of the variety are notably different and it is easy to separate the two inflorescence forms in the herbarium. Both the varieties have very variable floral morphology but there are no consistent differences between the two. Both exhibit variation in the following characters: width of the leaf; fleshiness of flower; shape of lip and length of lip; length of spur; constriction of spur at the base. Attempts to find one floral characteristic that would consistently separate these two taxa have failed.

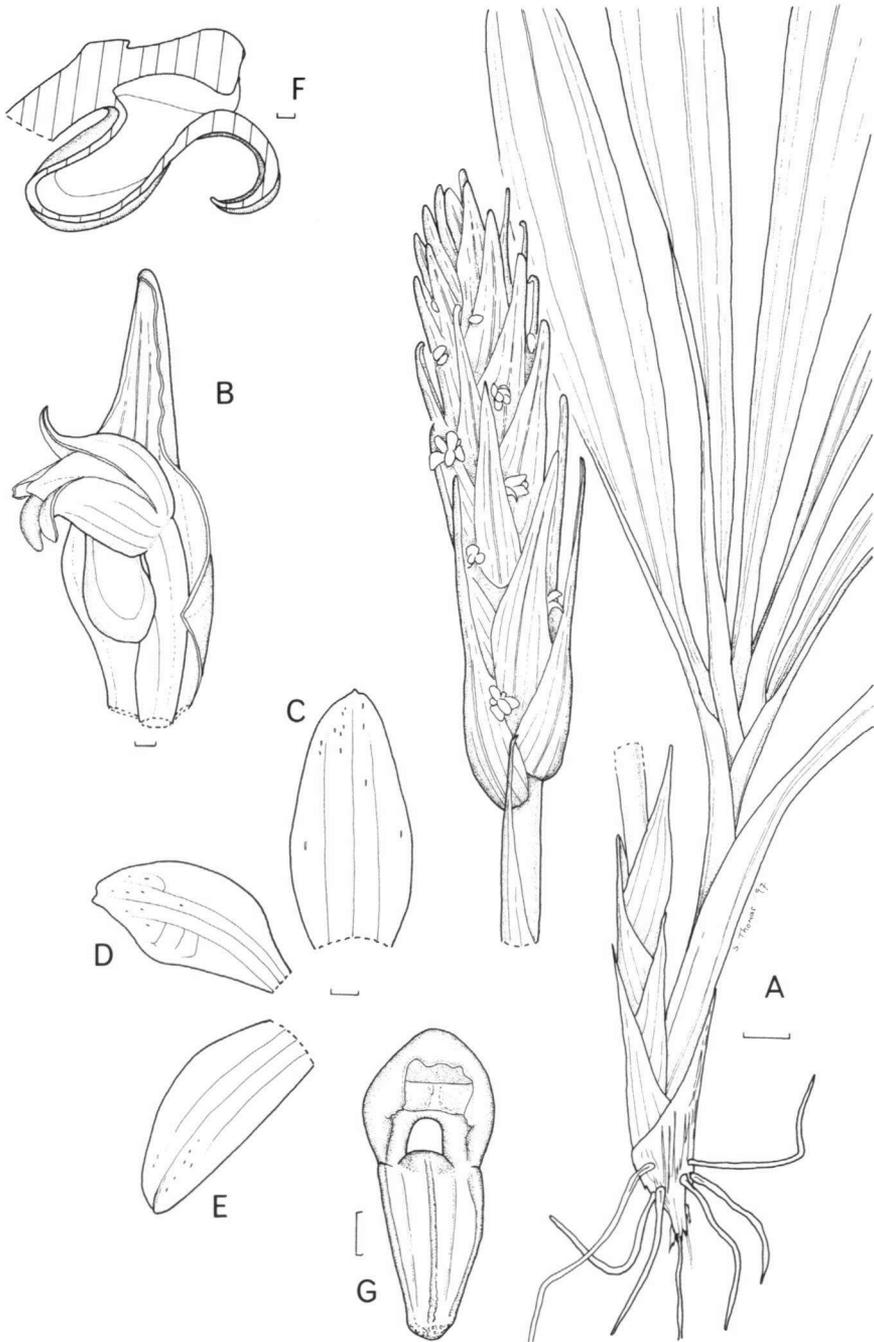


Fig. 2. *Calanthe rhodochila* Schltr. var. *reconditiflora* (J.J. Sm.) S. Thomas. A. Habit; B. flower and bract; C. dorsal sepal; D. petal; E. lateral sepal; F. lip and column, cross section; G. lip and column, front view (all Rees & Reeve 362, K). Scale bars: A = 1 cm; B–G = 1 mm.

2. The differences in bracts may be developmental. Both varieties have often been collected together, some mixed collections have been made. The nature of the bracts may change with the maturity of the inflorescence or plant, some plants do seem somewhat intermediate (e.g., *Reeve 1881*). Until specimens can be observed flowering in cultivation for a number of years this remains speculation. In the mean time the use of the varietal level accommodates the two forms, this being felt preferable to recognising two species.

3. The type of *C. manis* has narrower leaves (5 mm) than any of the other specimens studied, but is a good match to *C. rhodochila* var. *reconditiflora* in all other respects.

Collections studied: *Brass 11463* (L); *Coode et al. NGF 40296* (K); *Dickson A3* (K); *Douglas K15* (K); *Isles et al. NGF 34420* (K, L); *Kornasi 1488* (L); *Lam 1822* (L); *Raynal 1716* (photo; K); *Rees & Reeve 362* (K); *Reeve 340* (K, L); *Sands 2224, 2271* (K); *Schöller 03-2* (K); *Versteegh 3015* (L); *Wickison 45, 124* (K).

## 2. *Calanthe caulescens* J.J. Sm. — Fig. 3

*Calanthe caulescens* J.J. Sm., Bull. Jard. Bot. Buitenzorg 2 (1911) 2; Nova Guinea 12 (1913) 13, t. 4, f. 8; Mansf., Bot. Jahrb. Syst. 62 (1929) 468; P. Royen, Alp. Fl. New Guinea 2 (1979) 131. — Type: *De Kock 144* (holo BO), New Guinea, Mt Goliath.

*Calanthe apostasioides* Schltr., Repert. Spec. Nov. Regni Veg. Beih. 1 (1912) 377; *ibid.* 21 (1923) t. 132, f. 497; P. Royen, Alp. Fl. New Guinea 2 (1979) 128, f. 54, syn. nov. — Neotype: *Brass 30937* (holo L, iso K), New Guinea, Mt Otto.

*Calanthe salmonoviridis* P. Royen, Alp. Fl. New Guinea 2 (1979) 134, f. 56, syn. nov. — Type: *Brass 9055* (holo L), New Guinea, Lake Habbema.

Terrestrial or epiphytic herb, erect, 25–60 cm tall; rhizome decumbent, cauliform; roots flexuous, elongate, terete, shortly tomentose. *Stem* simple, elongated, terete, glabrous, densely leafed, covered with sheaths and their fibrous remnants, margins of sheaths crenulate. *Leaves* erect to spreading, lanceolate to elliptic-lanceolate, acuminate, narrowed in basal part, base sheathing; lamina (6–)10–18 cm long, 1.0–2.2(–3.2) cm wide. *Inflorescence* lateral, erect, subax, 4–10-flowered; bracts erect to suberect, elliptic, acuminate, shorter than the flowers. *Flowers* erect, rather small, glabrous. *Dorsal sepal* obovate to oblong, rounded or acute to minutely apiculate, 8–11 mm long, 3.5–4.5 mm wide, concave, glands in upper half. *Lateral sepals* oblique, 7.5–10 mm long, 3.5–4.5 mm wide. *Petals* spatulate to elliptic, obtuse, oblique, 7–10 mm long, 3.5–5 mm wide. *Lip* curved, lamina small, broadly oblong-ligulate, apical margins inrolled; side-lobes basal, minute, rounded; immature flowers lack callus, mature flowers have a transverse thickening across the mouth of the spur which in some flowers becomes a fleshy callus; spur deflexed, cylindrical, obtuse, slightly narrowed at the base, (2–)6.6–8.8 mm long. *Column* adnate to margin of lip, sometimes slightly dilated towards apex; rostellum short, emarginate; anther subtruncate, glabrous; pollinia 8, oblique clavate.

Distribution — Endemic to New Guinea.

Habitat — Terrestrial amongst moss or epiphytic in moss cushions on low trunks and branches; altitude 2600–3200 m.

Notes — 1. Schlechter (1912) distinguished *C. apostasioides* from the previously described *C. caulescens* on the basis of the presence of a tall callus in the mouth of the spur. However, examination of material at Kew has shown this to be an unreliable

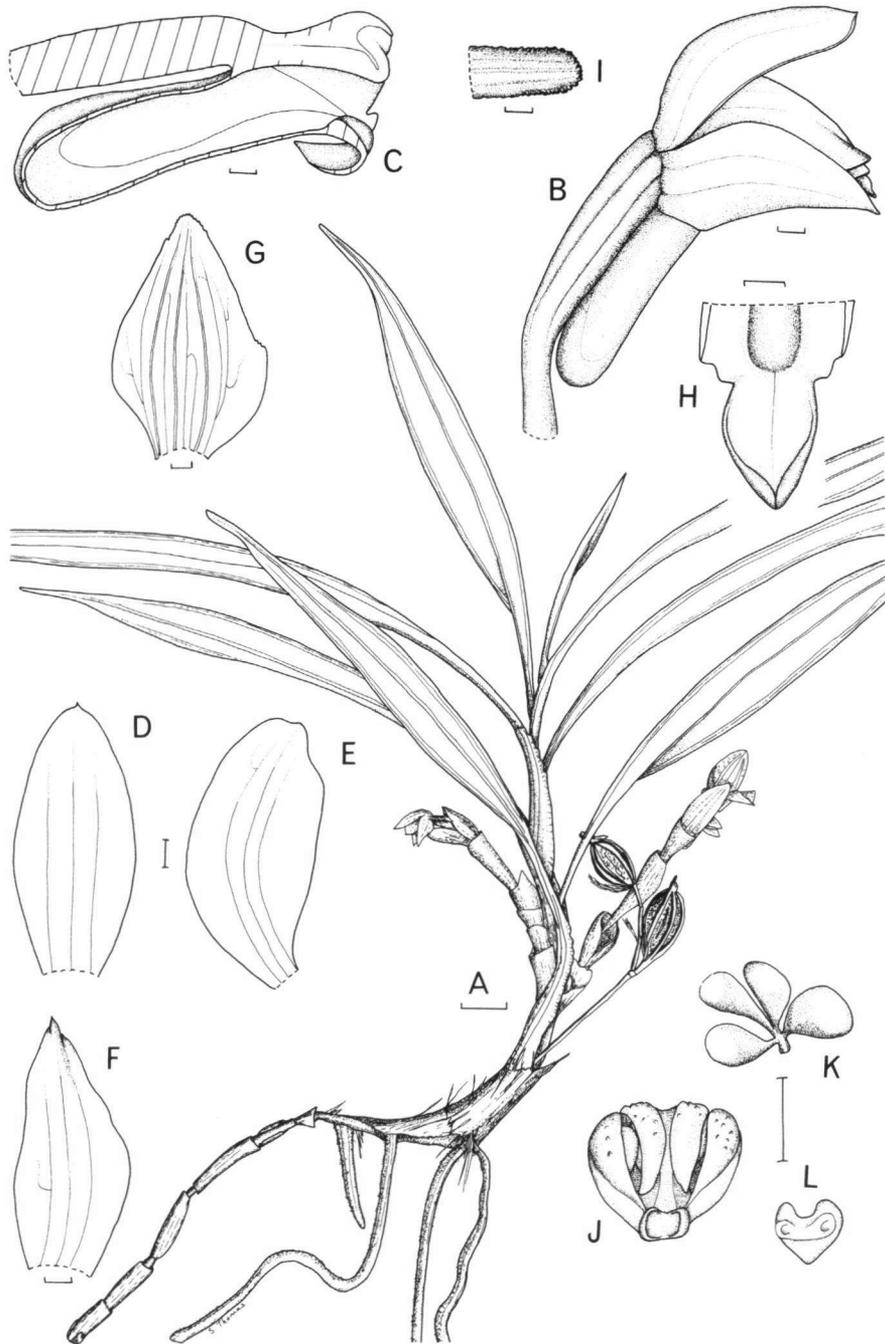


Fig. 3. *Calanthe caulescens* J.J. Sm. A. Habit; B. flower; C. lip and column, cross section; D. dorsal sepal; E. petal; F. lateral sepal; G. bract; H. lip; I. leaf-tip; J. anther; K. pollinia; L. viscidium (a: *van Royen 11098*, K; B–M: *Milliken 1163*, K). Scale bars: A = 1 cm; B–L = 1 mm.



Fig. 4. *Calanthe caulescens* J.J. Sm. (aberrant form). A. Habit; B. flower; C. dorsal sepal; D. petal; E. lateral sepal; F. column and lip; G. lip; H. anther; I. bract (all Reeve 1178, K). Scale bars: A = 1 cm; B-I = 1 mm.

character in this section. The development of the callus can vary in different flowers on the same inflorescence. This variation is easier to observe in specimens preserved in spirit than in herbarium material.

2. Van Royen (1979) chose *Brass* 30937 as the neotype for *C. apostasioides*, as the type (*Schlechter* 18731) was destroyed in Berlin and there appear to be no extant Schlechter specimens of this species. The Brass specimen matches well the original description, but Schlechter stated that the flowers equalled or were slightly shorter than the bracts. In the Brass duplicate at Kew the flowers overtop the bracts, which leads to a little uncertainty that this name is being correctly applied. However, at the present time, there does not appear a more fitting match for Schlechter's description and drawing. In Schlechter's notes following the description he stated that the flowers are white with a shiny red lip lamina and reiterated that there is a tall callus at the base of the spur. Van Royen described *C. salmonoviridis* on the basis that it lacked a basal callus on the lip. As noted earlier, this is a variable developmental feature and cannot be relied on within this group. Van Royen also used flower colour to distinguish *C. salmonoviridis*, the flowers being greenish white rather than white, and the lip being salmon pink rather than red.

3. One specimen from New Guinea, *Reeve* 1178, is rather different from the others examined. It has a number of abnormal flowers in which the lip is quite free from the column and the spur is very short. The specimens examined from K and L are both rather poor. Whilst some flowers have a very short spur (2 mm), a free column and a long membranous triangular lip, other flowers appear more normal, and a few intermediate. All the flowers are poorly preserved and difficult to interpret. The leaves are very much shorter than in other specimens of *C. caulescens*. This specimen is illustrated here (Fig. 4) with an aberrant flower shown. Measurements are given in brackets in the above description.

4. Some plants from New Guinea and the Solomon Islands, now included in *C. rhodochila* subsp. *reconditiflora* have been mistakenly referred to *C. apostasioides*.

Collections studied: *Brass* 9055, 10260, 11460 (L); 30937 (K, L); *Nicolas* 14 (L); *Reeve* 1178 (K, L); *Schodde* 2046 (L); *Van Royen* 11098 (K, L); *Veldkamp* 6359 (L).

### 3. *Calanthe versteegii* J.J. Sm. — Fig. 5

*Calanthe versteegii* J.J. Sm., Bull. Jard. Bot. Buitenzorg II, 13 (1914) 55; Nova Guinea 12 (1914) 206, t. 67, f. 112; Mansf., Bot. Jahrb. Syst. 62 (1929) 468; P. Royen, Alp. Fl. New Guinea 2 (1979) 132, f. 55. — Type: *Pulle* [*Versteeg*] 2485 (holo BO; iso L), New Guinea.

*Guilianettia disticha* Ridl., Trans. Linn. Soc. II, Bot. 9 (1916) 201, pl. 4, f. 71, pl. 6, f. 70, 72, 73. — Type: *Boden Kloss* s.n. (holo BM; iso K), New Guinea, Mt Carstensz.

*Calanthe arundinoides* J.J. Sm., Nova Guinea 14 (1929) 356, t. 47, f. 16, syn. nov. — Type: *Doorman* 2 (holo BO; iso L), New Guinea, 70 km north of Mt Carstensz.

*Calanthe aurantimacula* P. Royen, Alp. Fl. New Guinea 2 (1979) 137, f. 75, syn. nov. — Type: *Brass & Meijer Drees* 9908 (holo L), New Guinea.

Epiphytic herb up to 25 cm high, erect or slightly decumbent. *Stem* elongate, sheathed in lower half, leafy in top half, 6–13 cm long. *Leaves* distichous; blade patent to spreading patent, subcoriaceous, often conduplicate, apical margin denticulate, glabrous, ovate-linear or linear, 3–9 cm long, 3–5 mm wide, obtuse, base narrowly cuneate, midrib grooved above, prominent below; sheaths reddish purple, conduplicate, ribbed,

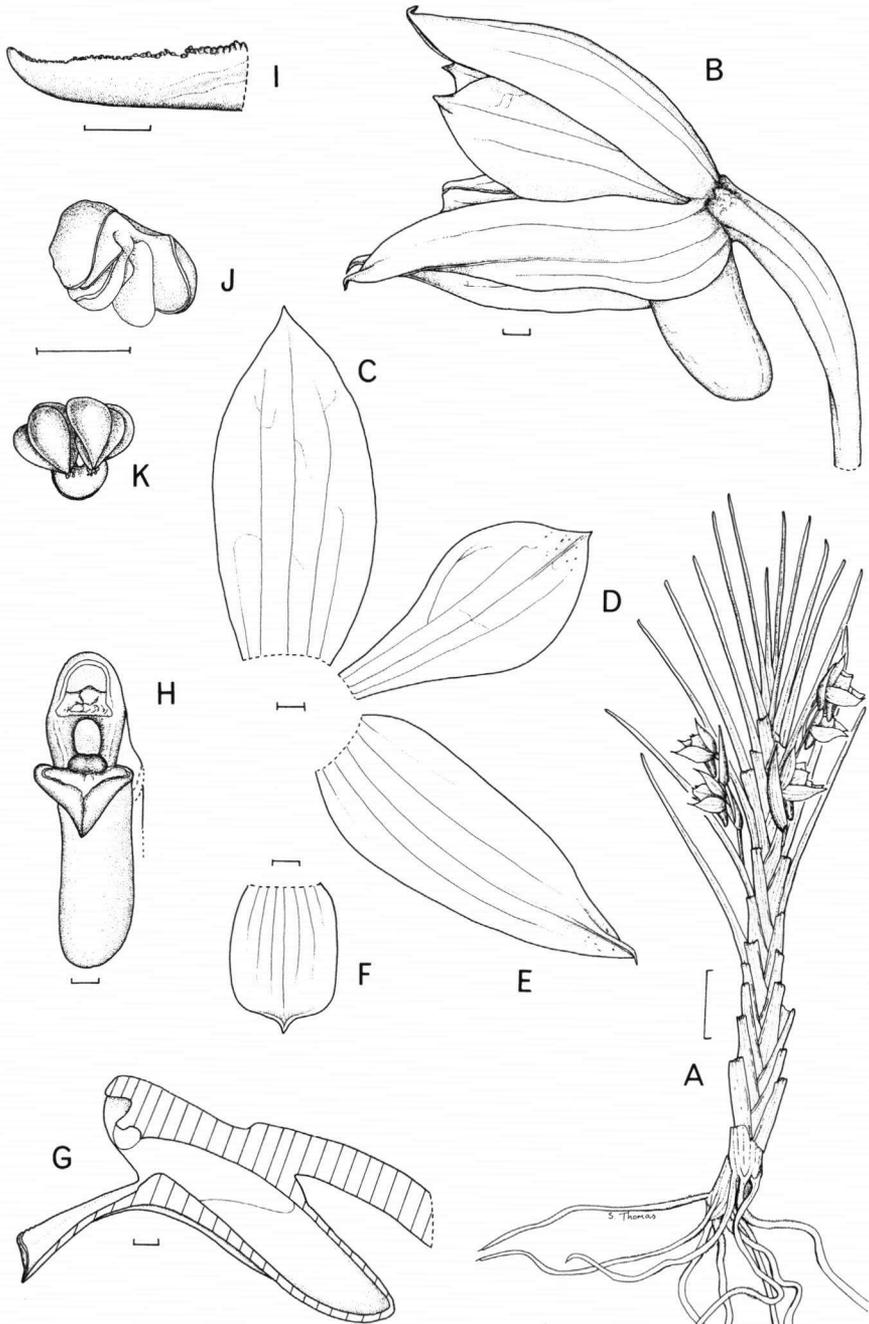


Fig. 5. *Calanthe versteegii* J.J. Sm. A. Habit; B. flower; C. dorsal sepal; D. petal; E. lateral sepal; F. lip; G. lip and column, cross section; H. column, lip and spur; I. leaf tip; J. anther cap; K. pollinia (all MacLennan 18, K). Scale bars: A = 1 cm; B–K = 1 mm.

often with crenulate margins. *Inflorescences* 1 or rarely 2, 1–3-flowered, up to 6 cm long; bracts persistent, lanceolate, acute or acuminate, margin minutely crenulate, 15–20 mm long; peduncle glabrous, 1–3 cm long. Pedicel with ovary 1 cm long, glabrous. *Flowers* greenish white, sometimes with orange or pink patch on the lip. *Dorsal sepal* elliptic or oblong, 10–15 mm long, 3–7 mm wide, cuspidate. Lateral sepals 11–13 mm long, 3–7 mm wide, obliquely ovate-oblong or ovate, midnerve keeled, often forming an apiculate tip. *Petals* 8–12 mm long, 5–9 mm wide, elliptic-obovate, obtuse, often apiculate, sometimes slightly falcate. *Lip* subquadrate to sub-orbicular when spread open, 5–6 mm long, 3–5 mm wide, in natural position apical margins often inrolled to give a triangular point; callus in mouth of spur rounded, bilobed, variously developed depending upon maturity of the flower; spur short, conical, 5–8 mm long, rounded. *Column* 5–6 mm long; anther ovoid, 1 mm across; pollinia 8, brownish yellow, pyriform.

Distribution — Endemic to New Guinea.

Habitat — Mossy limestone banks; altitude 1800–3500 m.

Note — Both *C. aurantimacula* and *C. arundinoides* appear to fall within the acceptable variation of *C. versteegii*. Amongst the specimens examined there is much variation in the size of the plants, especially the length of the leaves. The petal width is variable as is the length of the spur.

Collections studied: *Barker & Umba LAE 67288* (K, L); *Boden Kloss s.n.* (K); *Brass 9112, 9115, 9908* (L); *Brass & Meijer Drees 9673* (L); *Lam 1621* (L); *MacLennan 18* (K); *Milliken 1612* (K); *Raynal 17583* (photo; K); *Rees & Reeve 32* (K, L).

#### ACKNOWLEDGEMENTS

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#### INDEX TO SCIENTIFIC NAMES

The numbers refer to the species under which each name can be found; accepted names are in roman type, synonyms in *italics*.

- |   |  |
|---|--|
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