



Newly discovered native orchids of Taiwan (XIII)

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ABSTRACT: This report presents two new orchids of Taiwan, i.e., *Cheirostylis octodactyla* f. *cymbiformes* and *Gastrodia rubinea*. *Lecanorchis bihuensis* is revised and emended with new information.

KEY WORDS: *Cheirostylis octodactyla* f. *cymbiformes*; *Gastrodia rubinea*; *Lecanorchis multiflora* var. *bihuensis*; Orchidaceae; Taiwan.

INTRODUCTION

The present paper is a continuation of efforts to update the orchid flora of Taiwan. A complete list of native orchids of Taiwan and their type information were recently published (Lin *et al.*, 2016). However, the emergence of newly discovered orchids from different locations has continued due to ongoing orchid hunting activities. A recent field trip resulted in the discovery of two new orchids in Taiwan. Moreover, the rediscovery of a long missing species *Lecanorchis bihuensis* revealed new information about the relationship between this orchid and *L. multiflora*.

TAXONOMIC TREATMENT

New species found in Taiwan

Gastrodia rubinea T.P. Lin, *sp. nov.*

紅寶石赤箭 Figs. 1 & 3A-D

Holotype: Taiwan: Nantou Co. Zhongliao Township, 300 m, Jun. 7, 2018, *Po-Neng Shen s.n.* (TAI287421).

Mycoheterophytic orchid. Roots 3~5, slender, arising from apex of rootstock. Tuberosities fusiform, often 2~4.5 cm long, 0.5~0.9 cm in diam., brownish. Flowering plants 4~6 cm aboveground; peduncle whitish, with 3 or 4 sheath-bracts, 3 mm in diam. near base; sheath-bract membranous, tubular, brownish; rachis <5 mm long, 1~4-flowered. Floral bracts membranous, triangular, dark-brownish, 3~4 mm long, 3.8 mm wide. Pedicel and ovary whitish, 5 mm long. Flowers globular to ellipsoid, 8~10 mm long, 7~9 mm across, only slightly opening, perianth tube ca. 1.5 cm across when dissected and spread out; sepals united for 70% of their length, succulent, outer surface flesh-colored or yellowish-pink, verrucose; free portion of perianth tube ovate-triangular, reddish-brown or dark-brown; lateral sepal longitudinally ridged; free portions of petals orangish, spreading, ca. 1.5 mm long, apex rounded; inner surface

of perianth tube glabrous, whitish, decorated with a large dark-reddish-brown area just below apex of lateral sepals, dark-reddish-brown also occurring in a small area just below apex of upper sepal and petals; colored area often wrinkled and slightly or not thickened. Lip ovate to ovate-triangular, apex rounded, yellowish-green, dark-reddish-brown near apex, 5.3 (claw included) or 4.2 (not including claw) mm long, 3.5 mm wide near base, no clear ridge on upper surface, shallowly grooved especially near base, narrowly grooved along midrib abaxially, with 2 distinct gem-like calli near apex; calli retrorse, red or dark-red, ellipsoid when viewed from above, rounded at proximal end, ridged at distal end; claw short, with 2 relatively small brownish-green calli. Column white, more or less compressed, reddish-brown along margin wings, straight, 5.5~6 mm long, 2 mm across, with a pair of stelia, stelia taller than anther; column-foot short. Rostellum semi-orbicular. Stigma far distant from anther and located near base of column. Anther-cap oval, white; pollinia 2, white, each with 2 subequal partitions, granulose. Capsule ellipsoid, up to 2.3 cm long, stalk up to 19 cm long.

Flowering time: May-June

Distribution: Endemic to Taiwan

Taiwan: This species was discovered by the second author on the forest floor in late May at Zhongliao Township, Nantou Co.

Conservation status: *Gastrodia rubinea* found only in type locality which close to roadside and human activity. Base on the evaluation criteria of the IUCN Red List (2017), it should be Endangered (EN) status.

Note: *Gastrodia* species in Taiwan whose flowers exhibit a globular to ellipsoid shape with a small opening and are flesh-colored only include *G. rubinea*, *G. callosa* (Hsu and Kuo, 2010), *G. sui* (Yeh *et al.*, 2011), and *G. kaoshiungensis* (Wang *et al.*, 2018). *Gastrodia rubinea* can be easily differentiated from these 3 other species by the gem-like calli at the apex of the lip.

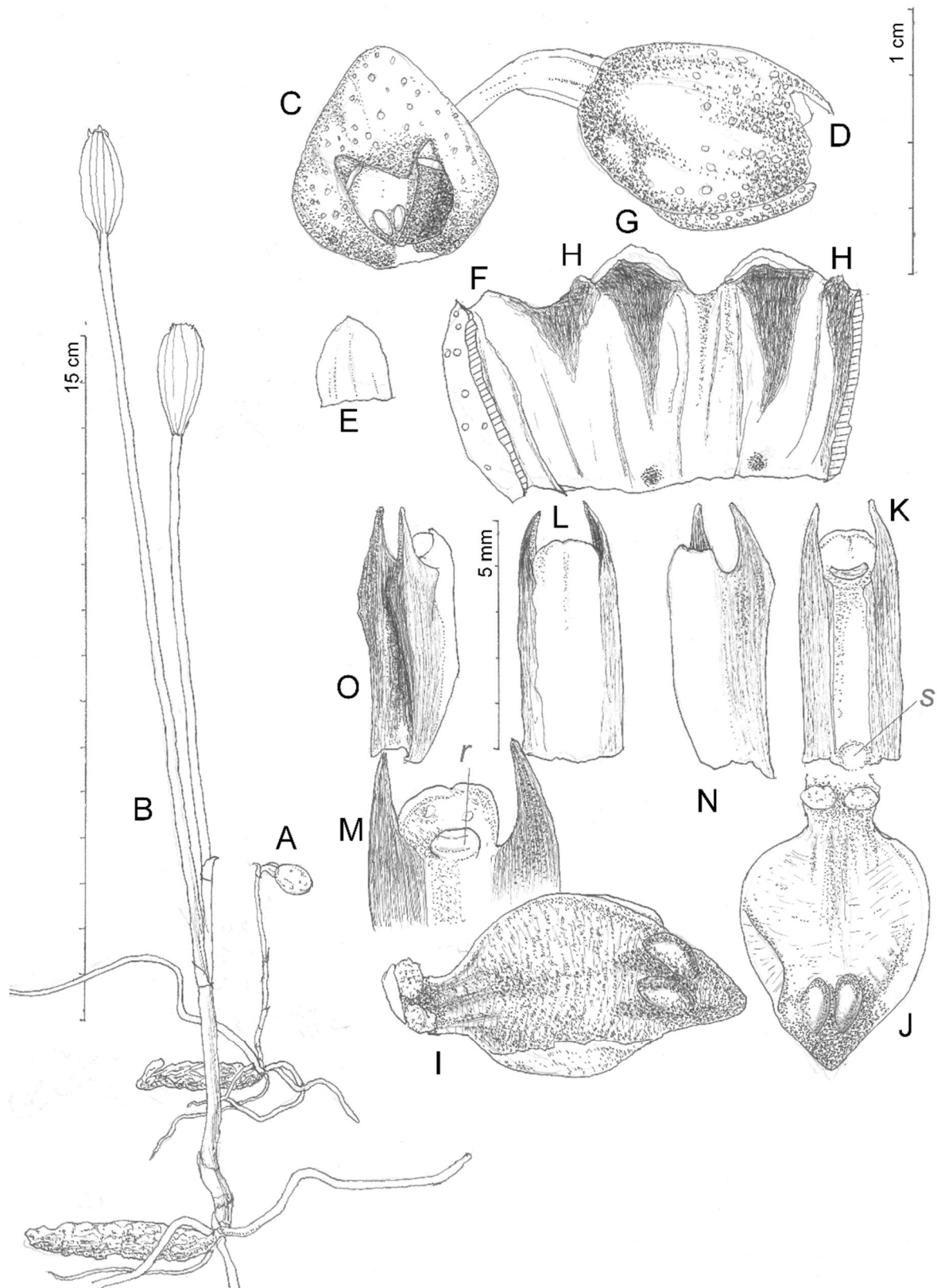


Fig. 1. *Gastrodia rubinea* T.P. Lin. A: Flowering plant. B: Fruiting stage. C: Flower, frontal view. D: Flower, side view. E: Floral bract. F: Upper sepal. G: Lateral sepal. H: Petal. I: Lip, oblique view. J: Lip, view from above. K: Column, view from below. L: Column, view from above. M: Column apex showing rostellum. N: Column: side view. O: Column: side view. *r*, rostellum. *s*, stigma.



Cheirostylis octodactyla Ames f. ***cymbiformes*** T.P. Lin, *forma nov.*; *Cheirostylis* sp. in Chung and Hsu. 2016: 348.
舟形指柱蘭 Figs 2 & 3 E-F

Holotype: Taiwan: Hsinchu Co. Jianshi Township, 1500 m, Sep. 2, 2018, *Da-Min Huang s.n.* (TAI287433)

A partial peloria (peloric flower) of *C. octodactyla*. Vegetative part is exactly identical to that of *C. octodactyla*. Flowers white, tube-like, glabrous. Lip free from column, 8.5~9 × 2 mm, entire, unlobed, cymbiform, saccate at base, rounded (Fig. 2I) or shrunken (Fig. 2J) at apex; when rounded, 2 greenish patches can be observed near apex; when shrunken, greenish patch not evident; sac of lip contains ca. 8 cylindrical papillae on each side. Column morphology including pollinarium is identical to that of *C. octodactyla*.

Flowering time: August-September.

Distribution: Endemic to Taiwan

Taiwan: The first author discovered this species in Jianshi Township, Hsinchu County at an elevation of 1500 m on Aug. 20, 2015. This small plant grows in a mixed population with f. *octodactyla* along a trail on the mountain ridge. The number of individuals of f. *cymbiformes* is much fewer than that of f. *octodactyla*, which is only known from the type locality so far. It is interesting to note that peloria is incomplete in f. *cymbiformes*, because the appendage in the sac of the lip is still well-developed, and the morphology of the lip is still quite different from that of the petal. We believe a possible scenario is that a few individuals have changed their gene regulation during flower development resulting in the loss of the fimbriate lip. This is a different situation from other peloria species in the genus *Cheirostylis* in Taiwan because most of them are able to grow independently in the wild.

Revision of *Lecanorchis bihuensis* and its relative species

The name *Lecanorchis nigricans* was wrongly used by Lin (1987) to describe an unknown species with a peloric flower. Lin and Wu (2012) renamed this unknown species *Lecanorchis bihuensis* based on a collection from Bihu, Pinglin Township, New Taipei City in Feb. 1980 (holo. TAI122114). The species was not seen again in the wild for 39 year, even though numerous efforts were dedicated to searching for it. In 2017, this mysterious species was rediscovered by the first author who continued monitoring the flowering of the supposed *Lecanorchis bihuensis* for 3 years. This was followed by independent sightings by 2 other people from different locations in New Taipei City last year.

In summer 2018, we selected a convenient site of Pinglin to study *L. bihuensis*, a small mountain ridge of 300 m in elevation where at least 15 individuals were found around the ridge. So far, we learned that 7

individuals are *L. bihuensis*, 5 are *L. multiflora* (for an explanation of the name, see below), and 3 have no flower. These plants have identical plant morphologies so differentiating them is impossible without the flower. Only 1 individual of *L. bihuensis* that blossomed in 2017 was fortuitously observed by the first author. In fact, no *L. bihuensis* has flowered based on at least 10 visitations in July to September 2018. However, individuals of *L. multiflora* were observed blossoming in 2018. The identification of 7 individuals as *L. bihuensis* was based entirely on dissection of the flower parts. The 3 individuals without flowers are probably also *L. bihuensis*, because they are growing beside known individuals of *L. bihuensis*. It became clear that in this mixed population, *L. bihuensis* dominates over *L. multiflora*. Even though individuals of *L. bihuensis* did not bloom, they still showed fruit development. This indicates that *L. bihuensis* tends to be autogamous, even though it has a well-developed rostellum. From another location, Mr. D. Lou made 18 visitations in 2018 without seeing *L. bihuensis* blooming (personal communication with D. Lou), again indicating that blossoming is not a common phenomenon in *L. bihuensis*. This explains why *L. bihuensis* was not seen in the wild for a long period of time and was not detected by amateur collectors. A similar phenomenon was recently reported. Suetsugu and Fukunaga (2018) showed that the flowers of *Lecanorchis triloba* var. *clausa* remain completely closed throughout the entire flowering period. In addition, Suetsugu *et al.* (2018) reported that *Lecanorchis nigricans* var. *nigricans* produces only cleistogamous flowers, and is distinct from the chasmogamous varieties *L. nigricans* var. *patipetala* and *L. nigricans* var. *yakusimensis*. At least in Taiwan and Japan including the Ryukyu Islands, cleistogamy and chasmogamy coexist in closely related species of *Lecanorchis*.

Although there are no formal records, mixing of *L. bihuensis* and *L. multiflora* was observed at several locations in Pinglin Township by different amateur collectors. Basically, their vegetative parts are indistinguishable. We suspect that *L. bihuensis* could be a peloric flower of an unknown species of *Lecanorchis* (Lin and Wu, 2012), and now it is reasonable to speculate that *L. multiflora* would be a parental species. Intriguingly, in the southern part of Taiwan, mixing between *L. subpelorica* (Hsu and Chung, 2010) and *L. multiflora* was also reported at low elevations of about 400 m. Their vegetative parts are indistinguishable, and the number of *L. multiflora* was greater than that of *L. subpelorica*. Flowers of *L. subpelorica*, however, still have a well-developed lip, but it is simplified. We propose that *L. multiflora* would be a parental species of *L. subpelorica*, but the peloric flower is not yet complete. Thus, under different environmental conditions, *L.*

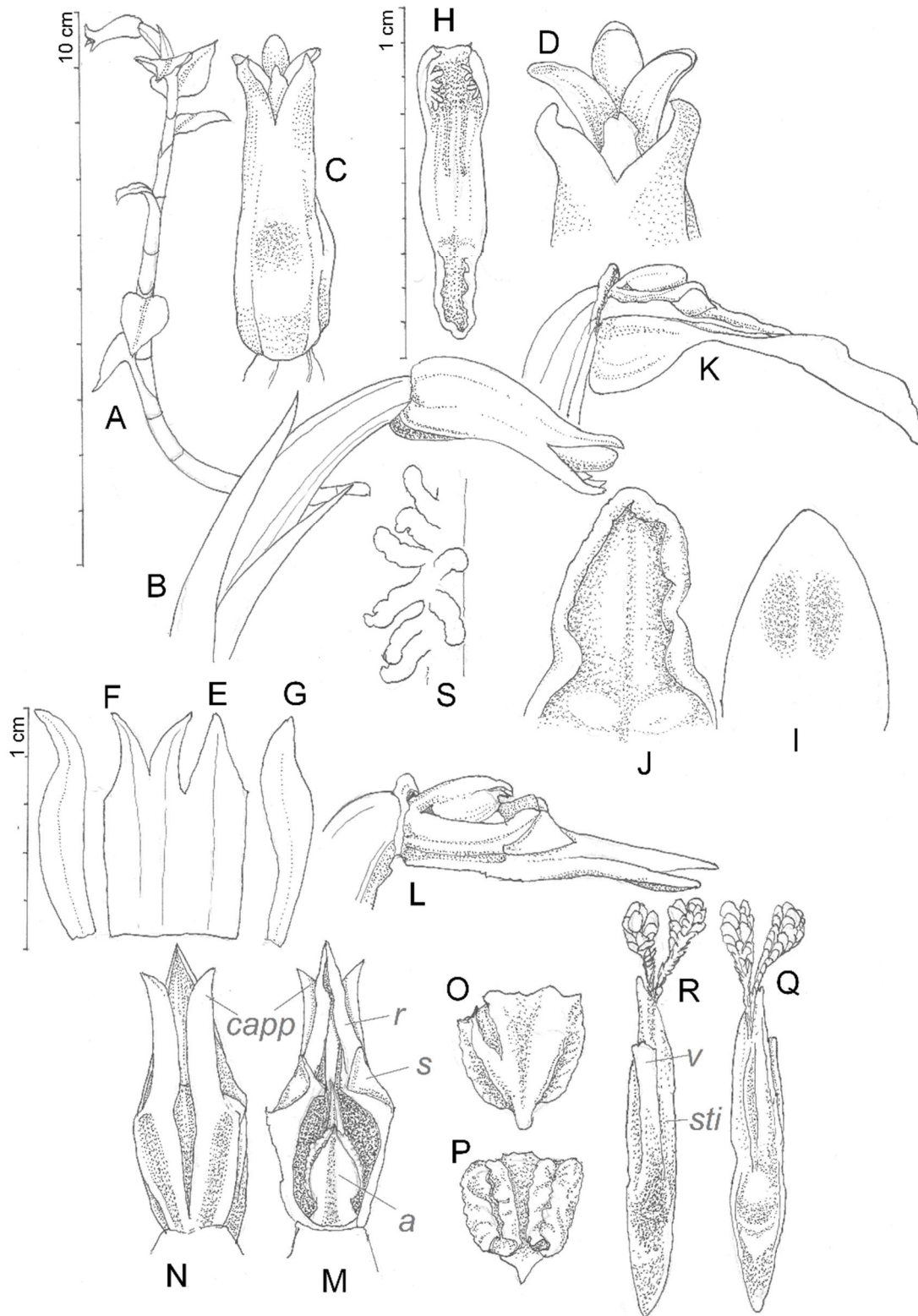


Fig. 2. *Cheirostylis octodactyla* Ames f. *cymbiformes* T.P. Lin. **A:** Flowering plant. **B:** Flower, side view. **C:** Flower, view from below. **D:** Apex of perianth tube, view from below. **E:** Upper sepal. **F:** Lateral sepal. **G:** Petal. **H:** Lip, in natural state. **I:** Lip apex. **J:** Lip apex, from another individual plant. **K:** Column and lip, side view. **L:** Column with anther attached, side view. **M:** Column with anther attached, view from above. **N:** Column, view from below. **O:** Anther-cap, view from above. **P:** Anther-cap, view from below. **Q:** Pollinarium, frontal view. **R:** Pollinarium, view from below. **S:** Glandular hairs inside the lip base. *a*, anther-cap. *capp*, column appendage. *r*, rostellum. *s*, stigma. *sti*, stipe. *v*, vicidium.

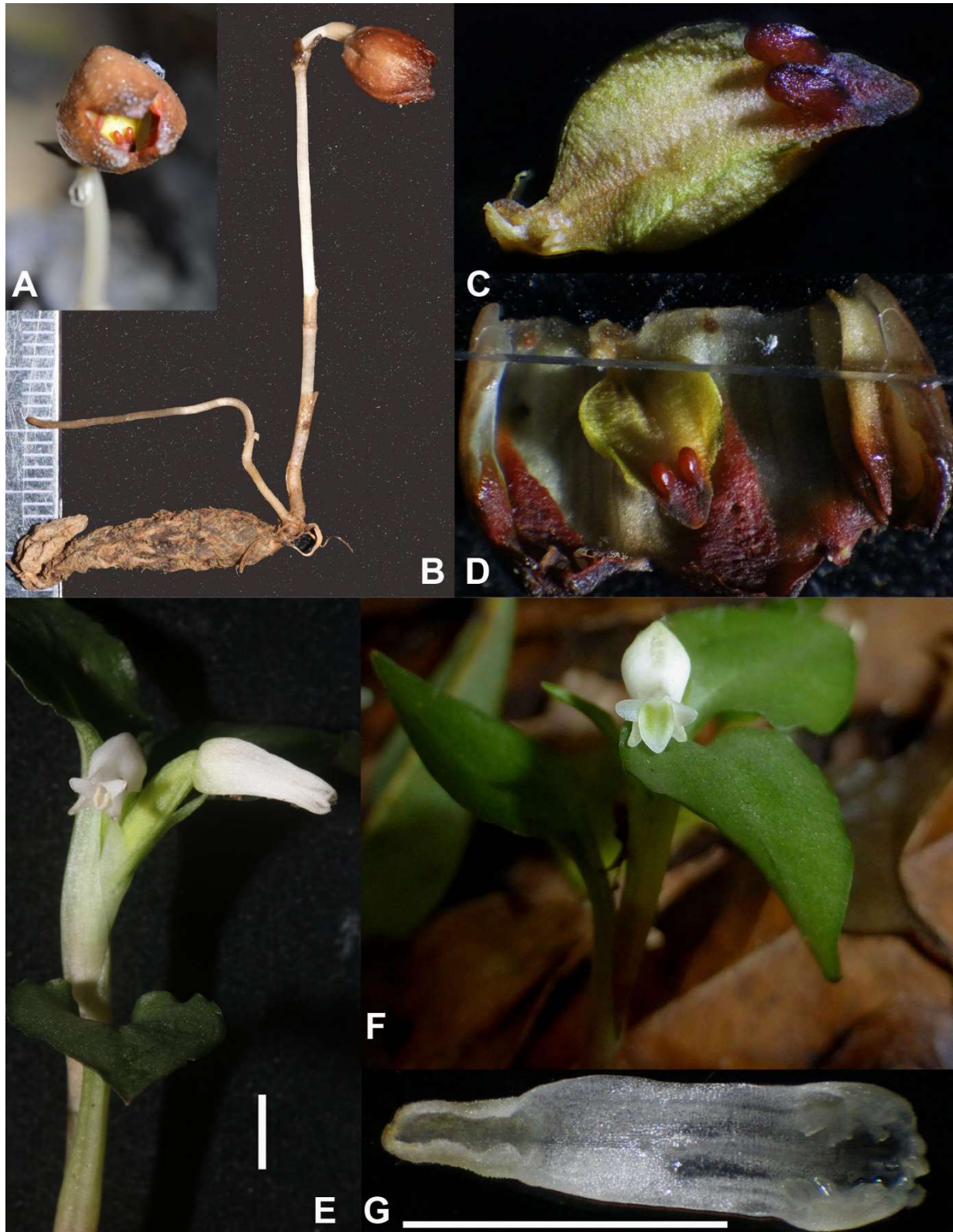


Fig. 3. *Gastrodia rubinea* T.P. Lin (A-D) and *Cheirostylis octodactyla* Ames f. *cymbiformes* T.P. Lin (E-G). **A:** Flower of *G. rubinea*, frontal view. **B:** Flowering plant of *G. rubinea*. **C:** Lip of *G. rubinea*. **D:** Perianth tube of *G. rubinea*, dissected and spread out. **E:** Flowering plant of *C. octodactyla* f. *cymbiformes* with shrunken lip. **F:** Flowering plant with entire lip. **G:** Lip of A, showing shrunken lip apex and calli of lip base. A, B, taken by D.M. Huang. Scale Bar E = 5 mm, G = 5 mm.



multiflora, a widespread species in Asia, has evolved into different varieties. Here, we propose that the status of *L. bihuensis* be adjusted to *L. multiflora* var. *bihuensis*. We propose new taxonomic treatment among these 3 species in Taiwan. In addition, the original description of *L. bihuensis* (Lin, 1987) was incomplete. Herein, we provide further information as follows.

***Lecanorchis multiflora* J.J. Sm var. *multiflora*.** Bull. Jard. Bot. Buitenzorg ser. II, xxvi. 8. 1918; Bull. Jard. Bot. Buitenzorg, III, 5: t.25, f.2. 1922. Seidenf., Bot. Tidsskr. 67: 98, f.19. 1972; Dansk Bot. Arkiv. 32(2):127, f.78. 1978. **Isosyntype:** Indonesia: Java: Jawa Barat, Malang, Java. Bantam. G. Malang. ?Am Z.O. van Pasaoeran, 400 m. Jan. 1, 1913, *Backer, C.A.* 7158 (L0426579, L0061477) **三裂皿蘭**

Lecanorchis triloba auct. non. J. J. Sm.; T.C. Hsu and S.W. Chung, *Taiwania* 54(1): 83. 2009.

Lecanorchis triloba was first reported in Taiwan by Hsu and Chung (2009). However, this name is a synonym of *L. javanica* in The Plant List website (<http://www.theplantlist.org/tpl1.1/record/kew-109160>). After examining the name history, it was concluded that it would be better to use *L. multiflora* for Taiwanese plants at the present time.

One year after his original publication, J.J. Smith indicated that *L. triloba* J.J. Smith was synonymous with *L. javanica* Bl. in the figure legend of *Nova Guinea* 8, 1: 10, t. 3, f. 9. 1909. Again, J.J. Smith put *L. triloba* as a synonym of *L. javanica* in his 1910 paper (Smith, 1910). *Lecanorchis javanica* however has an unlobed lip (Blume, 1858) which differs from *L. triloba* which has a 3-lobed lip. This could be caused by a wrong assignment by J.J. Smith in his paper in 1910 (Smith, 1910), and this was noted by Seidenfaden (1978). Pedersen *et al.* (2011: 173 & fig.) indicated that the exact identity of *L. triloba* is unknown, and *L. multiflora* is probably the correct name to use. Based on the original paper by J.J. Smith (1908 and figure in 1909), the lip of *L. triloba* has an obovate-triangular midlobe, and there is an indistinctly 3-lobulate swollen area near the middle of the midlobe (Figure 4). These features differ from Taiwanese plants which have a round midlobe and no elevations on the midlobe. The round midlobe is also true of plants of the Ryukyu Islands (Hashimoto, 1990: 35). These features agree well with the flower figure of *L. multiflora* (Smith, 1922). J.J. Smith did not give a description of *L. multiflora* in his original paper (Smith, 1918) but said it was not *L. javanica* Bl. The drawing of 1922 is the only reliable evidence of *L. multiflora*. It seems to us that differentiation between *L. triloba* J.J. Smith and *L. multiflora* J.J. Smith relies on the shape of the labellum (Figure 4). Some authors considered the morphological differences between *L. triloba* and *L. multiflora* to be unclear (Seidenfaden, 1978, Suetsugu, 2017). We are not sure if this was because these features were overlooked

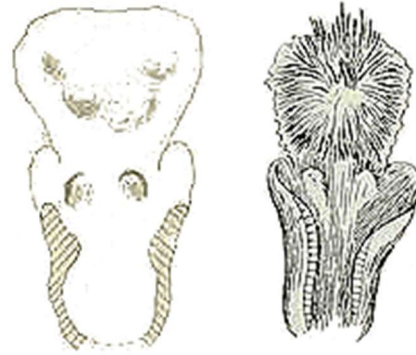


Fig. 4. Labellum of *Lecanorchis triloba* J.J. Smith (Smith 1909: t. 3, fig. 9, left) and *Lecanorchis multiflora* J.J. Smith (Smith 1922: t. 25, fig.2, right). Figures are cropped from original publications.

or were considered intraspecific variations.

Distribution: Borneo, China, Java, Malaysia, Ryukyu Islands (Japan), Sumatra, and Thailand

Lecanorchis multiflora* var. *subpelorica (T.C. Hsu & S.W. Chung) T.P. Lin, **comb. nov.**; *L. subpelorica* T.C. Hsu & S.W. Chung, *Taiwania* 55(4): 363-365. Figs. 1C, 1D & 3. 2010. **Holotype:** TAIWAN. Pingtung Co.: Shizi Township, Shouka, ca. 400 m alt., Jul. 4, 2008, *T.C. Hsu* 1438 (TAIF) **亞輻射皿蘭**

Lecanorchis multiflora* J.J. Sm. var. *bihuensis (T.P. Lin & S.H. Wu) T.P. Lin, **comb. & stat. nov.** *Lecanorchis bihuensis* T.P. Lin & S.H. Wu, *Taiwania* 57(4): 381. 2012. Figs. 3E-H & 5. **Holotype:** Taiwan: Hsinbei City: Pinglin, Feb. 17, 1980, *T.P. Lin* 455 (TAIF122114).

全唇皿柱蘭 Figs. 5 & 6

Lecanorchis nigricans auct. non Honda; T.P. Lin in *Native Orch.* Taiwan 3: 150. 1987.

A peloric form of *Lecanorchis multiflora*. Achlorophyllous herb with ascending scaly rhizome. Perennial. Root profuse. **Flowering** stem 15~40 cm aboveground, 1~1.5 mm in diam., slender, black, branched, densely many-flowered in succession. Floral bracts small, ovate-triangular, up to 2 mm long. Pedicel and ovary cylindrical, ca. 1 cm long, dark-purple, at apex with a shallow denticulate cup. **Flowers** dark-purple or purplish outside, whitish tinged purple inside, not widely opening; sepal oblanceolate or spatulate, somewhat cucullate, 6.5~9.5 × 1.5 mm, obtuse, lateral sepals slightly oblique; petals oblanceolate or spatulate, often wider, 6.5~9.5 × 1.5~2 mm, rounded or obtuse at apex. **Lip** free of column, 6.5~9.5 × 2 mm, oblanceolate or spatulate, rounded, cymbiform, glabrous, entire. **Column** straight, 6~8 mm long, whitish, tapering towards base, with column-wing. Rostellum semi-orbicular. **Stigmatic** surface almost overlapping with rostellum, covered with whitish glandular hairs. Pollinia 2, each with 2 subequal partitions, powdery. **Capsules** cylindrical, 1.5~2 cm long, dark-purple.

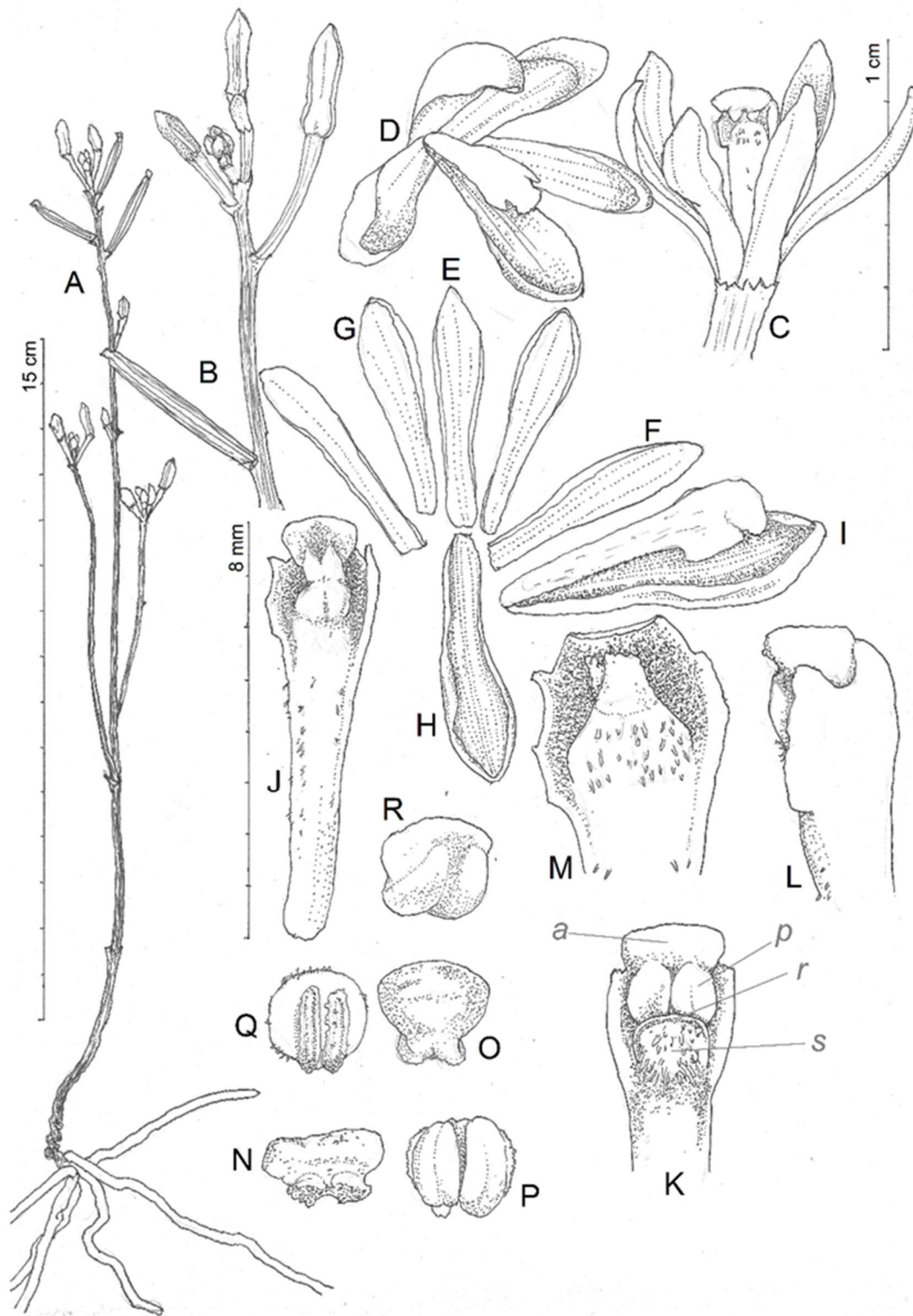


Fig. 5. *Lecanorchis multiflora* J.J. Sm. var. *bihuensis* (T.P. Lin & S.H. Wu) T.P. Lin. **A:** Flowering plant. **B:** Enlargement of a branch. **C:** Flower, view from below. **D:** Flower, view from above. **E:** Upper sepal. **F:** Lateral sepal. **G:** Petal. **H:** Lip. **I:** Lip and column, oblique view. **J:** Column with anther attached, view from below. **K:** Column with anther attached, at a younger stage. **L:** Column with anther attached, side view. **M:** Column apex. **N:** Anther-cap, frontal view. **O:** Anther-cap, view from rear. **P:** Anther, view from below. **Q:** Anther-cap, view from below. **R:** Anther, view from below and oblique view. *a*, anther-cap. *p*, pollinia. *r*, rostellum. *s*, stigma.



Fig. 6. *Lecanorchis multiflora* J.J. Sm. var. *bihuensis* (T.P. Lin & S.H. Wu) T.P. Lin. **A:** Flower of *L. multiflora* var. *bihuensis*. **B:** Flower of *L. multiflora* var. *bihuensis* from another individual plant. **C:** Inflorescence of *L. multiflora* var. *bihuensis*. **D:** Column and lip of *L. multiflora* var. *bihuensis*. A, B, taken by D.M. Huang; C, taken by Ching-Hwang Liu. Scale bar = 5 mm.

Flowering time: All year round, but mainly in summer.

Distribution: Endemic to Taiwan

Taiwan: Found in forests of northern part at elevations below 400 m.

Note: In comparing *L. multiflora* var. *bihuensis*, *L. multiflora* var. *multiflora*, and *L. subpelorica*, they have identical tepals and column morphology including the anther-cap, rostellum, and column-wing.

Specimen examined: Taiwan: Hsinbei City: Pinglin, 400-500 m, Jul. 21, 2018, K.H. Wang s.n. (TAI287432)

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