A REVISION OF THE GENUS *OREORCHIS* (ORCHIDACEAE)

N. PEARCE* & P. CRIBB*

A taxonomic revision of *Oreorchis* is presented. A key to the species and synonymies, descriptions, illustrations and distributions for each taxon are provided. The status of the genera *Kitigorchis* F. Maek. and *Diplolabellum* F. Maek. are discussed. The former is redefined as a monotypic genus, with three of the four species included by Maekawa being returned to *Oreorchis*; the latter is considered congeneric with *Oreorchis*. Three species, *O. angustata*, *O. aurantiaca* and *O. nepalensis*, are newly described here and *O. indica* is reduced to varietal status within *O. foliosa*. Some outstanding problems in the taxonomy of the genus are noted.

Keywords. *Diplolabellum*, distribution of *Oreorchis* species, *Kitigorchis*, new taxa, pollination, synonymy.

INTRODUCTION

Oreorchis Lindl. is a small genus of approximately 16 species, ranging from the Himalayas across China to Taiwan, eastern Siberia, Korea and Japan. The paucity of herbarium material, the presence of autogamy in some species and the subsequent variation in floral morphology have led to frequent misidentification of herbarium material and confusion in the literature concerning the identity of some taxa within the genus.

HISTORICAL PERSPECTIVE

John Lindley (1840) first described two aberrant species of *Corallorhiza*, *C. foliosa* Lindl., from the Western Himalayas, and *C. patens* Lindl., from Siberia. Their floral structure was similar to that of *Corallorhiza* but they possessed leaves. In 1859, he proposed the new genus *Oreorchis* for them and a third undescribed species in his possession. He felt that they were distinct because of the presence of leaves and their globular, uncompressed pollinia attached to a 'true caudicle with its gland'. The new species he named *O. micrantha* Lindl. Further species have, subsequently, been described by several authors, based on plants found in the Himalayas, China, Japan, Korea and Taiwan. Twenty-eight species have so far been ascribed to this genus.

The first significant review of *Oreorchis* was published in 1919 by R. Schlechter, who discussed eight species, including three novelties. He suggested that *Oreorchis* was a 'typically Asiatic' genus, occurring in the high mountain ranges of northern India and China, the mountains of Japan, Korea, Formosa (Taiwan) and Siberia.

* The Herbarium, Royal Botanic Gardens, Kew, Richmond, Surrey TW9 3AB, UK.

He identified the centre of diversity as being in eastern Asia rather than the mountains of India and included *Oreorchis* in the subtribe *Corallorhizinae*, forming the first group of 'pleuranthous orchids'. Handel-Mazzetti (1936), Hu (1974) and Lang (1994) subsequently revised the Chinese species.

GENERIC SEGREGATES

Diplolabellum

Finet (1908) described *Oreorchis coreana* based on plants collected in Quelpaert, Korea. In the protologue he commented that pollinia were absent from the type material and concluded that further examination of floral material would help determine the exact status of this species. Maekawa (1935) reviewed the status of *O. coreana*, transferring it to a new genus that he named *Diplolabellum* which he distinguished from *Oreorchis* in having a lip with a V-shaped fleshy callus produced in front, rather than two lamellae, compressed rounded pollinia and lacking a caudicle and retinaculum (viscidium) rather than globose pollinia with a distinct caudicle. He added that the North American genus *Aplectrum* Nutt. was also related to his new genus as both lacked a caudicle. *Aplectrum* also shares with *Oreorchis* a hamular stipe (Freudenstein, 1991a).

We have examined the type material of *O. coreana* from Paris. This contains a dissected perianth; the shape of the callus differs from other *Oreorchis* species, but it has been impossible to confirm the other differentiating features, particularly of the pollinarium which is missing. The dissected perianth is the only floral material seen of this predominantly cleistogamous species. Although the usual form of the callus on the lip in *Oreorchis* is bilamellate there is considerable variation within the genus: *O. foliosa* var. *indica* lacks a callus, in *O. bilamellata* it is V-shaped and in *O. discigera* cockleshell-shaped.

As the distinguishing features of Maekawa's *Diplolabellum* cannot be confirmed from the herbarium material available, and since the other morphological features of *O. coreana* are consistent with *Oreorchis*, we treat it here as congeneric with *Oreorchis*. Further material should be examined before a definite conclusion can be reached about the status of this genus.

Kitigorchis

Maekawa (1971) revised *Oreorchis* and proposed a new genus, *Kitigorchis*, for four species: *K. itoana* F. Maek. (the type species), *K. shimadai* (Hayata) F. Maek., *K. erythrochrysea* (Hand.-Mazz.) F. Maek. and *K. foliosa* (Lindl.) F. Maek. He distinguished *Kitigorchis* from *Oreorchis* by its distinct mentum, poorly developed calli on the lip, rigid leaf blade and prominent nerves on the leaf.

Kitigorchis itoana is a Japanese species that was described by Maekawa (1971) based on a specimen collected by Saburo Ito and Kitigoro Suzuki from Mount Yatsugatake in the Hondo region of Japan. His excellent illustration shows that the

plant has coral-like rhizomes quite different from the subterranean organs of *Oreorchis*. Otherwise it is not unlike *Oreorchis* in its morphology. However, we do not regard the other features listed as separating these genera as significant. *Kitigorchis shimadai* is based on *Tainia shimadai* Hayata (1916). The illustration associated with the type description shows eight pollinia, suggesting that the species does not belong in *Kitigorchis* and should probably remain in *Tainia*. *Kitigorchis erythrochrysea* is based on *Oreorchis erythrochrysea,* which does indeed have a reduced callus on the lip, but in every other respect is typical of *Oreorchis*. *Kitigorchis foliosa*, based on *Oreorchis foliosa*, has two distinct central lamellae on the lip and is typical of *Oreorchis* in all respects. Maekawa was probably referring to *O. foliosa* var. *indica*, which lacks a callus. This is also in all other respects typical of *Oreorchis* and its removal to *Kitigorchis* is rejected here.

Thus, we consider *Kitigorchis* to be a monotypic genus intermediate between *Corallorhiza* and *Oreorchis*. Further investigation into this relationship is required but, unfortunately, little herbarium material is available and Maekawa (1971) noted that *K. itoana* was on the verge of extinction in Japan.

GENERIC RELATIONSHIPS

Dressler (1981) included *Oreorchis* in the subtribe *Corallorhizinae* (tribe *Maxillarieae* of subfamily *Vandoideae*). He was uncertain whether this association of genera was correct and, in particular, wondered whether some of the Asiatic genera of the subtribe were better placed in the tribe *Calypsoeae*. Chen & Tang (1982) considered that *Oreorchis* belonged to the subtribe *Cymbidiinae*, within the tribe *Vandeae*. Recent phylogenetic studies led Dressler (1993) to reconsider this relationship and to propose an alternative classification where *Oreorchis* and allied genera are included under the cymbidioid phylad within the tribe *Calypsoeae*. All the plants in the cymbidioid phylad share in common the *Corallorhiza-Eulophia* seed type (Barthlott & Ziegler, 1981).

Freudenstein (1991a) examined *Aplectrum*, *Corallorhiza*, *Cremastra* and *Oreorchis* and noted that all have a hamular stipe sensu Rasmussen (1982, 1985, 1986) and share unique morphological and molecular apomorphies that suggest they are a monophyletic group. Further evidence to support this association comes from a further study by Freudenstein (1991b). He considered that the form of secondary wall thickenings, occurring in the layer of anther tissue known as the endothecium, is of taxonomic significance and found that these four genera share a common pattern, which he termed type IIIc. The other genera in the tribe *Calypsoeae* have different endothecial thickening types.

POLLINATION

The only published report of pollination in *Oreorchis* is from A.I. Shatalkin (in Khrapko, 1990) who recorded pollination of *O. patens* by the flies *Episyrphus*

balteatus and *Sphaerophata menthastri* (Diptera). Hogan (1983) discussed the pollination biology of the related *Aplectrum hyemale* Nutt. and suggested that, although it is sometimes pollinated by halictid bees, it is usually autogamous and perhaps agamospermous. *Corallorhiza* species have been shown to be pollinated by syrphid flies (Dexter, 1913) and by other small Diptera, Hymenoptera and Coleoptera (Løjtnant & Jacobsen, 1976) but self-pollination is also frequent. The flowers with a more or less petaloid lip, cleistogamous flowers and high fruit set found in some of the species of *Oreorchis* examined in this study suggest that some species are autogamous.

TAXONOMY

The following account is a preliminary attempt to clarify the taxonomic and nomenclatural difficulties posed by this genus. The study has been based upon examination of herbarium specimens that are cited under each species description and upon a limited number of field observations of species in China, the Himalayas and eastern Russia.

Oreorchis Lindl. in J. Proc. Linn. Soc. 3: 27 (1859); Benth. & Hook.f., Gen. Pl. 3: 498 (1883); Schltr. in Repert. Spec. Nov. Regni Veg. Beih. 4: 223–225 (1919). Lectotype: *O. patens* (Lindl.) Lindl. (selected here).
Syn.: *Diplolabellum* F. Maek. in J. Jap. Bot. 11: 305, t. 8 (1935). Type species: *D. coreanum* (Finet) F. Maek.

Terrestrial herbs. *Rhizomes* pseudobulbous; pseudobulbs underground, of several internodes. *Leaves* erect, 1 or 2, plicate, linear to lanceolate, petiolate. *Inflorescence* lateral from the pseudobulb, simple, racemose, usually several- to many-flowered. *Flowers* spirally arranged, small to medium. *Sepals* and *petals* free, subsimilar, spreading or porrect; mentum absent or, if present, short, formed by lateral sepal bases. *Lip* three-lobed or entire, unguiculate, without a spur, usually with a callus. *Column* with a short foot; anther terminal, operculate; pollinia four, globose to subglobose, superposed; stipe a hamulus; stigma entire, concave, oval.

Distribution. A genus of 16 species distributed in the montane regions of the western Himalayas, SW China and Tibet, north to Manchuria, Siberia, Japan and Taiwan.

Chromosome number. $2n=48$, 50 (for *O. patens*, in Khrapko, 1990).

Etymology. From the Greek *oreo-* (of mountains) and *orchis* (testicle, orchid), in reference to the alpine habit of this genus.

ARTIFICIAL KEY TO SPECIES

1a. Plant autumn-flowering; flowers orange ——— **2. O. aurantiaca**
1b. Plant spring-flowering; flowers not orange ——— 2

2a. Plant very small, less than 16cm tall; leaves less than 10cm long ——— 3
2b. Plant more than 16cm tall; leaves more than 10cm long ——— 5

3a. Leaves oblong-lanceolate, 5–9cm long; inflorescence usually more than 7-flowered — **14. O. parvula**
3b. Leaves elliptic-lanceolate, less than 4cm long; inflorescence 7-flowered or less — 4

4a. Flowers white, up to 7-flowered — **11. O. nana**
4b. Flowers purple, usually 3-flowered or less — **13. O. oligantha**

5a. Flowers large; dorsal sepal more than 15mm long — 6
5b. Flowers medium to small; dorsal sepal less than 15mm long — 7

6a. Inflorescence densely up to 20-flowered; flowers green-yellow to brown-yellow — **12. O. nepalensis**
6b. Inflorescence laxly up to 5-flowered; flowers deep purple — **16. O. porphyranthes**

7a. Lip lacking a callus; lateral lobes of lip auriculate, reduced or absent — **8b. O. foliosa** var. **indica**
7b. Lip with a callus; lateral lobes of lip distinct — 8

8a. Plants unifoliate — 9
8b. Plants bifoliate — 15

9a. Callus of lip resembling an open bivalve shell — **5. O. discigera**
9b. Callus of lip not as above — 10

10a. Callus of lip a projecting ridge below the insertion point of the lateral lobes — 11
10b. Callus of lip two raised lamellae usually extending from the base to the midpoint of lip — 12

11a. Flowers scarcely opening, apparently usually cleistogamous; found in Korea — **4. O. coreana**
11b. Flowers usually opening widely, not self-pollinating; found in Taiwan — **3. O. bilamellata**

12a. Callus reduced to two small raised lamellae in the centre of the lip; flowers olive-green to brown; lip yellow with purple-red spots — **6. O. erythrochrysea**
12b. Callus of two raised lamellae, extending from the base to midpoint of lip; flowers not coloured as above — 13

13a. Petiole of leaf sheathing; lip less than 5mm long — **1. O. angustata**
13b. Petiole of leaf not sheathing; lip more than 5mm long — 14

14a. Lip longly clawed; flowers red, brown to yellowish white; lip white dappled with red — **8a. O. foliosa** var. **foliosa**

14b. Lip shortly clawed; flowers yellow; lip white spotted with purple ——— **15a. O. patens** var. **patens**

15a. Margins of lip ciliate ——— **9. O. intermedia**
15b. Margins of lip not ciliate ——— 16

16a. Flowers yellow to brown; lip white with purple spots ——— **15b. O. patens** var. **gracilis**
16b. Flowers white; lip flecked with purple ——— 17

17a. Dorsal sepal c.10mm long; inflorescence condensed; lip flabellate, apex strongly undulate-crispate ——— **7. O. fargesii**
17b. Dorsal sepal c.6mm long; inflorescence racemose; lip obovate, apex weakly or not undulate ——— **10. O. micrantha**

1. Oreorchis angustata L.O. Williams ex N. Pearce & P. Cribb, **sp. nov.** *O. erythrochryseae* similis sed folio maiore (usque 19 × 2cm), inflorescentia usque 30-flora, sepalo dorsali usque 5.5 × 1.2mm, sepalis lateralibus usque 5 × 1.5mm, petalis usque 5 × 1.2mm, labello lamellis duabus sinuatis carinatis usque 2mm longis instructo differt. Typus: China, Yunnan, Likiang [Lijiang], iv–x 1922, *J.F. Rock* 4763 (holo. K!). **Fig. 1.**

Plant terrestrial, up to 32cm tall. *Pseudobulb* pyriform-conical, up to 15mm long and 10mm wide, unifoliate at the apex; roots filiform with fibrous sheaths. *Leaf* plicate, broadly lanceolate, acute, prominently veined; leaf blade up to 19cm long and 2cm wide; petiole sheathing, up to 6cm long. *Scape* lateral from the pseudobulb, enclosed by two sheaths, up to 30cm tall; sheaths up to 10cm long. *Inflorescence* racemose, up to 11cm long, laxly up to 30-flowered; bracts lanceolate, acute, up to 6mm long. *Flowers* widely opened, up to 7mm long and 11mm wide; pedicellate ovary up to 6mm long. *Dorsal sepal* lanceolate, acute, 3-nerved, up to 5.5mm long and 1.2mm wide. *Lateral sepals* lanceolate, subacute, 3-nerved, up to 5mm long and 1.5mm wide. *Petals* ovate-lanceolate, subacute, 3-nerved, up to 5mm long and 1.2mm wide. *Lip* 3-lobed at base, short unguiculate, up to 4.5mm long and 2.5mm wide when spread; lateral lobes ovate, rounded, up to 1.4mm long; midlobe ovate-pyriform, margins undulate; disc containing two sinuate, carinate lamellae of up to 2mm long. *Column* clavate, up to 3mm long.

Distribution and habitat. SW China only: Sichuan and Yunnan. Endemic. Montane grassland and open stony ground; above 3000m. Flowering in June.

Additional specimens examined. CHINA. Sichuan: Shuiluo He, 26 vi 1921, *Kingdon Ward* 4255 (E); Yunnan: without exact locality, 1907, *Mombeig* 247 (E); Tsekou, 20 vi 1895, *Soulié* 1475 (AMES, K, P).

Joseph Rock (1884–1962), an Austrian-born American botanist who was employed as a plant collector by the United States Department of Agriculture in China, found this plant in the Lijiang range of NW Yunnan in 1922. The name *O. angustata* was suggested by L.O. Williams but never published. Superficially the plant resembles

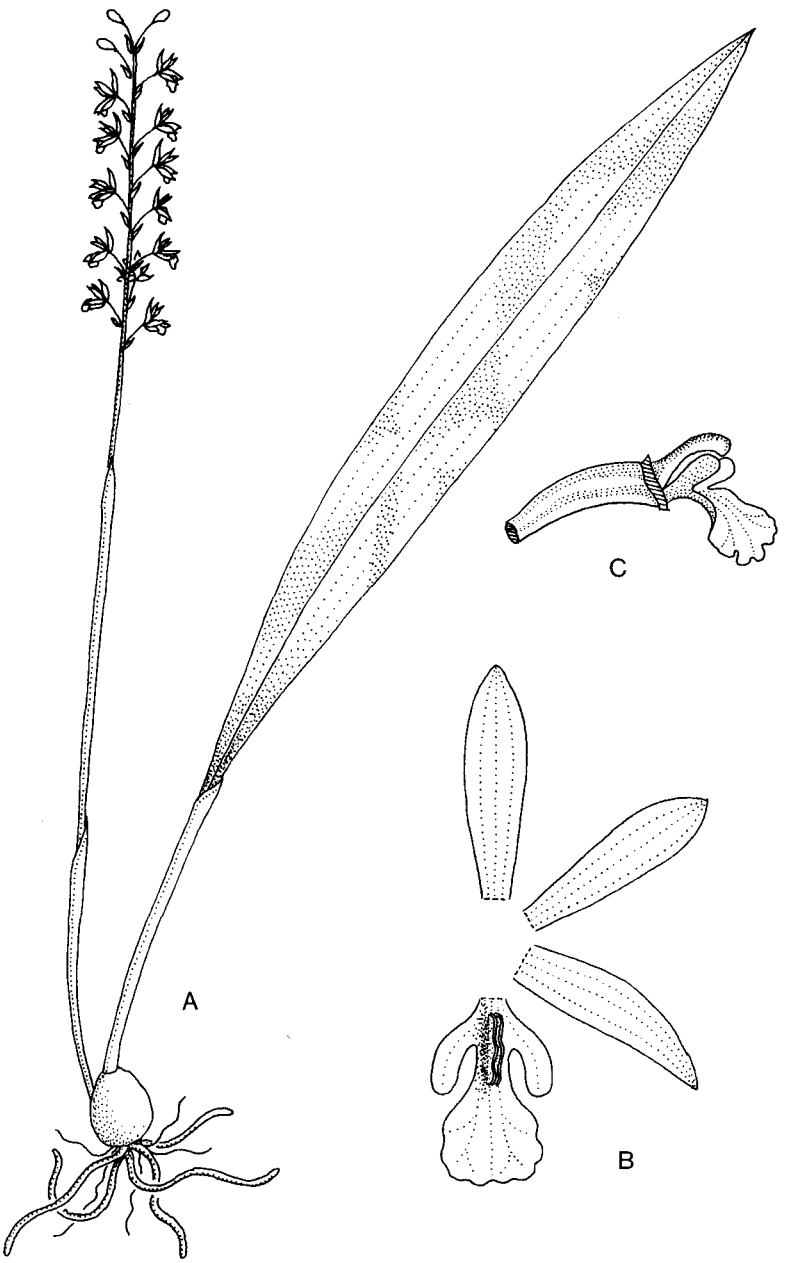

FIG. 1. *Oreorchis angustata*. A, habit (×⅔); B, perianth dissected (×6); C, column and lip, from the side (×4). All from *Rock* 4763.

O. erythrochrysea in its habit but is florally quite distinct with much longer callus ridges on the lip, and clearly represents a separate species. We have seen only two collections and neither provides information on flower colour.

2. Oreorchis aurantiaca P. Cribb & N. Pearce, **sp. nov.** Planta usque 16cm alta, autumno florens. Inflorescentia usque 12-flora. Flores late aperti, aurantiaci, sepalis dorsalibus 7.5 × 2.5mm, sepalis lateralibus 8 × 2.5mm, petalis 7.5 × 2mm, labellis trilobatis, unguiculatis, 5.5 × 2.5mm, lamellis duabus carinatis instructis, columnis 3.8mm longis. Typus: Upper Burma [Myanmar], Nam Tamai Valley, between Adung Wang and Gamlang Wang, 1 x 1937, *F. Kingdon Ward* 13334 (holo. BM!). **Fig. 2.**

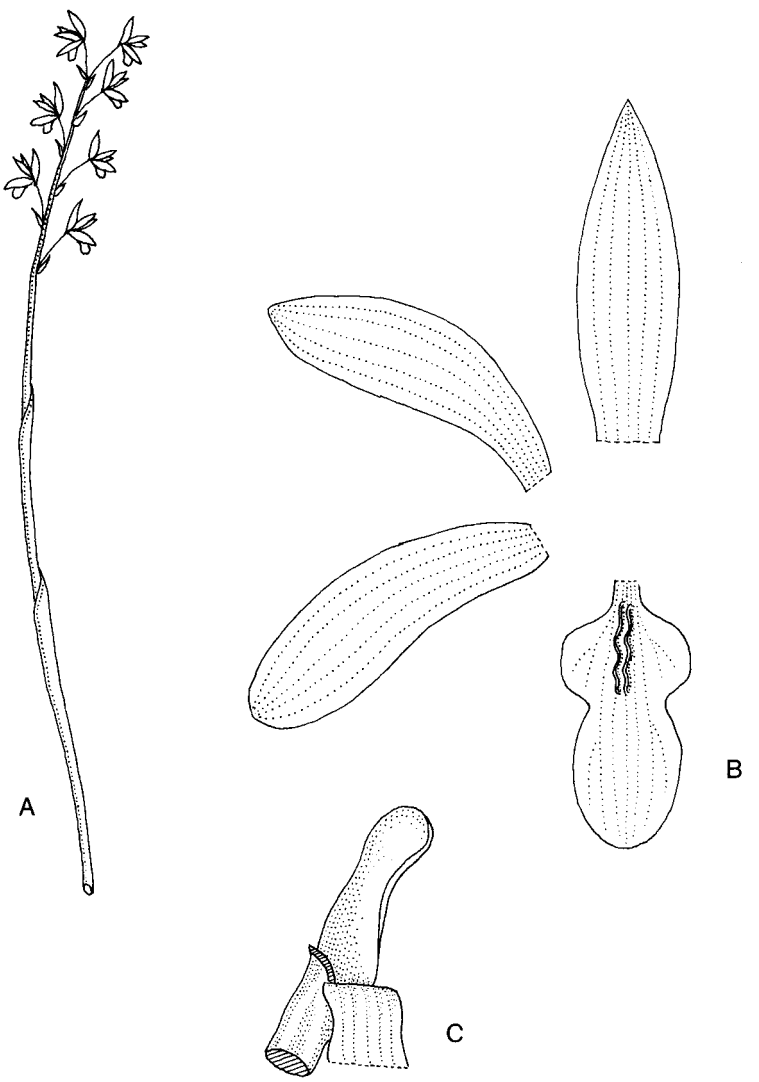

FIG. 2. *Oreorchis aurantiaca*. A, habit (×⅔); B, perianth dissected (×6); C, column, with lateral sepal folded down (×6). All from *Kingdon Ward* 13334.

Plant terrestrial, up to 16cm tall. *Pseudobulbs* not known. *Leaves* not known. *Scape* enclosed by two sheaths, up to 20cm tall; sheaths up to 6cm long. *Inflorescence* racemose, laxly up to 12-flowered, up to 5cm long; bracts lanceolate, up to 2mm long. *Flowers* widely opened, orange, up to 1cm long and wide; pedicellate ovary up to 4mm long. *Dorsal sepal* lanceolate, subcymbiform, acute, 5-nerved, up to 7.5mm long and 2.5mm wide. *Lateral sepals* oblong, falcate, obtuse, 5-nerved, up to 8mm long and 2.5mm wide. *Petals* oblong-lanceolate, subacute, 5-nerved, up to 7.5mm long and 2mm wide. *Lip* 3-lobed, unguiculate, up to 5.5mm long and 2.5mm wide; lateral lobes small, auriculate, up to 1.2mm long; midlobe ovate, entire, up to 3.5mm long and 2.3mm wide; disc with two sinuate, carinate lamellae, from just above the lateral lobes to just below them, up to 2mm long. *Column* clavate, up to 3.8mm long.

Distribution and habitat. N Myanmar [Burma] only. Apparently endemic. Exposed high mountain scree; 3500–4000m. Flowering in October.

The type collection consists of seven leafless flowering plants that have all been heavily glued to the sheet. This sheet includes a handwritten note by Kingdon Ward that states: 'Flowers dull orange, the lip spotted with crimson. Scattered on a flower clad earth and rubble core, amongst a carpet of short plants on the exposed side of the valley; just above a big snow mound spanning the torrent. This orchid was the only flower on the exposed flank, everything else being in ripe or almost ripe fruit. A hundred yards away on the opposite bank above the snow mound scores of *Primulas*, *Trollius*, *Allium*, *Nomocharis* etc. were in full bloom. Clearly it is an autumn flowering orchid'.

This is the only orange, autumn-flowering *Oreorchis* and cannot be mistaken for any other species.

3. Oreorchis bilamellata Fukuy. in Bot. Mag. Tokyo 48: 436 (1934). Type: Taiwan, Shinchiku, vii 1932, *N. Fukuyama* 4132 (holo. TI).
Syn.: *Tainia bilamellata* (Fukuy.) S.S. Ying, Col. Illust. Ind. Orchids Taiwan 1(2): 503 (1977).

Plant terrestrial, up to 40cm tall. *Pseudobulbs* approximate, ovoid, of 2 or 3 internodes, up to 3cm long and 2cm wide. *Leaf* solitary, linear, up to 40cm long. *Scape* arising from the side of the pseudobulb, lower part covered by 3 or 4 sheaths, up to 40cm tall. *Inflorescence* racemose, 15- to 20-flowered, about 14cm long; bracts acute, small, up to 5mm long. *Flowers* ringent, up to 1.6cm across; sepals and petals dark brown, lip white with several dark brown spots and a yellow margin; pedicellate ovary up to 1cm long. *Sepals* narrow, acute, up to 8.5mm long and 3mm wide. *Petals* narrow, acute, up to 8mm long and 1.5mm wide. *Lip* attenuate at base, 3-lobed, up to 6.5mm long; lateral lobes narrow, parallel to the column, obtuse, up to 5mm long; midlobe reflexed, cuneate at base, truncate, undulate, up to 3.8mm long and 3.2mm wide; disc with a fleshy appendage, longitudinally folded, up to 2.5mm wide when flattened. *Column* terete, up to 4.5mm long; pollinia subglobose. (From Lin, 1987).

Distribution and habitat. Taiwan only. Endemic. In woods; 2500m. Flowering in May and June.

This species was described by Fukuyama in 1934 from his collection made in Mount Taihasenzan, Taiwan. We have not traced the type specimen but, based on the type description and the description and drawings given in Lin (1987), this species appears to be close to *O. coreana*. It is desirable to examine the type or more material before a decision is made about the status of *O. bilamellata*.

4. Oreorchis coreana Finet in Bull. Soc. Bot. Fr. 55: 337, t. 10 (1908). Types: Korea, Quelpaert [Cheju do], Hallaisan, vii 1907, *Faurie* 2055 (syn. P!; isosyn. E!, TI!, W!) and x 1907, *Taquet* 394 (syn. P!, isosyn. E!). **Fig. 3.**
Syn.: *Diplolabellum coreanum* (Finet) F. Maek. in J. Jap. Bot. 11: 305, t. 8 (1935).

Plant terrestrial, up to 34cm tall with short underground rhizomes. *Pseudobulbs* corm-like, pyriform, caespitose, unifoliate at the apex, up to 1.5cm tall and 1cm wide. *Leaf* elliptic-lanceolate, petiolate, plicate, up to 22cm long and 2.2cm wide; petiole sheathed, up to 5cm long. *Scape* lateral from the pseudobulb, up to 34cm tall and 3mm wide. *Inflorescence* racemose, up to 12-flowered; bracts triangular; pedicellate ovary thin, short. *Flowers* usually unopened. *Dorsal sepal* erect, ligulate, obtuse-acute, 3-nerved, up to 6mm long and 2.2mm wide; lateral sepals oblique, subfalcate, up to 5mm long and 1.5mm wide. *Petals* subfalcate, ovate, obtuse-acute, up to 5mm long and 1.5mm wide. *Lip* erect, cuneate, 3-lobed, 5-nerved, up to 5.2mm long and 4mm wide; lateral lobes ligulate, obtuse, up to 2.5mm long; midlobe cuneate, margins undulate; callus short, diamond-shaped, projecting upwards, below reinsertion point of lateral lobes. *Column* clavate, apex dilated. *Fruit* pendent, ridged, up to 1.5cm long and 1cm wide.

Distribution and habitat. Korea only. Endemic. Damp woods; 900–1000m. Flowering in June and July.

Additional specimens examined. KOREA. Quelpert, Hallaisan, viii 1908, *Taquet* 1648 (K); Quelpaert, Hallaisan, ix 1909, *Taquet* 3333 (K).

Oreorchis coreana was described by Finet in 1908 based on collections made by Faurie in July 1907 and by Taquet in October 1907. Faurie's collection consists of two sheets, the first with four plants, all with pendulous cleistogamous flowers, and the second having one plant with cleistogamous flowers, a separate leaf and pseudobulb and a packet containing a mounted dissected perianth. Taquet's consists of one fruiting plant. None of the specimens that we have examined have open flowers, suggesting that *O. coreana* might be autogamous.

Maekawa (1935) proposed that *O. coreana* be transferred to the new genus *Diplolabellum*, based upon the different shape of its callus and the absence of caudicles. From the limited material available these distinctions do not seem sufficient to uphold Maekawa's genus, which we here consider congeneric with *Oreorchis*.

FIG. 3. *Oreorchis coreana*. A, habit, with fruiting inflorescence (×⅔); B, flowering inflorescence with cleistogamous flowers (×⅔); C, perianth dissected (×6). A from *Taquet* 394; B–C from *Faurie* 2055.

5. Oreorchis discigera W.W. Smith in Notes Roy. Bot. Gard. Edinburgh 13: 215 (1921). Type: Upper Burma [Myanmar], Feng-shui-ling, 5 iv 1914, *F. Kingdon Ward* 1640 (holo. E!). **Fig. 4.**

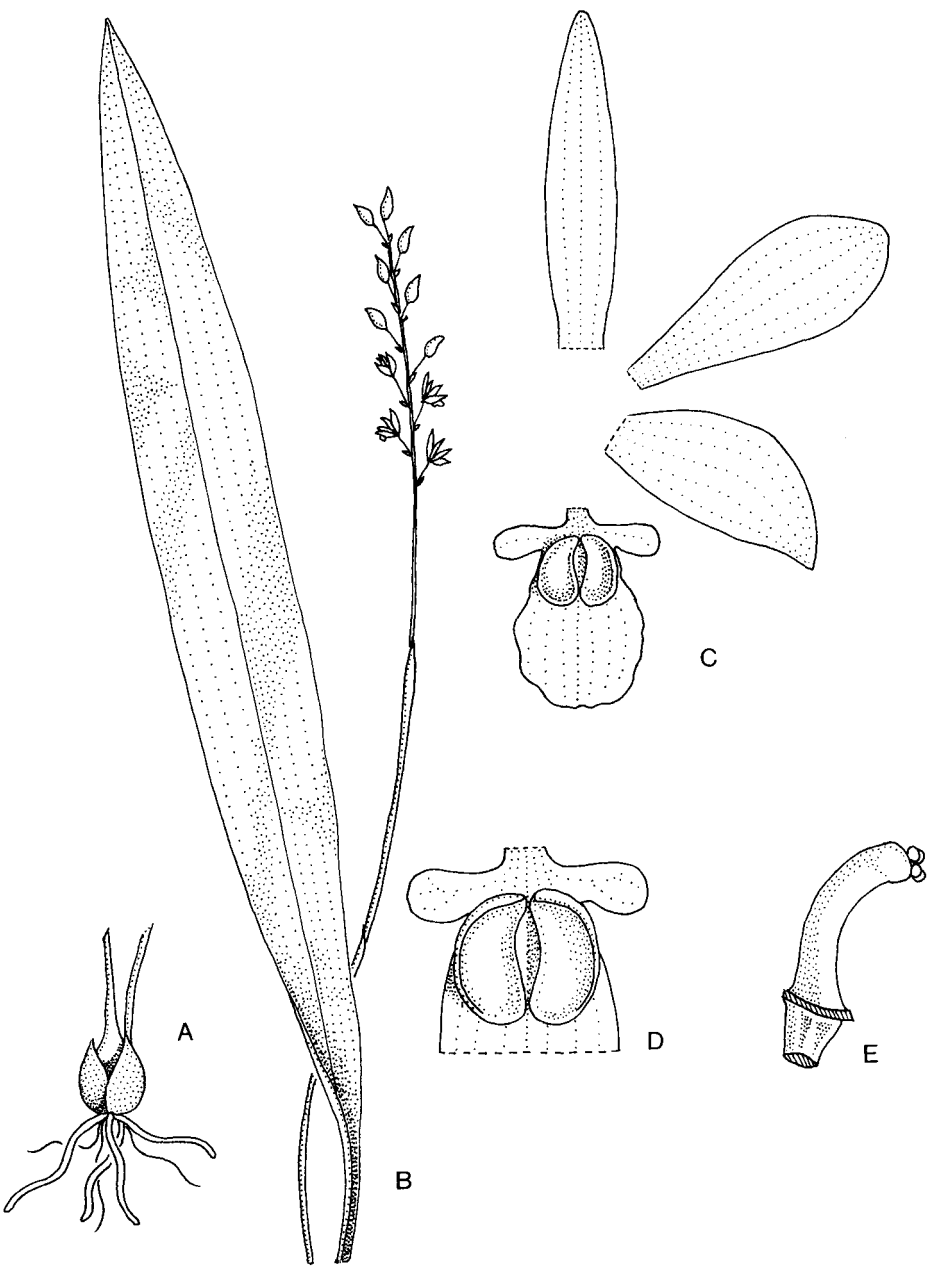

FIG. 4. *Oreorchis discigera*. A, pseudobulb and roots (×⅔); B, habit (×⅔); C, perianth dissected (×6); D, detail of callus (×10); E, column (×6). All from *Kingdon Ward* 1640.

Plant terrestrial, up to 30cm tall. *Pseudobulbs* ovoid, unifoliate at the apex, up to 2cm long and 2cm wide; roots fibrous. *Leaf* plicate, linear-lanceolate, many-nerved, petiolate; leaf blade up to 30cm long and 2.5cm wide. *Scape* lateral from the pseudobulb, enclosed by 2 or 3 sheaths, up to 25cm tall. *Inflorescence* racemose, laxly up to 15-flowered; bracts linear-lanceolate, acute, up to 5mm long. *Flowers* greenish brown, the petals striped with purple inside, the lip white with purple spots. *Dorsal sepal* lanceolate, obtuse, up to 7.5mm long and 1.6mm wide. *Lateral sepals* falcate-ovate, acute, up to 5.5mm long and 2.5mm wide. *Petals* spathulate-falcate, obtuse, up to 6.6mm long and 2.5mm wide. *Lip* 3-lobed, shortly clawed, up to 4.5mm long and 3.5mm wide when spread; lateral lobes auriculate, up to 1.3mm long and 1mm wide; midlobe ovate-elliptic, margins undulate; disc with two raised calli resembling an open bivalve shell. *Column* clavate, up to 4mm long.

Distribution and habitat. N Myanmar [Burma] only. Endemic. 2400–2800m. Flowering in June.

The lip of *O. discigera* is unique within this genus and could not be mistaken for any other species. The type specimen was discovered by Frank Kingdon Ward during his travels in Burma in 1914, described in his book *In Farthest Burma*. It has not been recollected.

6. Oreorchis erythrochrysea Hand.-Mazz. in Anzeig. Akad. Wiss. Wein. Math.-Naturw. Kl. 62: 252 (1925) & Symb. Sin. 7: 1354 (1936). Type: China, Yunnan, Yülungshan [Yulongxueshan], near Lidjiang [Lijiang], 18 vi 1915, *Handel-Mazzetti* 6805 (holo. W!; iso. E!, K!). **Fig. 5.**
Syn.: *Kitigorchis erythrochrysea* (Hand.-Mazz.) F. Maek., Wild Orchids of Japan in Colour: 469 (1971).

Plant terrestrial, up to 30cm tall. *Pseudobulbs* corm-like, pyriform, unifoliate at the apex, up to 1cm tall and 0.7cm wide. *Leaf* elliptic-lanceolate, obtuse, plicate, ribs yellow, sheathed at the base, up to 16cm long and 1.5cm wide; petiole up to 2.8cm long. *Scape* lateral from the pseudobulb, green, spotted with purple, lower part enclosed by two tubular sheaths, up to 22cm tall; sheaths purple, up to 6.5cm long. *Inflorescence* racemose, laxly up to 9-flowered. *Flowers* small, the sepals and petals olive-green to brown, the sepals with purple undersides, the lip yellow spotted with red, up to 3mm long and 8mm wide; pedicel filiform, purple, up to 7mm long. *Dorsal sepal* oblong-elliptic, obtuse, 5-veined, up to 8mm long and 2mm wide. *Lateral sepals* oblong-elliptic, obtuse, up to 6.5mm long and 2mm wide, forming a short mentum. *Petals* spathulate, 5-nerved, up to 6.5mm long and 1.6mm wide. *Lip* 3-lobed, adnate to the column-foot, fleshy, quadrate, reflexed, up to 5mm long; lateral lobes arising from just above the middle of the lip, short linear, up to 1.2mm long; midlobe quadrate, broadly bilobed at the base with slightly undulate border, up to 2.5mm long and 1.5mm wide; callus above the lateral lobes, re-entering at about the midpoint of the lateral lobes, ovate with poorly developed lamellae. *Column* slightly arcuate, clavate, operculate, extending into a short foot, up to 3.5mm long.

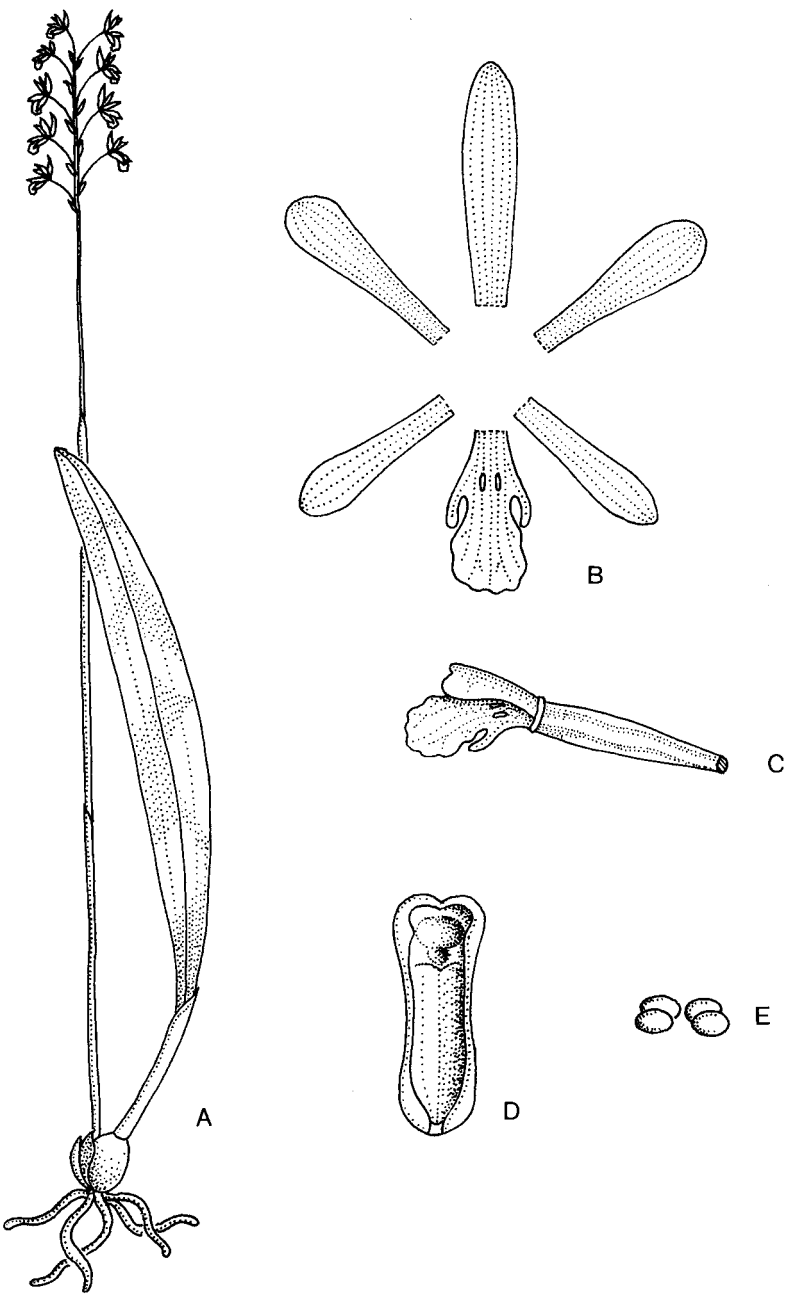

FIG. 5. *Oreorchis erythrochrysea*. A, habit (×⅔); B, perianth dissected (×4); C, column and lip, from the side (×4); D, column, from the front (×10); E, pollinia (×10). All from *Handel-Mazzetti* 3805.

Distribution and habitat. China: Yunnan, Sichuan and Xizang (Tibet). In shade of fir forest and alpine meadows; 3000–3600m. Flowering in June and July.

Additional specimens examined. CHINA. Sichuan: Yungning, vi 1922, *Forrest* 21296 (K, P); Yunnan: exact location not recorded, vii 1930, *Forrest* 28438 (BM); location not recorded, 1931, *Forrest* 30470 (BM); Muli, 7 vi 1921, *Kingdon Ward* 4027 (E); Yung-ning, vii 1933, *McLaren's collectors* 45 (K, BM); Muli, Kulu Mountains, vii 1929, *Rock* 18060 (AMES, W). Haut Mekong, Tsekou, *Biet* 1473 (P); Lijiang, 7 vi 1987, *Chamberlain, Grey-Wilson, Li, McBeath, Schilling, Xu & Yuan* 487 (K); loc. cit., 28 v 1987, *Chamberlain et al.* 926 (E); Litiping, 21 vi 1939, *R.C. Ching* 20819 (AMES); Lijiang, Gang-ho-ba, 16 vi 1990, *Cribb* 90/15 (K photo.); Lijiang, vi 1906, *Forrest* 2287 (E); loc. cit., vi 1912, *Forrest* 8158 (E); Li-ti-ping, vi 1921, *Forrest* 19473 (BM, K, P); Wolo-ho, 15 vi 1914, *Handel-Mazzetti* 3050 (W); Yungning, 24 vi 1914, *Handel-Mazzetti* 3172 (W); no exact locality, vii 1911, *Kingdon Ward* 150 (E); Tsekou, *Mombeig* A., B. (K); Weixi, vi 1933, *McLaren's collectors* 59 (E); Lichiang [Lijiang] Range, 1933, *McLaren's collectors* s.n. (BM); Lijiang, 1922, *Rock* 3472 (AMES, K); Likiang, Hua Yuan Ko, 1922, *Rock* 4287 (AMES); Likiang [Lijiang], 15 vi 1923, *Rock* 8685 (AMES); Tseku, *Rock* 8728 (E); Chung-tien [Zhongdian], iv–v 1932, *Rock* 24703 (AMES); Yungpeh, vi 1914, *Schneider* 1638 (E); Lijiang, Gang-ho-ba, vi 1990, *Walden* s.n. (K); Wei-si Hsien, vi 1935, *C.W. Wang* 64080 (AMES); 1935–36, *C.W. Wang* s.n. (AMES); 1937, *T.T. Yü* 8616 (AMES); 1938, *T.T. Yü* 11564 (AMES); Yunnan, Lijiang, vi 1913, unnamed collector 10241 (K). Xizang: Tibet-Mekong divide, *Forrest* 168 (E); Tsarong, viii 1919, *Forrest* 19075 (W); Tsela Dzong, 23 v 1924, *Kingdon Ward* 5695 (K); Ata, Zayul, 30 v 1935, *Kingdon Ward* 10445 (BM); Tsarung, Tjonatong, upper Salwin River, vi 1932, *Rock* 22325 (AMES, BM, K); Tsarung, west of Kaakerpo, *Rock* 23168 (AMES, BM, K).

O. erythrochrysea was discovered in Yunnan by Heinrich von Handel-Mazzetti during his travels in China. This species has a distinct geographical distribution, all the specimens we have examined being from W Sichuan, NW Yunnan and SE Xizang. It is morphologically unlike any other species, the lip having two small hump-like lamellae. Two other species, *O. angustata* and *O. parvula*, occur within the geographical range of *O. erythrochrysea* and share some features. *Oreorchis angustata* has a larger leaf, slightly wider lateral lobes of the lip and two distinct raised lamellae on the disc; *O. parvula* is a much smaller plant, lacks a sheathing leaf-petiole and has a densely flowered inflorescence and two raised lamellae on the disc of the lip.

7. Oreorchis fargesii Finet in Bull. Soc. Bot. Fr. 43: 697, t. 13 (1896). Type: China, Su-Tchuen [Sichuan], viii 1892, *Farges* 416 (holo. P!; iso. BM!, E!, K!). **Fig. 6.**
Syn.: *Oreorchis fargesii* var. *subcapitata* Hayata, Icon. Pl. Form. 2: 142 (1912). Type: Taiwan, iv 1910, *U. Mori* s.n. (holo. TI!).

O. subcapitata (Hayata) Schltr. in Repert. Spec. Nov. Regni Veg. Beih. 4: 225 (1919).

O. ohwii Fukuy. in Bot. Mag. Tokyo 49: 296 (1935); Masamune in J. Geobot. 20(3): t. 182 (1972), **syn. nov.** Type: Taiwan, Taihoku, 1 vi 1933, *J. Ohwi* 4547 (holo. TI!).

Plant terrestrial, up to 31cm tall. *Pseudobulbs* conical-ovoid, uni- or bifoliate at the apex, up to 15mm tall and 8mm wide, partially covered by scarious sheaths. *Leaves* petiolate, plicate, long lanceolate, acute, up to 25cm long and 1.2cm wide; petiole

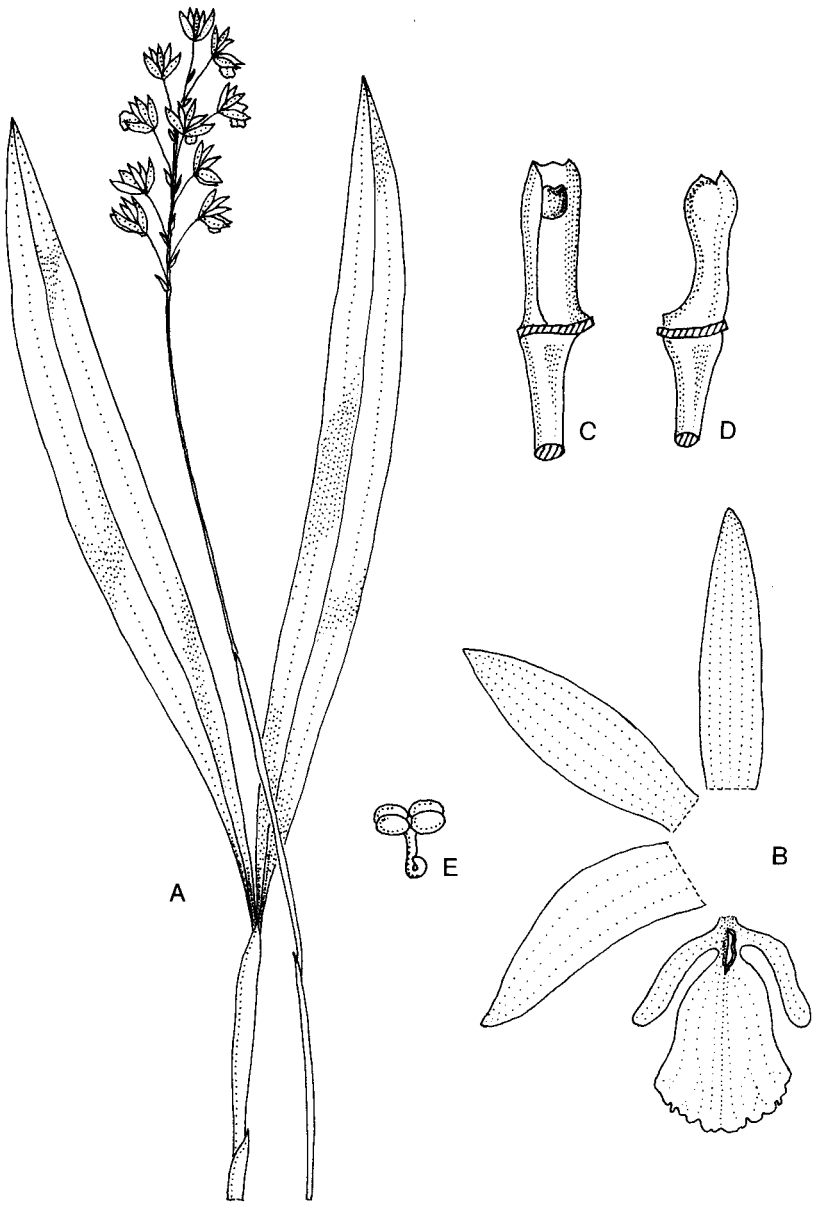

FIG. 6. *Oreorchis fargesii*. A, habit (×⅔); B, perianth dissected (×4); C, column, from the front (×6); D, column from behind (×6); E, pollinarium (×12). All from *Farges* 416.

sheathed, up to 8cm long. *Scape* lateral, with 2 to 3 tightly appressed sheaths, up to 31cm tall. *Inflorescence* densely flowered, racemose, subglobose or subcapitate, up to 15-flowered; floral bracts up to 2mm long. *Flowers* small, up to 2cm tall and 1cm wide, white; pedicel filiform, up to 1.1cm long. *Dorsal sepal* erect, ovate-lanceolate,

broader above middle, acute, veined, up to 10mm long and 2mm wide. *Lateral sepals* lanceolate, broadest at the base, acute, veined, up to 10mm long and 2.5mm wide. *Petals* ovate-lanceolate, broadest at base, subacute, veined, up to 10mm long and 2.5mm wide. *Lip* 3-lobed, base saccate, adnate to the column-foot, up to 9mm long; lateral lobes arise from near the base, erect, ovate-cuneate, obtuse, up to 3mm long and 1mm wide; midlobe broadly spathulate, emarginate, margins undulate, up to 3.5mm wide; callus carinate, extending 2mm below the origin of the lateral lobes. *Column* arcuate, clavate, the base extended into a column-foot, up to 6mm long; anther operculate; stipe hamular.

Distribution and habitat. China only: Sichuan, Hubei, Taiwan. Endemic. In damp forest; 2000–2600m. Flowering in June.

Additional specimens examined. CHINA. Sichuan: Wolong, 4 vi 1990, *Cribb* 90/23 (K photo.); without exact loc., 1989, *de Latouche* s.n. (P); W Hubei: without exact loc., *Wilson* 2130 (E, K, P).

Finet named this species in 1897 in honour of Farges who collected the type material in 1892 while stationed at Tchen-kéou-tin in NE Sichuan. Schlechter (1919) commented that this species could be recognized by its short, almost capitate inflorescence, which is densely flowered, and that there is only one short, high lamella on the central nerve of the lip. The herbarium material examined and the photographs that we have seen show that the lamella is longitudinally channelled. *Oreorchis fargesii* is the only species in this region with two leaves with sheathing petioles, and the subcapitate inflorescence is unique within the genus. We have examined herbarium material only from Taiwan, Sichuan and Hubei, but Yang et al. (1993) give a wider distribution that includes Hunan, Shaanxi, Gansu, Zhejiang and Guangxi.

Oreorchis ohwii was first described by N. Fukuyama in 1935 (loc. cit.) based on a collection by J. Ohwii from Mount Nanko-taizan in Taiwan. An excellent illustration by G. Masamune (1972) strongly suggests that *O. ohwii* is conspecific with *O. fargesii* and on the strength of this and the type description we reduce it here into the synonymy of *O. fargesii.*

8. Oreorchis foliosa (Lindl.) Lindl. in J. Proc. Linn. Soc. Bot. 3: 27 (1859). Type: India, Mussoree, *Royle* s.n. (holo. K-LINDL!).
Syn.: *Corallorhiza foliosa* Lindl. in Royle, Ill. Bot. Himal. 1: 362 (1839) *nomen nudum* & in Gen. Sp. Orch.: 535 (1840).

Kitigorchis foliosa (Lindl.) F. Maek., Wild Orchids of Japan in Colour: 469 (1971).

a. var. **foliosa. Fig. 7.**

Plant terrestrial, up to 35cm tall. *Roots* fleshy with fibrous strands. *Pseudobulbs* corm-like, unifoliate at the apex, up to 1.3cm tall and wide. *Leaf* plicate, oblong-lanceolate, acuminate, narrowing to a short petiole, up to 35cm long and 2.5cm

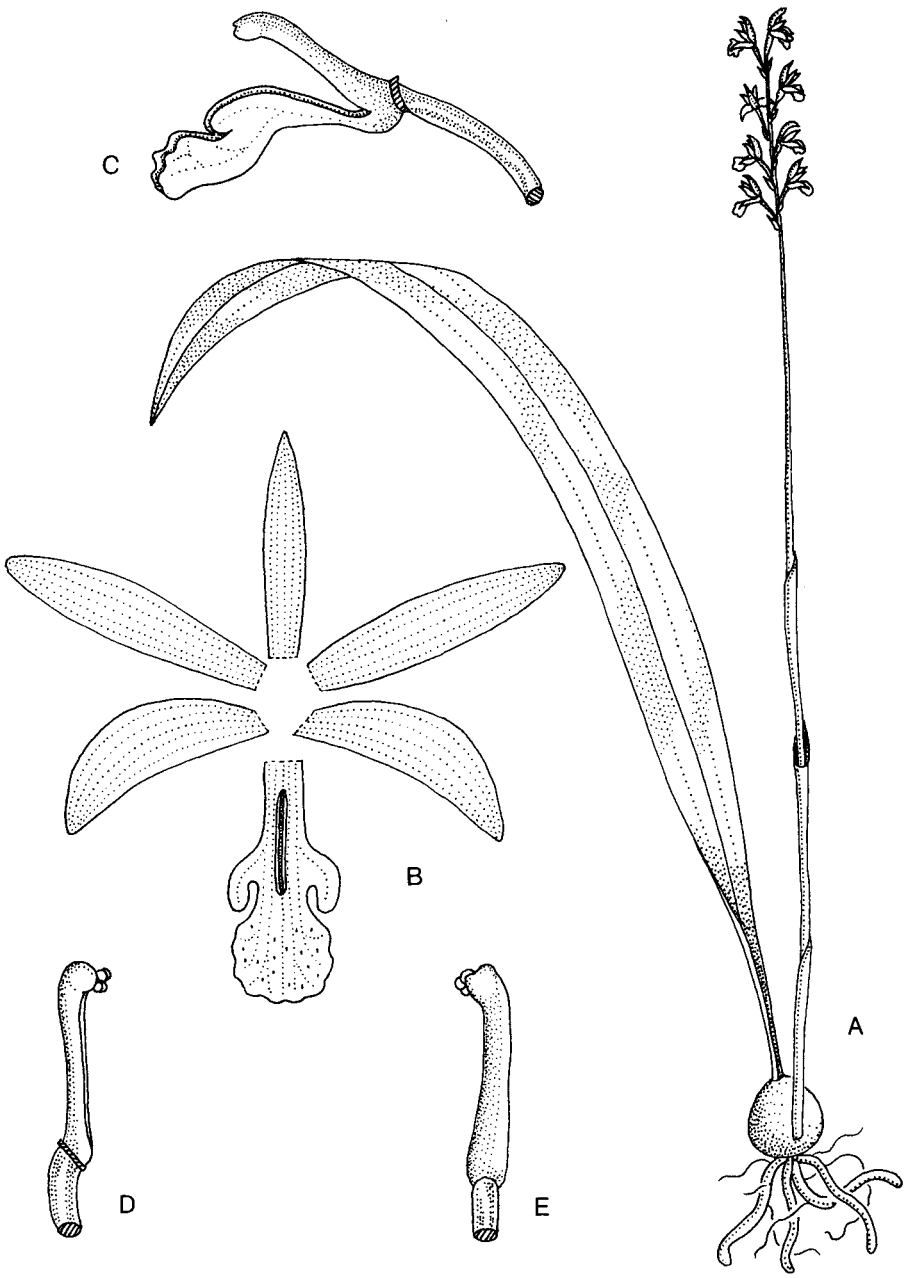

FIG. 7. *Oreorchis foliosa*. A, habit (×⅔); B, perianth dissected (×4); C, column and lip, from the side (×4); D, column, from the side (×4); E, column, from behind (×4). All from *Royle* s.n.

wide. *Scape* arising from the side of the pseudobulb, lower part enclosed by tubular sheaths, up to 30cm tall; sheaths up to 4cm long. *Inflorescence* up to 10-flowered, racemose, laxly to densely flowered; bracts lanceolate, acute, up to 5mm long. *Flowers* up to 6mm long; the sepals and petals red, purple to yellowish white, the lip white with purple spots, the column yellow; pedicellate ovary up to 6mm long. *Dorsal sepal* linear-lanceolate, acute, 5-nerved, up to 8mm long. *Lateral sepals* oblong-lanceolate, falcate, acute, 5-nerved, up to 7.5mm long, uniting to form a short mentum. *Petals* oblong-lanceolate, falcate, acuminate, 5-nerved, up to 9mm long. *Lip* adnate to the column-foot, 3-lobed, longly clawed, up to 7.5mm long and 3.5mm wide; lateral lobes falcate, oblong, obtuse, deflexed; midlobe suborbicular to subreniform, emarginate; disc containing two longitudinal carinate lamellae up to 3.5mm long, terminating in the upper part of the midlobe. *Column* with a short foot, clavate, truncate, up to 6.5mm long. *Fruit* ovoid, ridged, up to 1.5cm long.

Distribution and habitat. Western Himalayas of India, including Sikkim, and Nepal. Terrestrial, dappled shade and open meadows; 2500–4500m. Flowering in June and July.

Additional specimens examined. NEPAL. Tologaon [Marma], 15 vi 1965, *Stainton* 4939 (BM).
INDIA. Western Himalaya, Tehri-Garhwal, 16 vi 1961, *Rau* 15785 (K); Sikkim: Lachen Valley, 12 vi 1849, *Hooker* 213A (K-LINDL).

In his original description Lindley clearly stated that this plant has parallel membranous keels on the lip, and two distinct parallel lamellae can be seen in *Royle* s.n. (K-LINDL) from Mussorie. He also cited *J.D. Hooker* 213 (K) from Sikkim and stated that 'the only perfect flower' he could dissect had short, broad and acute keels. There are two sheets of this collection at Kew. The first (213A) consists of two plants, one a specimen of *O. micrantha* and the other a flowering inflorescence with a line drawing of a lip with two lamellae, presumably the flower dissected and described by Lindley. The other (213B) consists of four flowering inflorescences of between 18 and 22cm tall, one small section of a fruiting inflorescence and a fruiting plant 32cm tall. This sheet bears a drawing of a lip without a callus. The flowers that have been dissected lack a callus on the lip and correspond with the drawing on sheet 213B. This collection, therefore, differs from typical *O. foliosa* and is here referred to *O. foliosa* var. *indica*.

b. var. **indica** (Lindl.) N. Pearce & P. Cribb, **comb. et stat. nov. Fig. 8.**
Syn.: *Corallorhiza indica* Lindl. in J. Linn. Soc. Bot. 3: 26 (1859). Types: India, Western Himalaya, Simla, on Hattu, 5 viii 1847, *Thomson* 1724 (syn. K-LINDL!); Garwhal, *Edgeworth* 1844 (syn. K-LINDL!).
Oreorchis indica (Lindl.) Hook.f., Fl. Brit. Ind. 5: 709 (1890).

Plant terrestrial, up to 30cm tall. *Pseudobulb* corm-like, unifoliate at the apex, up to 1.3cm tall and wide. *Leaf* plicate, oblong-lanceolate, acuminate, up to 12cm long and 2.5cm wide; petiole up to 4cm long. *Scape* arising from the side of the pseudobulb, lower part enclosed by two tubular sheaths, up to 28cm tall; sheath up to 6cm

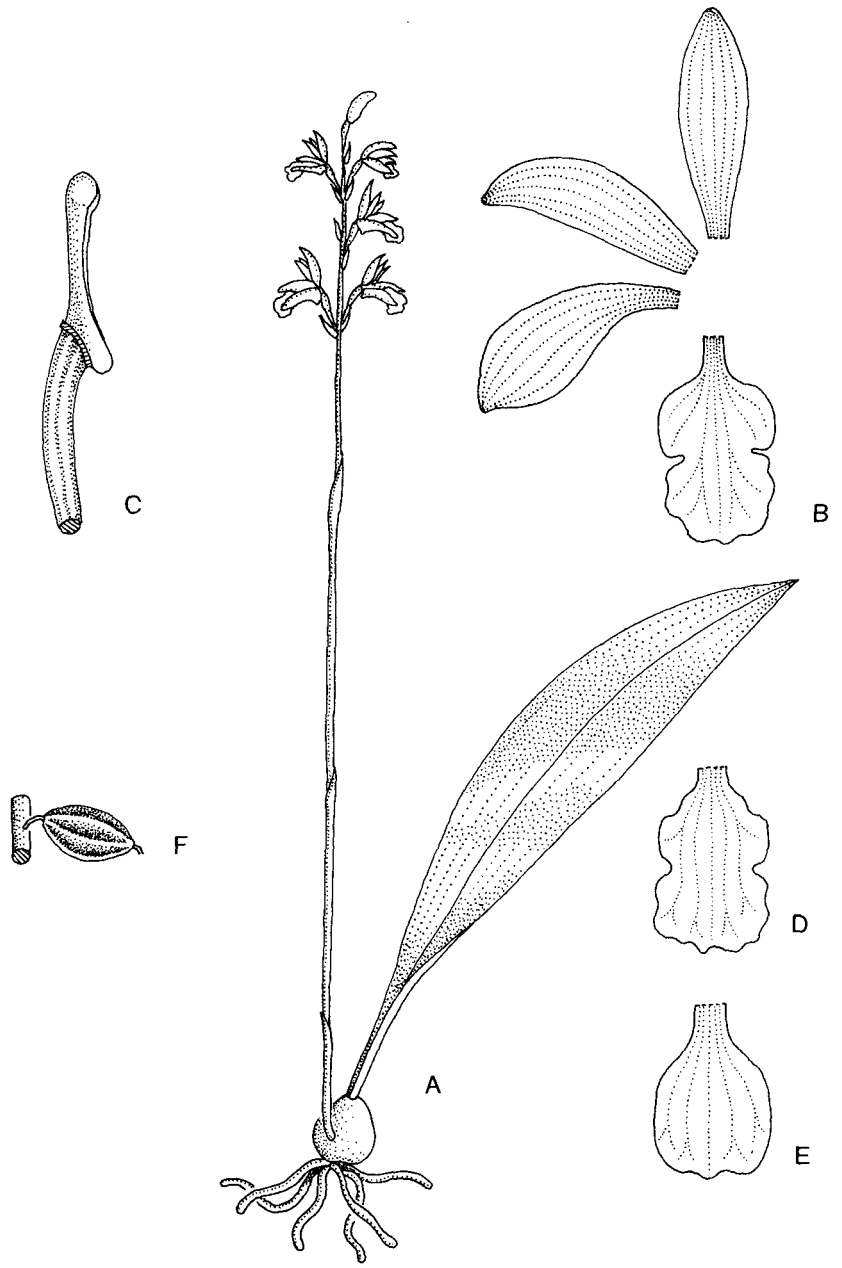

FIG. 8. *Oreorchis foliosa* var. *indica*. A, habit (×⅔); B, perianth dissected (×3); C, column (×3); D, lip (to show variation) (×3); E, lip (to show variation) (×3); F, fruit (×⅔). A–C from *Thomson* 1724; D from *Drummond* 22721; E–F from *Wilson* 4559.

long. *Inflorescence* laxly up to 7-flowered, racemose, up to 5cm long; floral bracts lanceolate, acuminate, up to 6mm long. *Flowers* up to 1cm long; purple to pink, blotched with reddish purple, lip white with purple spots; pedicel up to 13mm long. *Dorsal sepal* elliptic-obovate, acute, strongly veined, up to 10mm long and 3mm wide. *Lateral sepals* deflexed, elliptic-lanceolate, falcate, acute, strongly veined, up to 10mm long. *Petals* broad-elliptic, obtuse, falcate, strongly veined, up to 10mm long. *Lip* adnate to the column-foot, broadly 3-lobed to unlobed, clawed, strongly veined, up to 8.5mm long and 5.3mm wide across the lateral lobes; lateral lobes variable, broad, oblong obtuse to auricular or absent; midlobe suborbicular, up to 4mm wide, margins undulate, apex retuse; disc without a callus. *Column* with a short foot, arcuate, clavate, truncate, up to 7mm long. *Fruit* ovoid, ridged, pendent, up to 1.5cm long.

Distribution and habitat. China (Xizang, Yunnan & Sichuan), Bhutan, Nepal and Himalayan India. Terrestrial, dappled shade and open meadows; 2500–4500m. Flowering in June to August.

Additional specimens examined. CHINA. Sichuan: Tatsien-lu [Kangding], *Pratt* 19, 55 (BM, K); Tatsien-lu [Kangding], vii 1904, *Wilson* 4599 (AMES, BM, K); Yunnan, without exact locality, 1901, *Forrest* 167 (E); Xizang (Tibet): Yatung, 1897, *Hobson* s.n. (K); Migyi Tun, Tsari, 11 vii 1935, *Kingdon Ward* 11959 (BM); Tibet-Burma frontier, Adung Valley, *Kingdon Ward* 9596 (BM); Kongbo Province, Langong Chu Valley, 11 vi 1938, *Ludlow, Sherriff & Taylor* 5525 (BM); Kongbo Province, Tamnyen Chu, 19 vi 1938, *Ludlow, Sherriff & Taylor* 4878 (BM, E); Lantung, 1 vii 1903, *Younghusband* T29 (K).

BHUTAN. Sano Samp, 21 viii 1971, *Bedi* 805 (K); Bomthang, 23 vi 1969, *Bowes Lyon* 15084 (BM); 30 vi 1878, *Dungboo* 274 (K); Dochu La, 13 vi 1975, *Grierson & Long* 324 (E); Chendebi, near Trongsa, 5 vii 1933, *Ludlow & Sherriff* 234 (BM); Kohica, 14 vi 1949, *Ludlow, Sherriff & Hicks* 16553 (BM, E).

NEPAL. Dobato, Kathmandu, 26 vi 1973, *Grey-Wilson & Phillips* 153 (K); Inukhu Khola, 26 vi 1964, *D. McCosh* 292 (BM).

INDIA. Western Himalaya: Simla, vii 1885, *Collett* 214 (K); Kunawar, 1885, *J.R. Drummond* 22383 (K); Mussoorie, Jarhwal, Kidai Kantha, 12 vi 1904, *J.R. Drummond* 22721 (K); Garhwal, *Edgeworth* 1844 (K); Mashoba, Simla, 27 vi 1877, *J.S. Gamble* 4429A (K); Simla, Mahasu, 1878, *Gamble* 6251A (K); Himachal Pradesh, Manali, 6 vii 1986, *Kirkpatrick & McBeath* 1777 (E); Simla, on Hattu, 5 viii 1846, *T. Thomson* 1724 (K-LINDL); Narkanda Hill, 8 vii 1889, *Watt* 7909 (E); Sikkim: Lachen Valley, 11 vi, 17 vi, 30 viii 1849, *Hooker* 213B (K-LINDL); Lachen Valley, vii 1895, *Pantling* 399A (BM, K, P).

In 1890 J.D. Hooker (loc. cit.) transferred *Corallorhiza indica* Lindl. to *Oreorchis* and cited two specimens, *Thomson* 1724 (K-LINDL) and *Edgeworth* 1844 (K-LINDL). He described the plants as having a mentum, ear-shaped lateral lobes of the lip and a disc with a single raised median lamella. The first problem is that the Thomson specimen has no leaves and a lip without a callus, and the second that one flower of the Edgeworth specimen appears to have a median lamella although another flower examined from the same sheet lacks a lamella. This raises the question of whether or not the flower that Hooker saw and described had a lamellate callus.

It is probable that the lamella has arisen as an artifact from the pressing. Furthermore, no other collections have been found with a similar lamella.

Ever since Hooker's description of *O. indica* it has been confused in the literature with *O. foliosa*. Schlechter (1919) stated that *O. foliosa* had a mentum and a lip lacking a callus. King & Pantling (1898) described the disc of *O. foliosa* as lacking a callus, whereas Duthie (1906) described *O. indica* as having raised lamellae between the side lobes. Deva & Naithani (1986) discussed this confusion but were unable to resolve it.

It seems likely that Hooker's misleading description of this species has caused the confusion. We have redescribed it here based on the material available to Hooker and subsequent collections. It seems probable that *O. foliosa* var. *indica* is a variant of *O. foliosa*, the main difference being that *O. foliosa* var. *indica* has lost the lamellae on the disc and has a lip with reduced or absent lateral lobes. Forms in which the lip is more or less petaloid are often linked to self-pollination; this variety certainly appears to be self-pollinated, judging by the high fruit set.

9. Oreorchis intermedia Chien in Contrib. Biol. Lab. Sci. Soc. China. Bot. Ser. 6(3): 26 (1930). Type: China, Chekiang, E. Tienmu Shan, 18 v 1929, *K.K. Tsoong* 337 (holotype not located).

Plant terrestrial, up to 28cm tall. *Rhizome* creeping; roots simple, villose. *Pseudobulbs* obliquely elongate-pyriform, bifoliate at the apex, pale translucent, covered with a few fibres of the sheath. *Leaves* erect, linear-lanceolate, acuminate, base petioled, equitant, 2-sheathed, blade up to 22cm long and 0.9cm wide, sparsely puberulent, margin rough; petiole up to 4.7cm long. *Scape* lateral from the pseudobulb, slender, erect, 2-sheathed, glabrous, up to 21cm tall. *Inflorescence* short, densely many-flowered, up to 3cm long; bracts ovate-triangular, acuminate, 1-veined, up to 3mm long. *Flowers* small, white, somewhat purplish, up to 1cm long; pedicel slender, up to 4mm long. *Sepals* erect, 5-veined; dorsal sepal lanceolate, obtuse, up to 10mm long and 2.5mm wide; lateral sepals falcate-lanceolate, obtuse, oblique, purple-veined. *Petals* oblong, 5-veined, up to 10mm long and 2.5mm wide. *Lip* erect, unguiculate, oblong, 3-lobed, base subrotundate, crispate, up to 8mm long and 2mm wide; lateral lobes basal, linear, truncate, 1-veined, up to 4mm long and 0.5mm wide; midlobe oblique, margins ciliate with transparent hairs, purple spotted, up to 7mm long and 3mm wide; disc with two erect arched lamellae of up to 2mm long. *Column* slender, winged, up to 4mm long.

Distribution and habitat. China (Zhejiang) only. Endemic. Habitat not known. Flowering in May.

This plant was described by S.S. Chien (loc. cit.) in 1930 based on a plant collected by K.K. Tsoong at East Tienmu Shan in Zhejiang. It is related to *O. fargesii* and *O. subcapitata* differing in several minor features from both but having distinctive ciliate margins to the lip that has not been recorded from any other species. *Oreorchis subcapitata* has since been reduced to synonymy in *O. fargesii*. We have seen neither

the type nor any other material of this species and its exact status remains enigmatic. It was the first *Oreorchis* species to be recorded from eastern China.

10. Oreorchis micrantha Lindl. in J. Proc. Linn. Soc. 3: 27 (1859). Type: India, NW Himalayas, Kamaon, Yakul Mountains, *Thomson* 214 (holo. K-LINDL!). **Fig. 9.**
Syn.: *O. rolfei* Duthie in J. Asiat. Soc. Bengal 71: 38 (1902). Type: India, Western Himalayas, Thri-Garhwal, Nág Tiba, vi 1901, *Mackinnon's collector* s.n. (holo. CAL).

O. foliosa sensu Stewart, Fl. W. Pakistan: 73 (1972).

Plant terrestrial, up to 30cm tall. *Roots* fleshy, with fibrous strands. *Pseudobulb* corm-like, bifoliate at apex, up to 15mm long and wide. *Leaves* plicate, long-linear, acuminate, up to 28cm long and 7mm wide. *Scape* arising from the side of the pseudobulb, lower half enclosed by 1 or 2 tubular sheaths, up to 30cm tall; sheaths up to 9cm long. *Inflorescence* densely flowered, racemose. *Flowers* small, up to 6mm long; the sepals and petals pale yellow spotted with purple, the lip white spotted with purple. *Dorsal sepal* oblong-elliptic, acute, 5-nerved, up to 6mm long and 1.5mm wide. *Lateral sepals* elliptic-lanceolate, acute, 5-nerved, up to 5mm long and 2mm wide. *Petals* oblong-elliptic, acute, 5-nerved, up to 5.5mm long and 1.5mm wide. *Lip* adnate to the column-foot, 3-lobed, clawed, saccate at base, up to 5mm long and 2.5mm wide; lateral lobes long-linear, up to 2mm long; midlobe suborbicular to elliptic, up to 3.5mm long and 2.5mm wide; disc with an ovate to linear elevated channelled fleshy callus. *Column* extended into a foot, arcuate, truncate, up to 3mm long. *Fruit* pendulous, ridged, up to 1.5cm long and 6mm wide.

Distribution and habitat. China (Xizang), Bhutan, Nepal, Myanmar and Himalayan India. Terrestrial, in wet pine, oak and rhododendron forest; 2300–3100m. Flowering in June and July.

Additional specimens examined. CHINA. Xizang: locality not recorded, 26 vi 1913, *Kingdon Ward* 563 (E); Migyi Tun, Tsari, 11 vii 1935, *Kingdon Ward* 11960 (BM).

BHUTAN. Tongsa, Shingjakpa La, 17 vi 1969, *Bowes Lyon* 15071 (BM); Dukye Dzong, 11 vi 1975, *Grierson & Long* 237 (E); Chendebi, 30 vi 1937, *Ludlow & Sherriff* 3332 (BM); Gyasa Dzong, 12 vi 1949, *Ludlow, Sherriff & Hicks* 16509 (BM); Thimphu District, 12 vi 1988, *J.R.I. Wood* 6396 (E).

NEPAL. Chitery, 24 vi 1971, *Beer* 8212 (BM); Inukhu Khola, Dudh Khosi, 13 vi 1964, *Bowes Lyon* 2025 (BM); Kalopani, 3 vi 1971, *Colville Barclay & Synge* 2451 (K); Kalopani, 9 vi 1971, *Colville Barclay & Synge* 2654 (K); Buri Gardaki, 3 vii 1953, *Gardner* 1089 (BM); Shiar Khola, near Tumje, 22 vi 1953, *Gardner* 841 (BM); Phulchoke, 17 vi 1966, *Schilling* 848 (K); Gurjakhani, 31 v 1954, *Stainton, Sykes & Williams* 2911 (BM, E); Kali Gandaki, 16 vi 1954, *Stainton, Sykes & Williams* 1196 (BM, E); Tiringdham, 15 vi 1969, *Williams* 600 (BM).

MYANMAR (BURMA). Feng-shu-ling, 4 vi 1914, *Kingdon Ward* 1633 (E).

INDIA. Western Himalaya: Punjab, Simla, 1887, *Drummond* 20888 (K); Punjab, 1885, *Drummond* 22662 (K); Simla, Mashobra Forest, 27 vi 1877, *Gamble* s.n. (K); Simla, Mahasu, 1878, *J.S. Gamble* 6250A (K); location not recorded, *Jacquemont* 1033 (P); Simla, Mahasu, 15 vi 1916, *Rich* 236 (K); Kamaon, Yakhul Mountains, *Thomson* 214 (K-LINDL); Kamaon, Yakhul Mountains, v 1845, unnamed collector (K-LINDL); Assam Himalaya: Dirang Dzong,

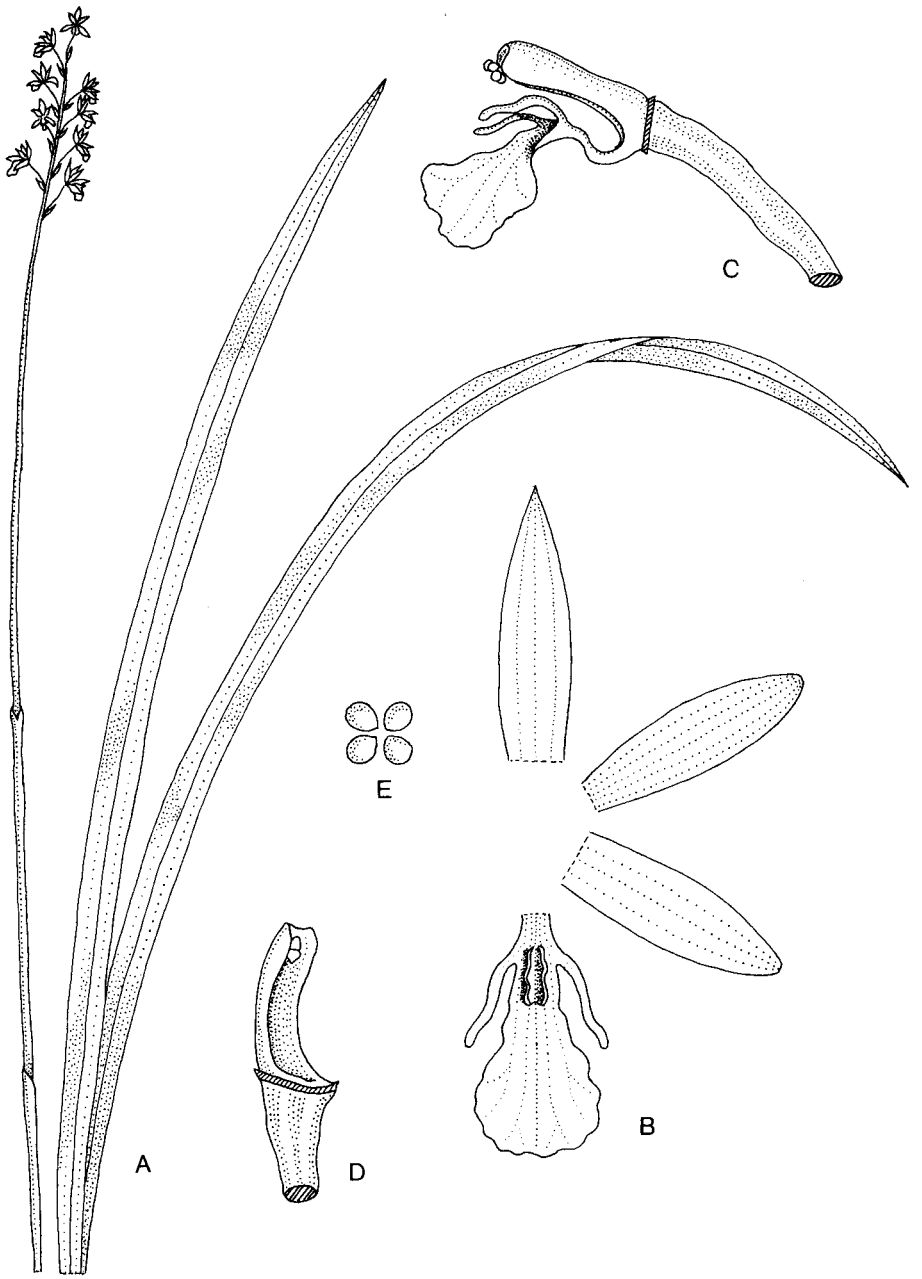

FIG. 9. *Oreorchis micrantha*. A, habit (×⅔); B, perianth dissected (×6); C, column and lip, from the side (×6); D, column, from the front (×6); E, pollinia (×12). All from *Thomson* 214.

18 vi 1938, *Kingdon Ward* 13804 (BM); Tha Chu Valley, 1 vii 1950, *Kingdon Ward* 19553 (BM); Simla, Narkanda, *Lace* 2159 (E); Darjeeling District, below Tiger Hill Summit, 5 vii 1992, *Long, McBeath, Noltie & Watson* 49 (E); Sikkim: Lachen Valley, vii 1895, *Pantling* 400 (BM, K, P); Lachen Valley, vi 1897, *Pantling* 399B (K).

John Lindley described this species in 1859 based on a specimen collected by T. Thomson from the Yakul Mountains in the Kamaon region of the NW Indian Himalayas. He stated that the habit was 'as *O. foliosa*; flowers not a ¼ the size; petals broader than sepals'. *O. micrantha* is distinct from *O. foliosa* in having two long linear leaves, smaller flowers and an oval elevated callus that is quite distinct.

Deva & Naithani (1986) discussed the conspecificity of *O. micrantha* and *O. rolfei*. The keels of the callus of *O. micrantha* are essentially parallel and those of *O. rolfei* arranged as an oval. However, there is a considerable variation in the callus orientation and examination of the type specimen of *O. micrantha* (*T. Thomson* 214, K) shows that the callus ridges form an oval rather than being parallel.

11. Oreorchis nana Schltr. in Act. Hort. Gothoburg. 1: 151 (1924). Type: China, N Szechwan [Sichuan], Huang-ling-ssü [Huang-long-si], 21 vii 1922, *H. Smith* 3345 (holo. UPS!). **Fig. 10F–H.**
Syn.: *Oreorchis nana* Rolfe ex Adamson in J. Bot. 51: 130 (1913) *nomen nudum.*

Terrestrial or lithophytic plant, very small, up to 10cm tall. *Pseudobulbs* ovoid-conical, irregular, up to 7mm long, unifoliate at the apex. *Leaf* erect, petiolate, plicate, elliptic-lanceolate, acuminate, base cuneate, lamina up to 3cm long and 1cm wide; petiole canaliculate, up to 2cm long. *Scape* erect, with 2 or 3 amplexicaul sheaths at base, glabrous. *Inflorescence* racemose, up to 7-flowered; bracts erect-patent, deltoid, acuminate; pedicellate ovary short, up to 4mm long. *Flowers* suberect, white. *Sepals* 3-nerved; dorsal sepal ligulate, narrowing towards the base, obtuse, up to 8mm long and 2mm wide; lateral sepals oblong-oblique, falcate, connivent at base to form a shallow mentum, up to 8mm long and 3mm wide. *Petals* 3-nerved, oblique, subfalcate-ligulate, up to 7mm long and 2mm wide. *Lip* without a claw, 3-lobed, obovate-spathulate, up to 7mm long; lateral lobes short, falcate, porrect; midlobe obovate, slightly undulate margin, up to 4.5mm long; disc with two raised lamellae towards the base, not extending as far as the re-entry angle of the lateral lobes. *Column* semi-terete, up to 3mm long.

Distribution and habitat. China: Sichuan, Hubei and Yunnan only. Terrestrial, on rocks; 2500–3500m. Flowering in June and July.

Additional specimens examined. CHINA. Sichuan: Tien-chuan-hsien, 14 vi 1936, *K.L. Chu* 2809 (E); Tatsien-lu [Kangding], 25 vi 1910, *Kingdon Ward* s.n. (CBG); Western Hubei: without exact loc., 7 vii 1902, *Wilson* 2352 (K, W); Yunnan: Lidjiang [Lijiang], *Handel-Mazzetti* 4485 (W).

Oreorchis nana was described by Schlechter in 1924 (loc. cit.) based on a specimen collected by Harry Smith from N Sichuan. It is one of the group of small *Oreorchis* species and is closely related to *O. oligantha.* Handel-Mazzetti (1936) and Lang

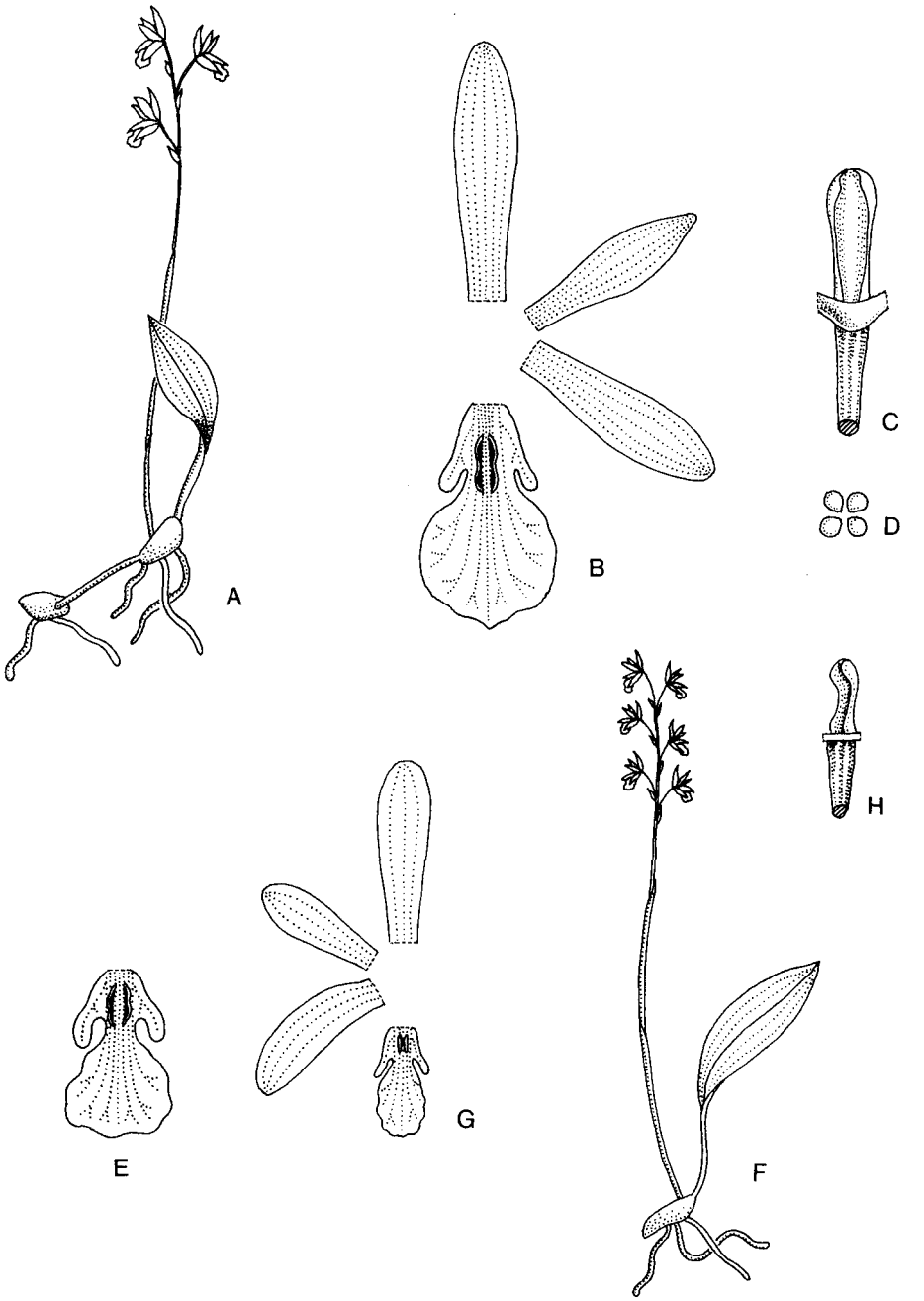

FIG. 10. *Oreorchis oligantha*. A, habit (×⅔); B, perianth dissected (×4); C, column (×4); D, pollinia (×10); E, lip (from the type of *O. rockii*) to show variation (×4). *O. nana*. F, habit (×⅔); G, perianth dissected (×4); H, column (×4). A–D from *Handel-Mazzetti* 6809; E from *Rock* 12744; F–H from *Wilson* 2352.

(1994) both reduced *O. oligantha* to the synonymy of *O. nana*. However, *O. nana* has an inflorescence usually of seven flowers which are significantly smaller than those in the three-flowered inflorescence of *O. oligantha*. Based upon detailed examination of the available herbarium material we treat these species here as distinct. Some herbarium material of *O. nana* has been misidentified as *O. parvula*, another small plant, causing more confusion. *O. parvula* is a larger plant, has a different leaf and larger perianth segments.

O. nana Rolfe ex Adamson is an earlier homonym for *O. nana* Schltr. but was published without a description and is therefore invalid. We have examined the specimen to which this name was given (*Kingdon Ward* s.n.), which is at CBG, and the plant clearly belongs to the same species as *O. nana* Schltr.

12. Oreorchis nepalensis N. Pearce & P. Cribb, **sp. nov.** e regione Tibetica meridionali atque Nepalensi *O. folioso* Lindl. habitu similis sed floribus maioribus sepalis petalisque 12.5–15.6mm longis, labello maiore 11–12 × 5–5.5mm callis duobus elevatis undulatis semilunatis instructo, columna longiore 8–8.5mm longa satis distincta. Typus: Nepal, Kali Gandaki, v 1971, *Colville Barclay & Synge* 2286 (holo. K!). **Fig. 11.**

Plant terrestrial, up to 40cm tall. *Pseudobulb* ovoid-conical to subquadrate, unifoliate at the apex, up to 2cm long and 1cm wide. *Leaf* plicate, lanceolate, acute, petiolate; leaf-blade up to 30cm long and 1.7cm wide, strongly veined; petiole up to 10cm long. *Scape* from the side of the pseudobulb, up to 35cm tall, enclosed by two sheaths; sheaths up to 12cm long. *Inflorescence* racemose, loosely to fairly densely about 20-flowered; bracts lanceolate, up to 5mm long. *Flowers* large, widely open, up to 1.5cm long and 1.5cm wide; the sepals and petals brown-green to yellow-green, the lip pale pink to white with violet spots; pedicellate ovary up to 1.2cm long. *Dorsal sepal* linear-lanceolate, subacute, 5-nerved, up to 15.6mm long and 3mm wide. *Lateral sepals* broadly lanceolate, subfalcate, acute, 5-nerved, up to 12mm long and 3mm wide. *Petals* ovate-lanceolate, obtuse, 5-nerved, up to 12.8mm long and 3mm wide. *Lip* longly unguiculate, 3-lobed, up to 11.6mm long and 5.3mm wide when spread, claw up to 1.2mm long; lateral lobes falcate, oblong, obtuse, up to 4.2mm long and 1.2mm wide; midlobe ovate-elliptic, margins undulate, up to 6mm wide; disc with two raised semi-lunar lamellae, situated centrally at the re-entry point of the lateral lobes, up to 2.6mm long and 1mm tall. *Column* clavate, with a short foot, up to 8.3mm long; anther-cap up to 1.3mm wide and 0.8mm tall.

Distribution and habitat. Nepal and China [S Xizang]. In shade among shrubs and open damp meadows; 2700–3100m. Flowering in May and June.

Additional specimens examined. CHINA. Xizang: Tsari Chu, Migytun, 23 v 1936, *Ludlow & Sherriff* 1665 (BM).

NEPAL. Malemchi Khola, 27 v 1962, *Bowes Lyon* 160 (BM); Kali Gandaki Valley, 27 v 1971, *Colville Barclay & Synge* 2286, 2287 (K); Kali Gandaki Valley, 4 vi 1954, *Stainton,*

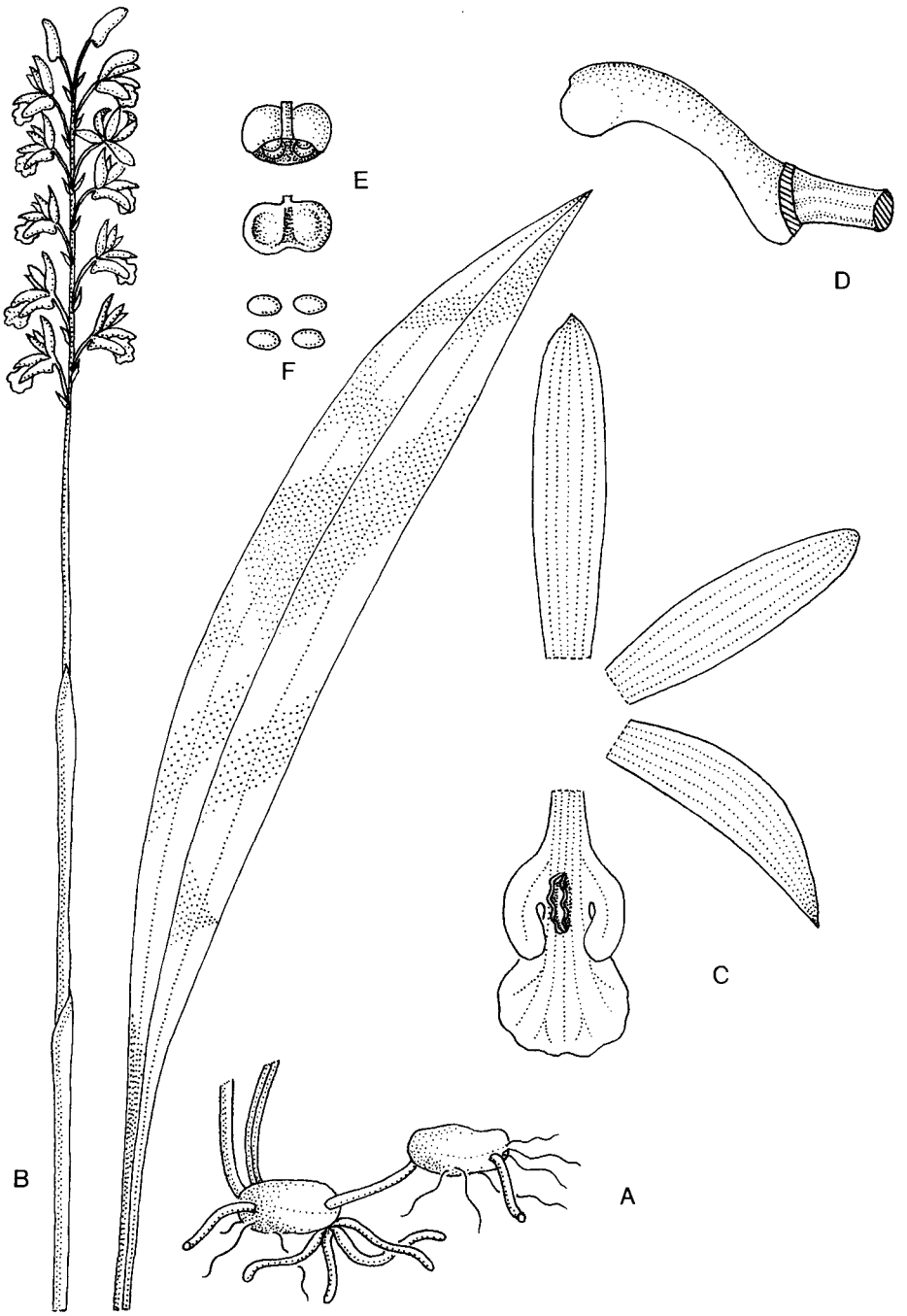

FIG. 11. *Oreorchis nepalensis*. A, pseudobulbs and root system (×⅔); B, habit (×⅔); C, perianth dissected (×3); D, column, from the side (×4); E, anther cap, two views (×8); F, pollinia (×8). A–D from *Colville Barclay & Synge* 2286; E–F from *Stainton, Sykes & Williams* 5390.

Sykes & Williams 5606 (BM, E, K, P); Kali Gandaki, 6 vi 1954, *Stainton, Sykes & Williams* 960 (BM, E); Ghar Chola, 22 v 1954, *Stainton, Sykes & Williams* 5390 (BM); Modi Khola, 22 v 1975, *J.D.A. Stainton* 7347 (BM); Gurjakhani, 31 v 1954, *Stainton, Sykes & Williams* 2910 (BM, E).

Oreorchis nepalensis is similar in habit to *O. foliosa* and *O. foliosa* var. *indica*. However, the species is clearly morphologically distinct, being the largest of all *Oreorchis* species with a leaf reaching 30cm long, and a lip 11–12 × 5–5.5mm whereas the lip of *O. foliosa* is about 7.5 × 3.5mm. The flowers appear similar to those of *O. foliosa* var. *indica* but are much larger and the lip has two raised undulate, semi-lunate lamellae. Based upon the herbarium material that we have examined, its distribution is confined to Nepal and southern Xizang.

13. Oreorchis oligantha Schltr. in Acta Hort. Gothoburg. 1: 152 (1924). Type: China, N Szechuan [Sichuan], Huang-ling-ssü [Huang-long-si], 21 vii 1922, *H. Smith* 3257 and 23 vii 1922, *H. Smith* 3658 (syntypes UPS!). **Fig. 10A–E.**
Syn.: *Oreorchis rockii* C. Schweinf. in J. Arnold Arbor. 10: 173 (1929). Type: China, C Kansu (Gansu), Lien-hoa-shan, 14–20 vii 1925, *J.F. Rock* 12744 (holo. AMES!, iso. K!).

Plant terrestrial, erect, slender, up to 16cm tall. *Pseudobulb* cylindrical to ovoid, unifoliate at the apex, up to 1cm long and 0.5cm wide; rhizome repent, up to 3cm between pseudobulbs, with fibrous, lanuginose roots. *Leaf* erect, slender-petioled, elliptic-lanceolate, acute, base cuneate, lamina up to 4cm long and 1cm wide; petiole up to 1.7cm long. *Scape* slender, erect, glabrous, with 3-tubular sheaths, up to 16cm tall. *Inflorescence* 1–3-flowered, loose; bracts minute, ovate-deltoid, subacute. *Flowers* purple, lip pale purple to white. *Sepals* subacute, 5-nerved; dorsal sepal oblanceolate-oblong, up to 15mm long and 2.2mm wide; lateral sepals subfalcate, lanceolate, up to 10mm long and 2.8mm wide, connivent at base to form a short mentum. *Petals* oblanceolate, falcate, obtuse, 5-nerved, up to 9mm long and 2mm wide. *Lip* recurved, 3-lobed, shortly clawed, base slightly saccate; lateral lobes upcurved, small, porrect, lanceolate-falcate, free portion up to 1.9mm long; midlobe obovate-spathulate, broadly rounded, minutely retuse, up to 6mm long and 5.8mm wide; disc with two semi-elliptic keels in centre near the base. *Column* arcuate, up to 6mm long; pollinia 4, complanate-ovoid.

Distribution and habitat. China: Yunnan, Sichuan, Gansu and Xizang. Alpine meadows and in woods; 3000–4000m. Flowering in June and July.

Additional specimens examined. CHINA. Sichuan: Sung pan [Songpan], 6 viii 1914, *Weigold* s.n. (W); Yunnan: Lijiang, Yulong Shan, Wutodi, 13 vi 1987, *Chamberlain, Grey-Wilson, Li, McBeath, Schilling, Xu & Yuan* 1379 (K); Chungtien [Zhongdian] Plateau, 6 vii 1939, *K.M. Feng* 1506 (AMES); Yulung-schan, Likiang [Lijiang], 18 vi 1915, *Handel-Mazzetti* 6809 (K, W); Xizang: Kongbo Province, Kulu Phu Cha, near Paka, 28 vii 1938, *Ludlow, Sherriff & Taylor* 5985 (BM); Kongbo, 21 vi 1947, *Ludlow, Sherriff & Elliot* 13961 (BM).

Oreorchis oligantha was described by Schlechter, based upon two collections made by Harry Smith in northern Sichuan. It is closely related to *O. nana* and some authors have considered them conspecific.

Charles Schweinfurth (loc. cit.) described *O. rockii*, based upon a specimen collected by Joseph Rock in Central Gansu. The type collection matches that of *O. oligantha*, so we follow Handel-Mazzetti (1936) and Lang (1994) in treating it as conspecific. Further consideration of the relationship between *O. oligantha* and *O. nana* can be found in the discussion under *O. nana*.

14. Oreorchis parvula Schltr. in Repert. Spec. Nov. Regni Veg. Beih. 10: 483 (1912). Type: China, Yunnan, Yen-tsé-hay, 7 vi 1888, *Delavay* 4335 (holo. P!, iso. K!). **Fig. 12.**

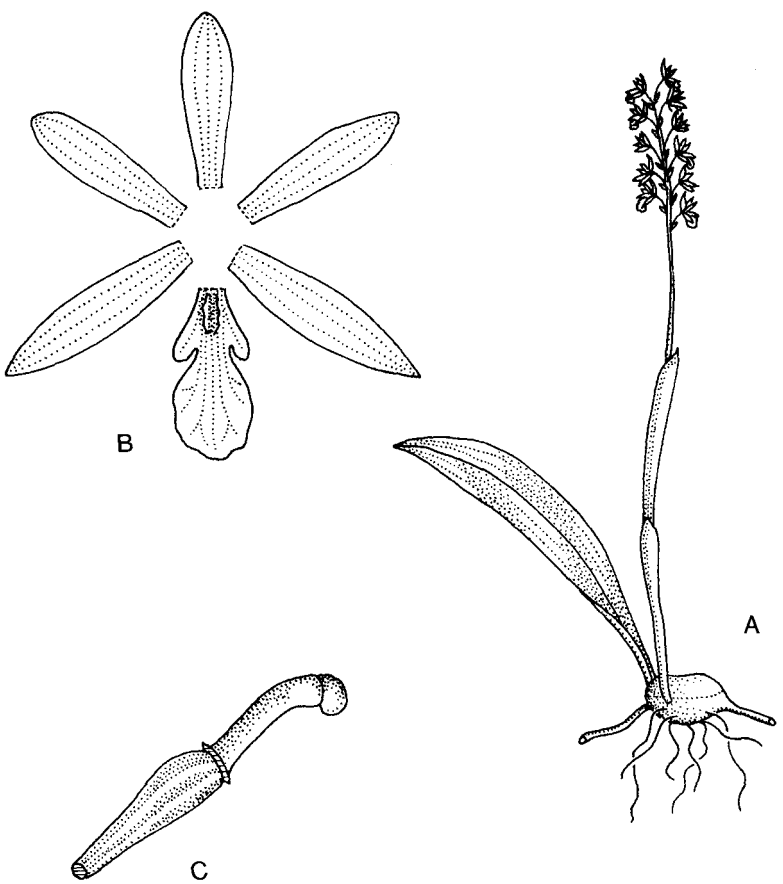

FIG. 12. *Oreorchis parvula*. A, habit (×⅔); B, perianth dissected (×6); C, column, from above (×6). All from *Delavay* 4335.

Plant terrestrial, erect, up to 16cm tall. *Roots* filiform, flexuous, elongate, papillose. *Pseudobulbs* corm-like, thickened, unifoliate at the apex, up to 1.5cm tall and 1cm wide. *Leaf* elliptic-lanceolate, subacute, gradually tapering to a short petiole, lamina up to 10cm long and 2cm wide; petiole up to 3.5cm long. *Scape* upright, terete, glabrous, sheathed at base, up to 16cm tall; sheaths 3 or 4, up to 2cm long. *Inflorescence* racemose, 8- to 15-flowered; bracts ovate-lanceolate. *Flowers* erect, the sepals and petals olive-green to golden yellow, the lip cream with bright purple spots. *Dorsal sepal* lanceolate to ligulate, falcate, obtuse, 3-nerved, glabrous, up to 5.5mm long and 1.5mm wide. *Lateral sepals* lanceolate, obtuse, subfalcate, 3-nerved, up to 6mm long and 2mm wide. *Petals* lanceolate-ligulate, subfalcate, 3-nerved, up to 4mm long and 1.5mm wide. *Lip* shortly unguiculate, 3-lobed, up to 5mm long; lateral lobes short, ligulate-falcate, obtuse, porrect; midlobe ovate-spathulate, margin slightly undulate, up to 2mm wide; disc with two upright longitudinal lamellae extending into the midlobe. *Column* clavate, glabrous, up to 3mm long. *Fruit* ovoid, ridged, brownish yellow, 5–8mm long.

Distribution and habitat. China: NW Yunnan and Sichuan. In shade in *Picea* and *Rhododendron* forest and in open pasture; 3000–3500m. Flowering in June and July.

Additional specimens examined. CHINA. Yunnan: Tsang-yang-tchang, 7 vi 1888, *Delavay* 3533 (P); Pi-iou-sé, 11 vi 1888, *Delavay* s.n. (P); Mo-so-yin, 17 vii 1889, *Delavay* 3986 (K); SE Chungtien [Zhongdian], 25 v 1939, *K.M. Feng* 1034 (AMES); Lijiang, *Forrest* 2288 (E); Atuntze [Deqen], Dokerla, 8 xi 1937, *T.T. Yü* 7929 (AMES, BM); Chungtien [Zhongdian], Chiren, 25 x 1937, *T.T. Yü* 13872 (BM); SW Sichuan: Ma-pien Hsien, 26 v 1931, *F.T. Wang* 22936 (AMES).

Schlechter described this species based upon a specimen collected by Abbé Delavay in Yunnan. Morphologically, *O. parvula* is most closely related to *O. erythrochrysea*; indeed, some herbarium material has been misidentified as such. Schlechter (1919) commented that its 'habit resembles *O. indica*' but it is smaller and has two separate parallel lamellae at the base of the lip.

O. parvula is a very small plant, never exceeding 16cm in height. Both *O. erythrochrysea* and *O. foliosa* var. *indica* (which was the plant referred to by Schlechter) are larger. *Oreorchis parvula* also differs morphologically from *O. erythrochrysea* in having two distinct longitudinal lamellae at the base of the lip. *Oreorchis foliosa* var. *indica* has no callus on the lip. *Oreorchis parvula* is confined to NW Yunnan and S Sichuan in western China.

15. Oreorchis patens (Lindl.) Lindl. in J. Proc. Linn. Soc. Bot. 3: 27 (1859). Type: Siberia, 1826, *J. Prescott* s.n. (holo. K-LINDL!).
Syn.: *Corallorhiza patens* Lindl., Gen. Sp. Orch. Pl.: 535 (1840).

a. var. **patens. Fig. 13.**
Syn.: *Oreorchis lancifolia* A. Gray in Mem. Amer. Acad. Arts n.s. 6: 410 (1858–59).
Type: Japan, Hakodate, 12 vi 1853, *Wright* s.n. (holo. GH!; iso. AMES!, K!, P!).
O. wilsonii Rolfe ex Adamson in J. Bot. 51: 130 (1913) *nomen nudum.*

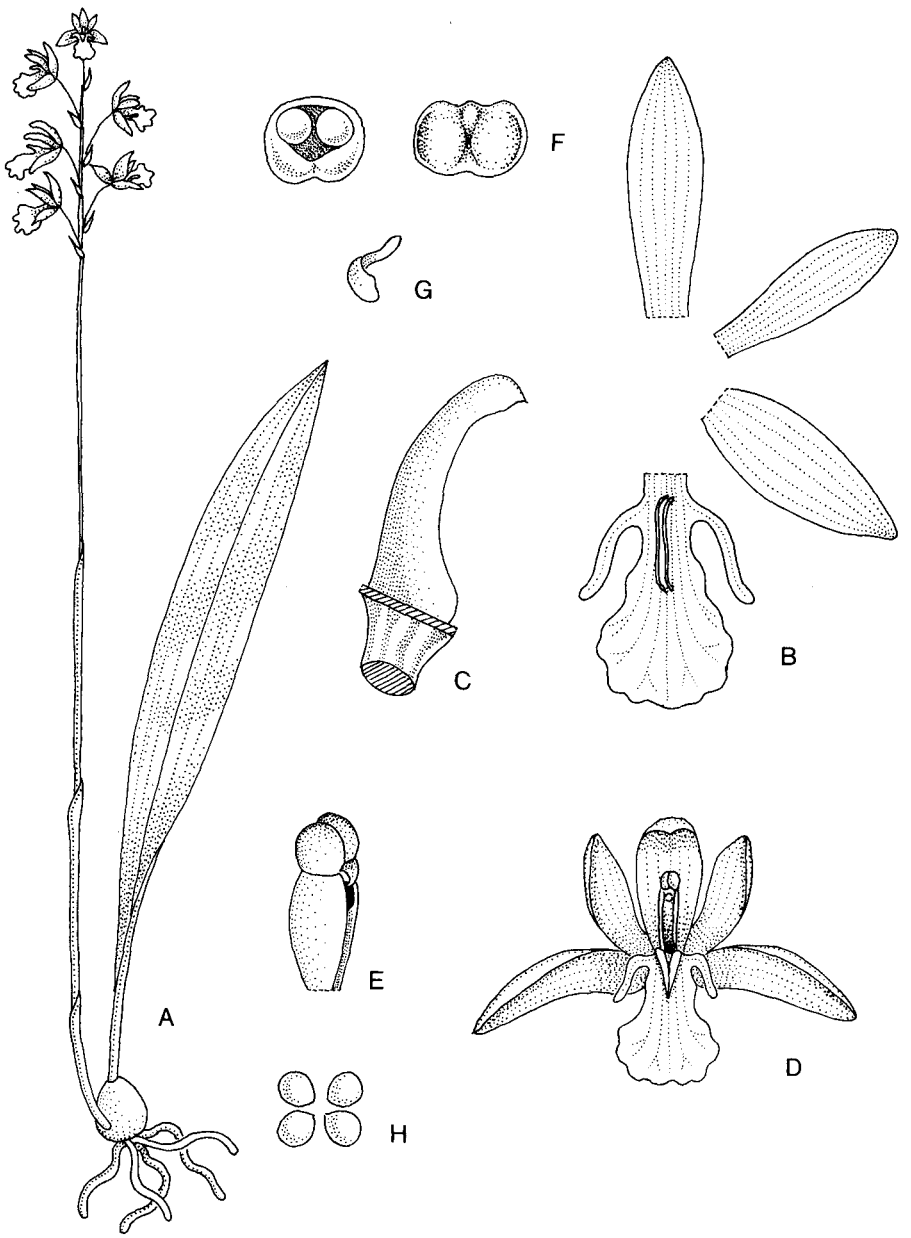

FIG. 13. *Oreorchis patens* var. *patens*. A, habit (×⅔); B, perianth dissected (×4); C, column (×6); D, flower (×4); E, column apex (×6); F, anther cap, two views (×12); G, stipe (×12); H, pollinia (×12). A–C from *Prescott* s.n.; D–H from *Perner* s.n.

O. setschuanica Ames & Schltr. in Repert. Spec. Nov. Regni Veg. Beih. 4: 65 (1919). Type: China, Western Szechuan [Sichuan], Pan-lan-schan, Kuan Hsien, vi 1908, *Wilson* 1771 (holo. AMES!).

O. yunnanensis Schltr. in Repert. Spec. Nov. Regni Veg. Beih. 17: 68 (1921). Type: China, Yunnan, *Maire* s.n. (holo. B†).

O. patens var. *confluens* Hand.-Mazz., Symbolae Sinicae 7: 1353, t. 42 (1936). Type: China, E Yunnan, 11 vi 1917, *Handel-Mazzetti* 10217 (holo. W!).

Plant terrestrial, up to 40cm tall. *Pseudobulbs* corm-like, uni- to bifoliate at apex, up to 10mm tall and 8mm wide. *Leaf* petiolate, plicate, lanceolate, acuminate, up to 35cm long and 2.5cm wide; petiole up to 3.8cm long. *Scape* arising from side of pseudobulb, green, enclosed by tubular sheaths; sheaths up to 4cm long. *Inflorescence* loosely up to 20-flowered, racemose. *Flowers* small, up to 8mm long and 12mm wide; the sepals and petals yellow, the petals with purple spots, the lip white with a few purple spots, the column white; pedicel filiform, up to 11mm long; floral bracts up to 5mm long. *Dorsal sepal* oblong-lanceolate, acute, 3–5-veined, up to 8.5mm long and 2.5mm wide. *Lateral sepals* subfalcate, elliptic-lanceolate, acute, 3–5-veined, up to 8.5mm long and 3.5mm wide. *Petals* oblong-lanceolate, 3–5-veined, up to 7.8mm long and 2.5mm wide. *Lip* three-lobed, adnate to the column-foot, saccate at base, unguiculate, up to 8.5mm long and 5.5mm wide when spread; lateral lobes linear, obtuse; midlobe flabellate, up to 5.8mm at widest point when spread, margins sinuate; disc with two longitudinal lamellae, up to 3.5mm long. *Column* extended into a short foot, clavate, up to 5mm long; anther apical; stipe hamular, J-shaped, up to 0.7mm long in natural position.

Distribution and habitat. Russia (Siberia), S Korea, Japan and China. Woodland; 1000–2900m. Flowering in June and July.

Additional specimens examined. RUSSIA. Siberia: Vladivostock Peninsula, 9 vi 1994, *Perner* s.n. (K).

S KOREA. Locality not recorded, 24 vi 1906, *Faurie* 234 (E); Kwangnung, Kyonggi-Do, 24 v 1949, *Yongsok* 6532 (E).

JAPAN. Shinano, 27 v 1880, *Bisset* 2495 (BM, E); Aomori, 18 vi 1886, *Faurie* 645 (P); location not recorded, vii 1887, *Faurie* 653 (K, P); Sado, 30 vi 1888, *Faurie* 2486, 2487 (P); Yesan, 12 vi 1889, *Faurie* 4026 (K, P); Irranai, 6 vi 1891, *Faurie* 7056 (K, P); Sapporo, 11 vi 1891, *Faurie* 7127 (P); Toya, 23–25 vi 1893, *Faurie* 10155 (K, P); location not recorded, 26 vi 1905, *Faurie* 7161 (BM); 9 v 1937, *Greatrex* H2320/51 (K); Hakodaki, 1860, *P. Hodgson* s.n. (K); Hakodate, Kumuga-take, 1861, *Maximowicz* 13390 (BM, K); Honshu: Shizuoka Pref., Umegashima-mura, 18 vi 1979, *Ohashi & Murata* 1822 (WAG); Sapporo, 6 viii 1921, *Takeda* s.n. (K) & 13 vi 1908, *Takeda* s.n. (E).

CHINA. Shenyang: Shenyang, 19 vi 1895, *Komaròv* 461 (K, P); Mukden [Shenyang], Lao-Yeh Ling Hills, 1886, *Komaròv* s.n. (K); Sichuan: Tatsien-lu [Kangding], 1923, *Cunningham* 177 (E); Tchen-kéou-tin, *R.P. Farges* s.n. (P); Tatsien-lu [Kangding], 26 vi 1910, *Kingdon Ward* s.n. (CBG); Kiala, Tatsien-lu [Kangding], 1893, *Soulié* 807 (P); Tatsien-lou [Kangding], *Soulié* s.n. (P); Tatsien-lu [Kangding], vii 1903, *Wilson* 4600 (BM, K, P); Yunnan: 17 vii 1889, *Delavay* 3986 (K, P); Mo-so-yu, 17 vii 1889, *Delavay* 3811 (P); Lijiang, vi 1910, *Forrest* 5820 (E); without exact locality, vi 1906, *Forrest* 2472 (E).

Lindley described this species in 1840 based on a plant, collected in Siberia, that he had received from J. Prescott. It resembled *Corallorhiza* in its floral structure but had a leaf. He remained uncertain whether it correctly belonged in that genus and,

later, transferred it to his new genus *Oreorchis*. It is fairly widely distributed, being found in south-eastern Siberia, Manchuria, Yunnan, Sichuan and Japan. One feature common to all the mainland plants is the presence of a single leaf. The Japanese plants, however, have one or two leaves and have been the subject of considerable confusion over the years.

Oreorchis lancifolia was described by Asa Gray in 1858–59 based upon a specimen from Hakodate in Japan collected by C. Wright. We have examined the type specimens (AMES, K, P) and they are all indistinguishable from *O. patens*.

The name *O. wilsonii* was published in 1913 without a description. We have examined the sheet from CBG upon which the name was based and it is clearly *O. patens* and has been included here as a synonym.

O. setschuanica was described by Ames & Schlechter in 1919 (loc. cit.) based upon a specimen collected by E.H. Wilson from Pan-lan-schan in western Sichuan. Schlechter (1919) commented that this species was closest to *O. patens* but due to the shape of the central lobe of the lip and of the column it was certainly a different species. We disagree, having examined the type specimen from AMES, and consider it synonymous with *O. patens*.

O. yunnanensis was described by Schlechter in 1921 based upon a specimen from Yunnan collected by E.E. Maire who was the Pro Vicar Apostolic of Yunnan and collected there between 1905 and 1916. The original description compares it with *O. setschuanica*, distinguishing it on minor differences between sepal and petal size and lip shape. As neither the type, which is probably destroyed, nor any other specimens have been located it is difficult to be certain about the exact nature of this taxon, but from its description, distribution and provenance we consider it probably synonymous with *O. patens*.

O. patens var. *confluens* was described by Handel-Mazzetti in 1936 based on a specimen he collected in Yunnan. He stated that it differed from the typical form of *O. patens* in having a lip with convergent keels joined at the apex. We have not been able to locate the type specimen nor any other material and suspect that the convergence of the two lamellae represents no more than a local variation from the typical form and here treat them as synonymous.

Lang (1994) also treats these four species as synonyms of *O. patens*.

b. var. **gracilis** (Franch. & Sav.) Makino ex Schltr. in Repert. Spec. Nov. Regni Veg. Beih. 4: 223 (1919). Type: Japan, Sikock, v 1875, *Rein* 3518 (holo. P!). **Fig. 14.**

Syn.: *Oreorchis gracilis* Franch. & Sav., Enum. Pl. Jap. 2: 27, 512 (1879).

Oreorchis gracilis var. *gracillima* Hayata, Icon. Pl. Form. 2: 141 (1912), **syn. nov.** Type: Taiwan, Rontabunzan, 29 iv 1914, *U. Mori* s.n. (holo. TI!).

O. gracillima (Hayata) Schltr. in Repert. Spec. Nov. Regni Veg. Beih. 4: 223 (1919), **syn. nov.**

O. patens var. *gracillima* (Hayata) S.S. Ying in Quart. J. Chin. Forest. 21(2): 116 (1988), **syn. nov.**

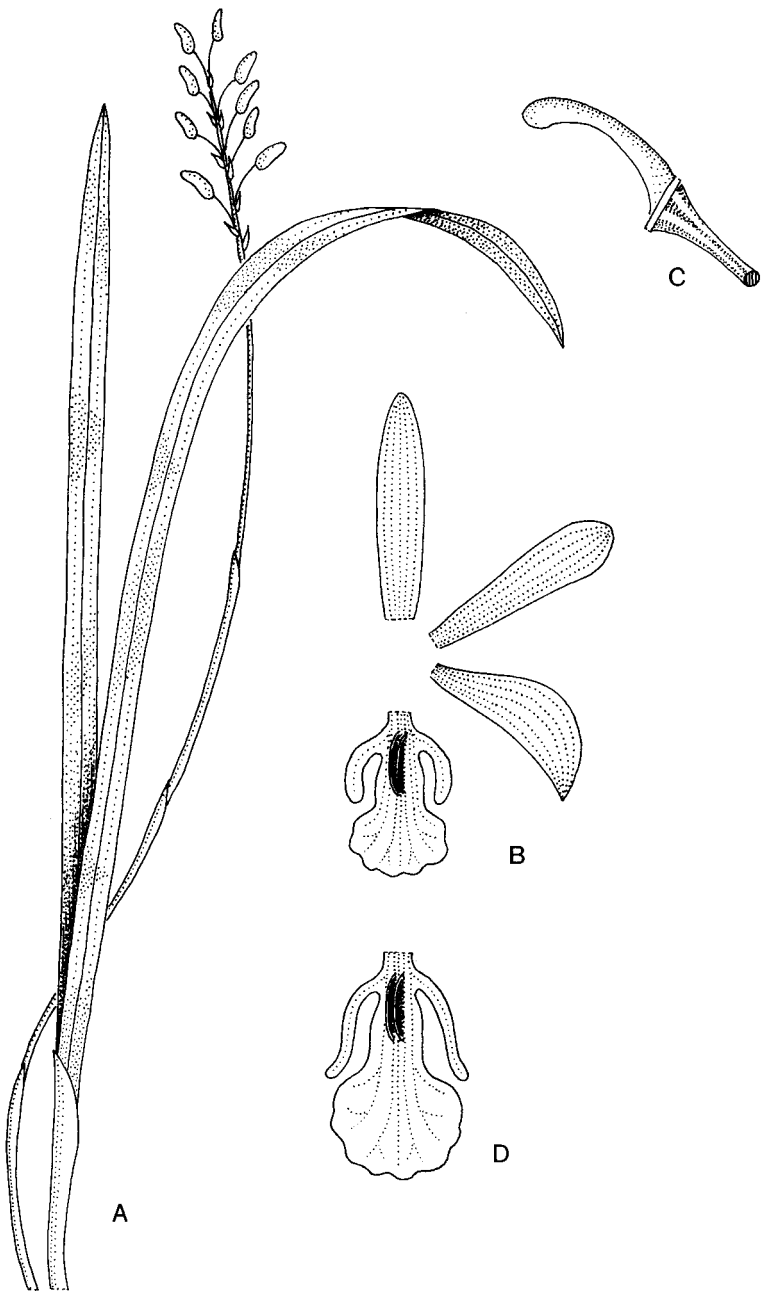

FIG. 14. *Oreorchis patens* var. *gracilis*. A, habit (×⅔); B, perianth dissected (×4); C, column (×6); D, lip (to show variation) (×4). A–C from *Rein* 3518; D from *Faurie* 418.

Plant terrestrial, up to 38cm tall. *Pseudobulb* ovoid-conical, bifoliate at the apex, partially covered with scarious sheaths, up to 1.6cm tall and 1cm wide. *Leaves* plicate, lanceolate to linear-lanceolate, acute, up to 38cm long and 2cm wide; petiole up to 8cm long. *Scape* lateral from the pseudobulb, lower part covered by 2 or 3 tubular sheaths; sheaths lax, membranaceous. *Inflorescence* racemose, laxly up to 15-flowered; floral bracts lanceolate, acute, up to 6mm long and 4mm wide. *Flowers* yellowish brown, widely opening, up to 1cm in diameter; pedicellate ovary up to 1.1cm long. *Dorsal sepal* oblong-lanceolate, obtuse, 3-nerved, up to 8.5mm long and 1.5mm wide. Lateral sepals broadly falcate, lanceolate, acute, 5-nerved, up to 6.5mm long and 2mm wide. *Petals* falcate, lanceolate, tapering to a subacute apex, 5-nerved, up to 7mm long and 1.6mm wide. *Lip* 3-lobed, base cuneate, up to 7mm long; lateral lobes oblong, curved downwards, up to 2.5mm long and 0.8mm wide; midlobe cuneate-obovate, rounded at apex, emarginate, undulate, up to 3mm wide when spread; disc with two raised keeled carinae extending below the re-entry point of the lateral lobes. *Column* arcuate, up to 4mm long.

Distribution and habitat. Japan and Taiwan. Woodland; 1000–2900m. Flowering in late April, May, June and early July.

Additional specimens examined. JAPAN. Mori, 8 vi 1887, *Faurie* 418 (K, P); Shibecha, vi 1890, *Faurie* 5448 (P); Yesan, 9 vii 1892, *Faurie* 8037 (P); Mayashine, 14 vi 1894, *Faurie* 13139 (P); Takaya, 24 vi 1904, *Faurie* 5656 (BM, W); Kitami, Hokkaido, Saroma-choo Tokoro-gun, 8 vii 1975, *M. Furuse* 9045 (K); Hakodate, Kimuna-ga-take, 1861, *Maximowicz* s.n. (P); Mino, Ena, Natatsu, *Nibino* 6196 (AMES); Mino, Sujo, Nakuno, *Shiota* 2233 (AMES); Mino, Sujo, Mount Ohigatake, *K. Shiota* 6611 (AMES); Nanokawa, Tosa, Sikock, 5 v 1896, *K. Watanabe* s.n. (K); Nanokaura, Tosa, 10 v 1889, unnamed collector s.n. (K).

TAIWAN. Rontabuzan, *B. Hayata* s.n. (TI).

Oreorchis gracilis was first described by the French botanists Franchet and Savatier in 1879 based on a specimen collected from Sikock in Japan. The type specimen, which is in Paris, has long-linear leaves, a fairly compact inflorescence and a lip that is similar to that of *O. patens*. In 1912, Hayata described *O. gracilis* var. *gracillima*, based on a specimen collected by Mori from Rontabunzan, in Taiwan. This variety differed from the typical one in having smaller flowers, a less wrinkled tip to the lip and narrower leaves with long attenuate petioles. Schlechter (1919) raised *O. gracilis* var. *gracillima* to species rank as *O. gracillima* and reduced *O. gracilis* to a varietal status in *O. patens*. Finally, Ying (1988) included both *O. gracilis* var. *gracillima* and *O. gracillima* together in the synonymy of *O. patens* var. *gracillima*.

Having examined the available herbarium material of *O. patens*, *O. gracilis* and its var. *gracillima* carefully it has proved to be impossible to distinguish these taxa based upon floral morphology alone. They form a variable and diverse group ranging in size from 21cm up to nearly 50cm tall with variable leaf shape and size ranging from lanceolate to linear-lanceolate and from 9cm to 28cm long. The only truly distinguishing factor is the number of leaves. We have therefore retained the name *O. patens* for those plants that have a single leaf and *O. patens* var. *gracilis* for the Japanese and Taiwanese plants with two leaves.

16. Oreorchis porphyranthes Tuyama in J. Jap. Bot. 50(3): 69 (1975). Type: Central Nepal, 7 vi 1954, *Stainton, Sykes & Williams* 3048 (holo. BM!, iso. E!). **Fig. 15.**

Plant terrestrial, up to 33.5cm tall. *Pseudobulbs* ovoid, at or just under the surface of the ground, unifoliate at the apex, up to 1.8cm wide. *Leaf* plicate, lanceolate, gradually tapering to apex, up to 16cm long and 1.8cm wide. *Scape* erect with 2 or

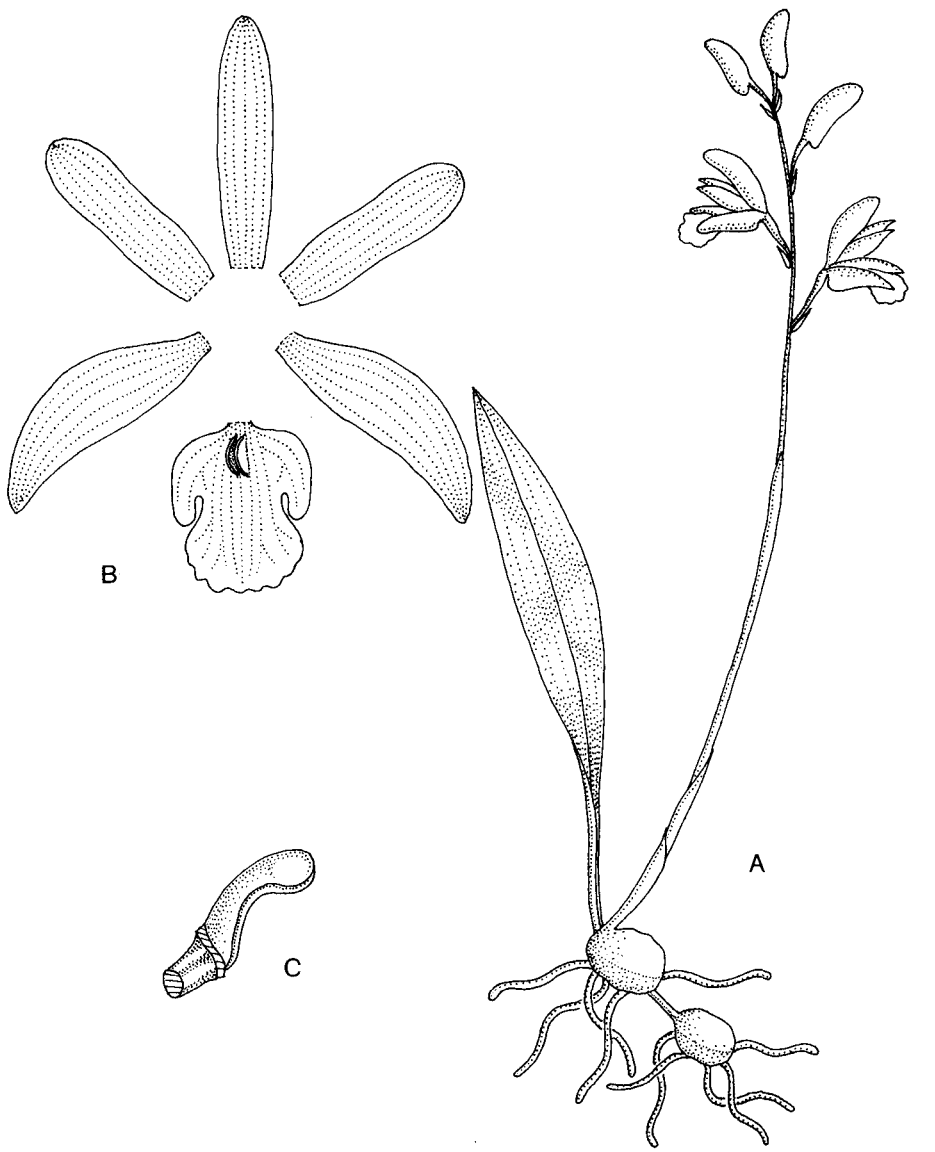

FIG. 15. *Oreorchis porphyranthes*. A, habit (×⅔); B, perianth dissected (×2); C, column (×2). All from *Stainton, Sykes & Williams* 3048.

3 sheaths; sheaths cylindrical, amplexicaul, up to 4.4cm long. *Inflorescence* racemose, laxly 2–5-flowered; floral bracts erect-patent. *Flowers* arcuate, patent, sepals and petals variable but usually deep purple, lip paler, up to 1.8cm long and 1.8cm wide; pedicel up to 1.3cm long. *Dorsal sepal* oblong-linear, mildly convex, 7-nerved, up to 18mm long and 4.5mm wide. *Lateral sepals* oblong, apex obtuse to acute, 7-nerved, up to 15mm long and 5mm wide. *Petals* oblanceolate, up to 16mm long and 4.8mm wide. *Lip* shortly ovate-oblong, 3-lobed, up to 11mm long and 9mm wide when spread; lateral lobes oblong-oblique, apex rounded; midlobe broadly ovate, margins undulate; disc with two raised lamellae. *Column* arcuate, up to 10mm long.

Distribution and habitat. Nepal. In dappled shade in mixed woodland; 3000–3700m. Flowering in late May and June.

Additional specimens examined. NEPAL. Sringi Himalaya: Shiar Khola, 27 v 1953, *Gardner* 602 (BM); Sabze Khola, 15 vi 1950, *Lowndes* 1014 (BM, E paratypes); Tukucha, Kali Gandaki, 16 vi 1954, *Stainton, Sykes & Williams* 1172 (BM paratype).

Oreorchis porphyranthes was described by Tuyama (1975) based upon a specimen collected by Stainton, Sykes and Williams in Central Nepal. It is sympatric with *O. foliosa* var. *indica* and *O. nepalensis* but is unlike any other *Oreorchis* species. It differs from *O. foliosa* var. *indica* in having larger, deep purple flowers with a lip that is shorter than the petals and sepals and two distinct lamellae on the disc, and from *O. nepalensis* in its few-flowered inflorescence, deep purple flowers and a differently shaped lip.

EXCLUDED SPECIES

1. Aplectrum unguiculata (Finet) F. Maek., Wild Orchids of Japan in Colour: 380, t. 153 (1971). Type: Japan, Sapporo, vi 1892, *Faurie* 8093 (holo. P!).
Syn.: *Oreorchis unguiculata* Finet in Bull. Soc. Bot. Fr. 43: 698 (1896).
Cremastra unguiculata (Finet) Finet in Bull. Soc. Bot. Fr. 44: 235 (1897).

When Finet described this plant first in 1896 as *Oreorchis unguiculata* he was unsure about its status and transferred it to *Cremastra* the following year. Maekawa (1971) transferred it to *Aplectrum*. We have examined the type from Paris and it is clearly not an *Oreorchis*.

2. Tainia laxiflora Ito ex Makino in Bot. Mag. Tokyo 23: 138 (1909). Type: Liukiu, Kunchan, iii 1887, *Y. Tashiro* s.n. (holo. TIU).
Syn.: *Oreorchis laxiflora* Ito ex Makino in Bot. Mag. Tokyo 23: 138 (1909) *nomen nudum.*
Calanthe laxiflora Makino in Matsmura, Ind. Pl. Jap. 2: 237 (1905) *nomen nudum.*

This species was first published as *Tainia laxiflora* with *Oreorchis* included as a synonym by Makino (loc. cit.). It has eight pollinia typical of *Tainia* and there is no question of its confusion with *Oreorchis*.

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