



## Newly discovered native orchids of Taiwan (X)

Tsan-Piao LIN<sup>1,\*</sup> and Da-Ming HUANG<sup>2</sup>

1. Institute of Plant Biology, National Taiwan University, 1 Roosevelt Rd., Section 4, Taipei 106, Taiwan.

2. No. 17, Alley 35, Lane 706, Nanta Road, Hsinchu City 300, Taiwan.

\* Corresponding author's tel: +886-2-33662537; email: tpl@ntu.edu.tw

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**ABSTRACT:** This report presents three new orchids of Taiwan, i.e., *Habenaria alishanensis* T.P. Lin & D.M. Huang, *Neottia cinsbuensis* T.P. Lin & D.M. Huang, and *Nephelaphyllum tenuiflorum* Blume.

**KEY WORDS:** *Habenaria alishanensis*, Native orchids, *Neottia cinsbuensis*, *Nephelaphyllum tenuiflorum*, Taiwan.

### INTRODUCTION

The present paper is a continuation of efforts to update the orchid flora of Taiwan. A complete list of native orchids and their type information of Taiwan 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 three new orchids including a newly recorded genus in Taiwan.

### TAXONOMIC TREATMENT

*Habenaria alishanensis* T.P. Lin & D.M. Huang, *sp. nov.* 樂氏玉鳳蘭 Figs. 1A-C, 2

**Typus:** Kuo-Chu Yueh *s.n.* (holo TAI286844, Aug. 13, 2017, Alishan Township, Chiayi Co., 700 m)

Plant morphology similar to that of *H. ciliolaris*, plant and inflorescence 60~70 cm tall. Tubers 1-2, obliquely ellipsoid, 3.7 cm long, 1.8 cm in diameter. Belowground stem 8 cm long, 6 mm in diameter. Leaves clustered on lower half of stem, elliptic-lanceolate, obovate-spatulate, narrowly elliptic, 7, intergrading into 11 bract sheaths up the stem; leaves up to 20 cm long, 4 cm wide, glossy, smooth on back with a keel-like midvein. Inflorescence terminal, about 50 cm tall, scape about 28 cm long, angled; peduncle angled, 21 cm long, covered with tiny ciliate-pilose along the angles. Floral bracts ovate, 1.6 cm long, 6 mm wide. Pedicel and ovary clavate, apical end narrower than basal end, curved, ridged, 1.8~1.9 cm long. Flowers greenish, widely open, about 1.5 cm across, perianths hairless; upper sepal cucullate, elliptic, 5.6 mm long, greenish, strongly keeled on outside; lateral sepals highly reflexed and always adnate to ovary, obliquely ovate, concave, 6 mm long, 4 mm wide; petals pale-green, obliquely ovate, rounded at apex, 6 mm long, 2 mm wide, upper edge forming a hood with upper sepal, lower edge slightly reflexed

making hood about 5.8 mm across; lip green, 3-lobed, base about 3 mm wide, side-lobes 1.2~1.4 cm long, about 45° from mid-lobe axis, mid-lobe linear, 8.5 mm long, curved forwards; spur slender, 1.6 cm long, basal part very narrow, 0.7 mm in diameter, dilated at distal end to about 1.7 mm in diameter. Column trapezoid, deeply notched at apex, sides extending dilated into 2 lateral arms which carry 2 lateral glands/staminodes at the tips; anther locules approximate at upper ends, connective between them 0.7 mm wide, 2 divergent locules protruding into 2 long arms; rostellum erect, shorter than column, extending into 2 arms and forming a holder to hold the pollinia disc; stigma lobes cylindrical, gently arching and bracing rostellum; pollinia 2, each with long caudicle.

**Flowering time:** August-September.

**Ecology:** This plant was originally found in a bamboo stand of Alishan Township, Chiayi Co. at an elevation of 700 m by Mr. Kuo-Chu Yueh on Aug. 13, 2017. *Habenaria alishanensis* T.P. Lin & D.M. Huang exists as a small population and is accompanied by 4 other *Habenaria* species in the same locality, i.e., *H. petelotii*, *H. ciliolaris*, *H. longiracema*, and *H. stenopetala*. Among them, the flowering time of *H. petelotii* and *H. ciliolaris* overlap with *H. alishanensis* (Fig. 1B). The senior author suspects that *H. alishanensis* T.P. Lin & D.M. Huang could be of hybrid origin. *Habenaria ciliolaris* could be a potential parent because it has a similar flower morphology with that of *H. alishanensis* but is much larger. However, the spreading tripartite labellum of *H. alishanensis* differs from that of *H. ciliolaris* and could be derived from another species. *Habenaria stenopetala* could be another potential parent because of the tripartite labellum, even though it is not very similar to that of *H. alishanensis*. Molecular tools must be used to investigate the potential parents.

**Note:** *Habenaria alishanensis* T.P. Lin & D.M. Huang is similar to *H. leptoloba* Benth. of Hong Kong (Barretto *et al.*, 2011); however, it can be distinguished

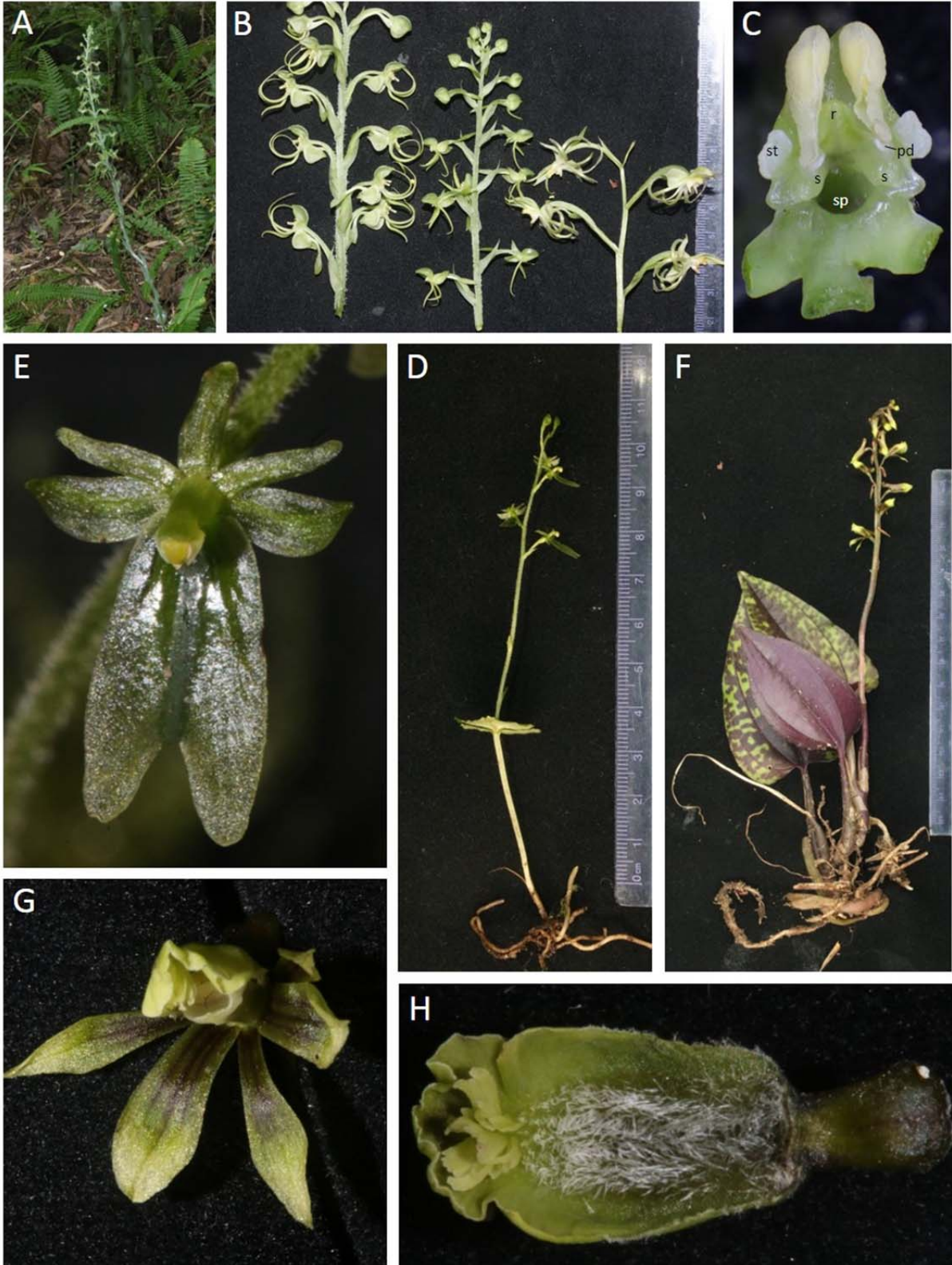
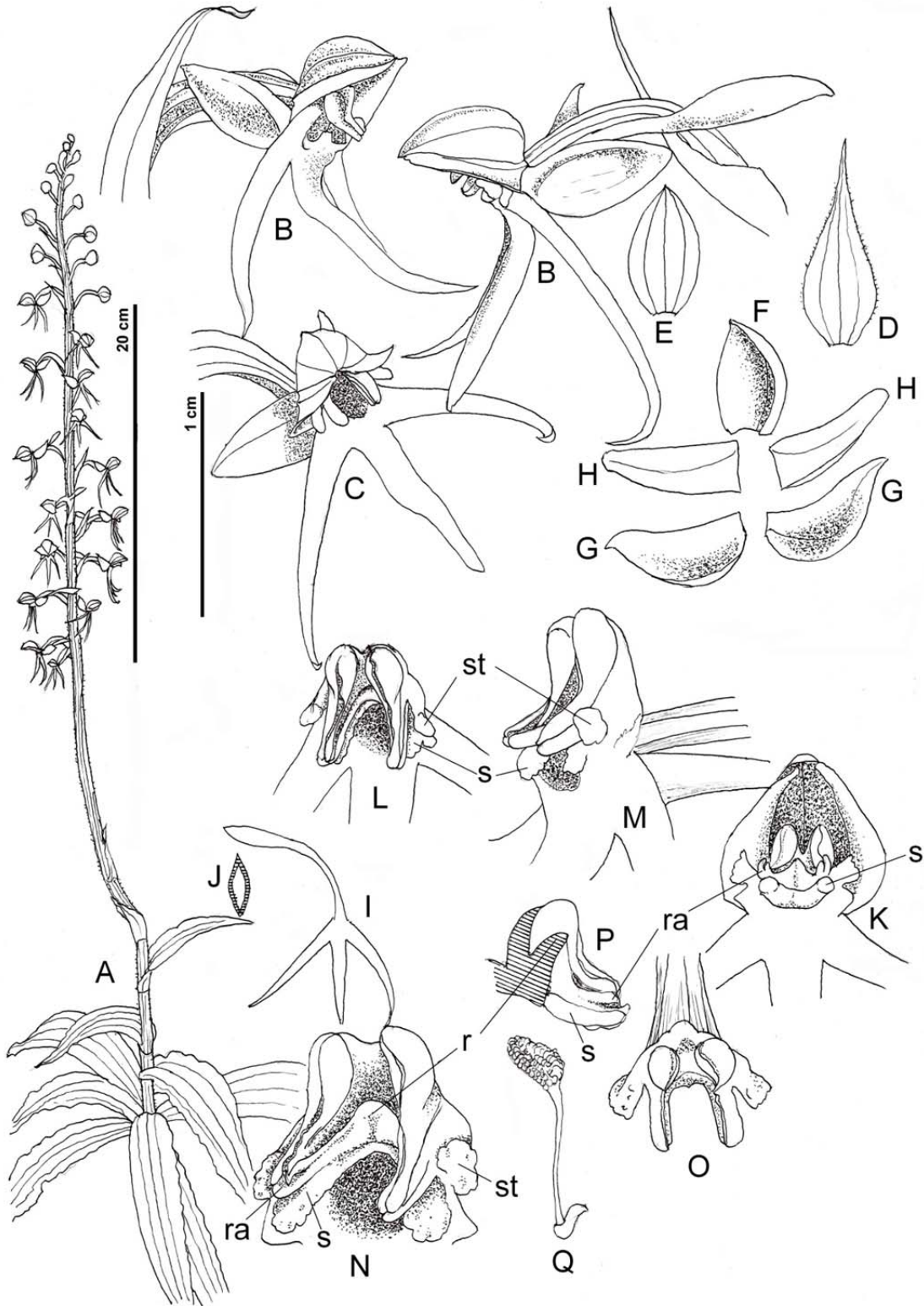


Fig. 1. *Habenaria alishanensis* T.P. Lin & D.M. Huang, *Neottia cinsbuensis* T.P. Lin & D.M. Huang, and *Nephelaphyllum tenuiflorum* Blume. **A:** *Habenaria alishanensis* in its native habitat. **B:** Three flowering *Habenaria* spp. in the type locality: *H. ciliolaris* (left), *H. alishanensis* (central), and *H. petelotii* (right). **C:** Front view of column of *Habenaria alishanensis*. r, rostellum; s, stigma; sp, spur; st, staminodes; pd, pollinia disc. **D** and **E:** Plant and enlarged flower of *Neottia cinsbuensis* T.P. Lin & D.M. Huang. **F, G,** and **H:** Plant and enlarged flower and spread-out labellum of *Nephelaphyllum tenuiflorum* Blume.



**Fig. 2.** *Habenaria alishanensis* T.P. Lin & D.M. Huang. **A:** Plant body and inflorescence. **B:** Side view of flower. **C:** Front view of flower. **D:** Floral bract. **E:** Back view of upper sepal with ridged veins. **F:** Front view of upper sepal. **G:** Lateral sepal. **H:** Petal. **I:** Labellum and spur. **J:** Cross-section of spur near the end. **K:** Upper sepal, and petal hood and column. **L:** Top view of column. **M:** Side view of column. **N:** Oblique view of column showing rostellum (r) and rostellum arm (ra). **O:** Top view of column showing rostellum arms and staminodes arms. **P:** Longitudinal section showing rostellum. **Q:** Pollinia. r, rostellum; ra, rostellum arm; s, stigma; st, staminodes.



from *H. leptoloba* which has lanceolate or linear-lanceolate leaves, various much-smaller size measurements (for example, the flower is only 8 mm across), yellow lip, dorsal sepal ovate but not cucullate, cylindrical spur not showing significant dilation, anther locules widely separated, and the 2 lateral glands attached to the base of the rostellum but not forming short arms.

*Neottia cinsbuensis* T.P. Lin & D.M. Huang, *sp. nov.*

鎮西堡雙葉蘭 Figs. 1D, E, 3

*Typus:* Hsi-Chi Tsai *s.n.* (holo TAI286832, July 8, 2017, Cinsbu, Hsinchu Co., 2450 m)

Terrestrial. Stems green, slender, arising from rhizome, angled, 4–11 cm long but half of them embedded in mossy floor. Roots many, filiform. Leaves 2, opposite, ovate-triangular, 2 cm long, 2.2 cm wide, acute, green, pale-green beneath. Inflorescence terminal, 4–8.5 cm long; scape green, minutely hairy, 3–5.6 cm long; raceme 3–4 cm, with 5 or 6 flowers. Bracts ovate-lanceolate, about 3 mm long. Pedicel and ovary 6–7 mm long, with sparse hairs on pedicel. Flowers greenish, open, 6.5–7 mm across, about 1 cm long; upper sepals elongate elliptic, 3.4 mm long, 1.2 mm wide, obtuse; lateral sepals obliquely falcate, 3.5 mm long, 1.4 mm wide, acute; petals linear, about 3.3 mm long, 0.7 mm wide. Lip spreading forward, cuneate, 6.7–7 mm long, 3.7 mm wide, apex deeply 2-lobed; lobes slightly divergent, ovate and tapering to a rounded apex, lobes about 1.7 mm long; central disc with a linear dark-green thickened area, situated between 2 lustrous ridges running 2/3 length of disc. Column about 2.5 mm long, semi-terete; stigma flat and wide. Anther firmly attached to column, but abscission zone exists, brown on margin. Pollinia 4 in 2 pairs, vicid disc derived from liquefied rostellum tip. Capsules obovoid.

*Flowering time:* early July.

*Ecology:* This species grows alone without accompanying *Neottia* under a *Chamaecyparis* forest at Cinsbu, Hsinchu Co. at an elevation of 2450 m. This species was also found at Kirittoi at 2550 m (see below).

*Note:* The specific epithet refers to the location where it was found. Cinsbu in the Atayal (one of the aboriginal groups in Taiwan) language means a field with the first sunshine in the early morning. It also means abundant sunshine in the four seasons, and fertile soil of the land. This species was identified as *Listera nankomontana* Fukuyama (now *Neottia nankomontana* (Fukuy.) Szlach.) by Chung (2008: 86). However, *N. nankomontana* has a pointed, not rounded, labellum, which can clearly be seen in the type specimen, *Fukuyama 4139* in KPM-NA0105561 (Fukuyama, 1935, also see fig. 4b in Lin, 2015). The pointed tips of the lobules of *N. nankomontana* are in

agreement with Fukuyama's original description as "apice acutis". The misidentification could also be because *N. cinsbuensis* is also found at Kirittoi at 2550 m (photo provided by Mr. Sheng-Kun Yu, not shown). A location between Kirittoi (2570 m) and Bunakkei (3500 m) at Nanhutashan is the type locality of *Listera nankomontana* (Fukuyama, 1935).

Flower qualities of *N. cinsbuensis* are similar to those of other species of *Neottia* in Taiwan, but the margin of the lip has no layer of specialized cells which reflect light in the daytime, thus forming a white outline.

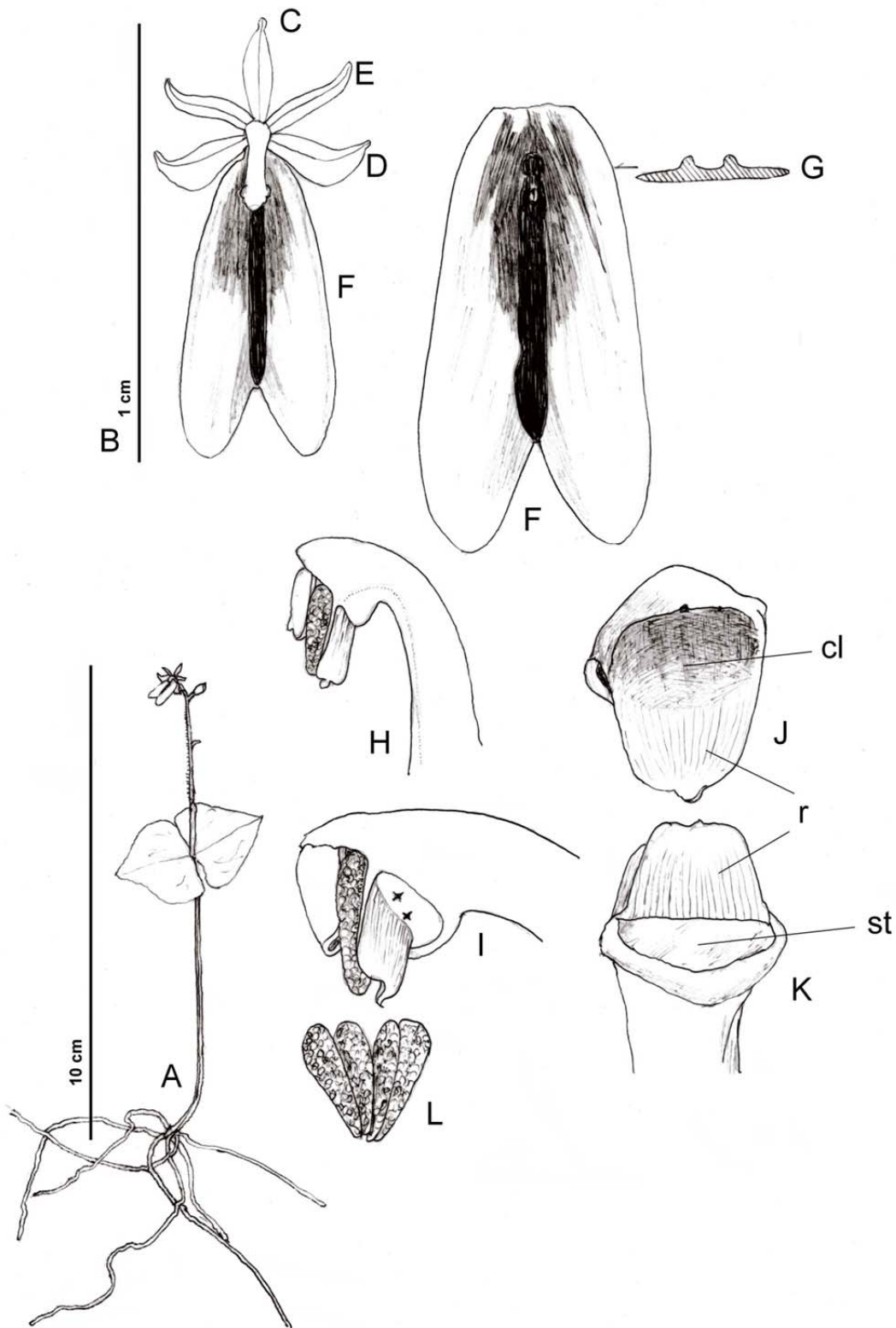
*Nephelaphyllum tenuiflorum* Blume, 1825, Bijdr. Fl. Ned. Ind. 8: 373; Seidenf., 1986, Opera Bot., 89: 21, fig. 6, pl. 2a; id., 1992, Opera Bot., 114: 82; Seidenf., Wood, 1992, Orch. Malay. Sing.: 151, fig. 64g-k; Aver., 1994, Ident. Guide Vietnam. Orch.: 91; P.H. Ho, 2000, Ill. Fl. Vietnam 3: 866, fig. 11213; Chen, Wood, 2009, Fl. China, 25: 281; Aver., 2013 Turczaninowia 16(1): 29, fig. 12c, d.– *Tainia tenuiflora* (Blume) Gagnep., 1932, Bull. Mus. Natl. Hist. Nat. ser. 2, 4: 706; id., 1933, Fl. Gen. Indo-Chine 6, 3: 380.

雲葉蘭 Figs. 1F, G, H, 4.

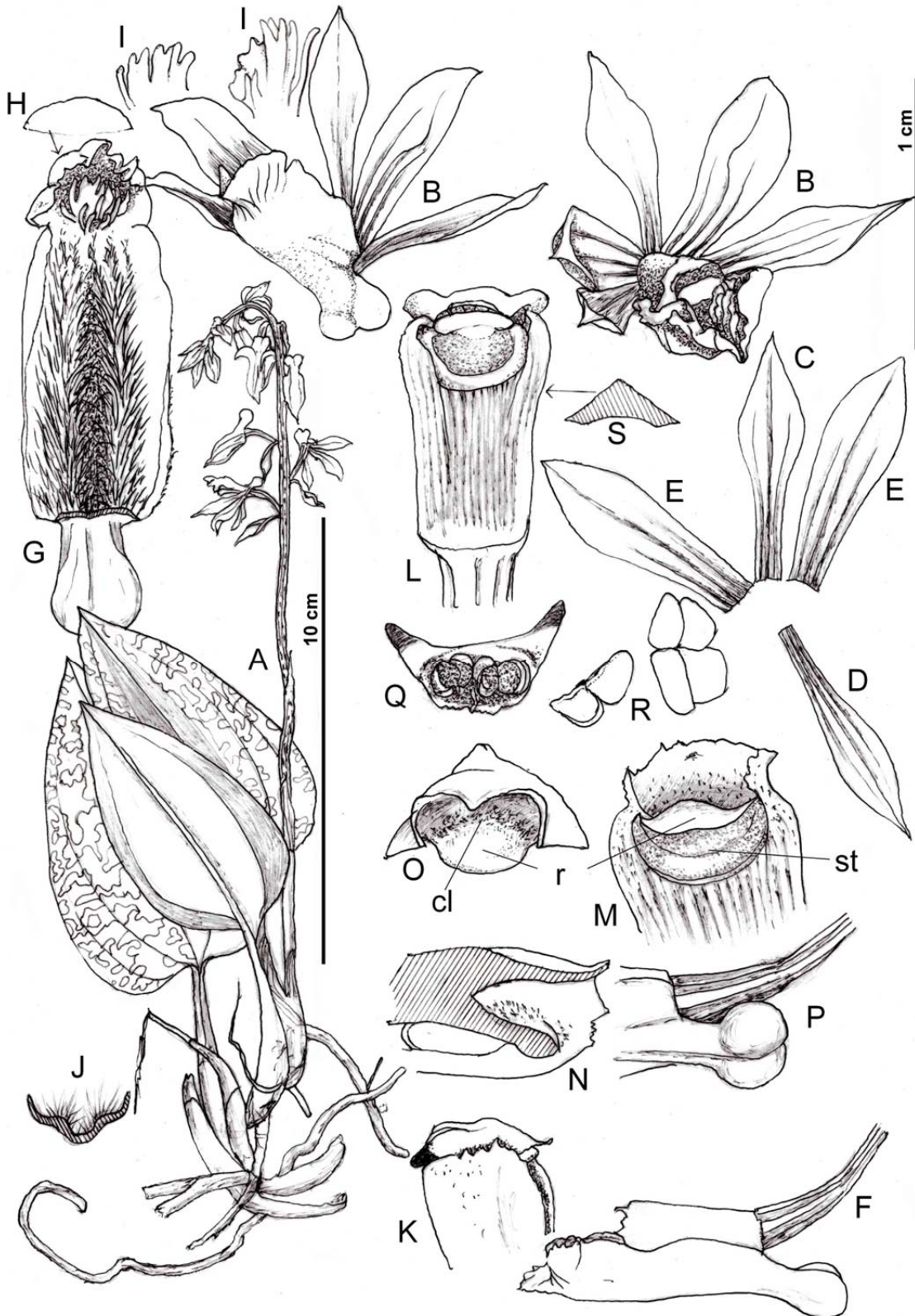
*Type:* C.L. von Blume *s.n.*, Jawa Barat (W. Java) ("Salak"), Indonesia (K000943501, L0940460, NY1104662, all are possible types).

*Taiwan:* Hsinchu Co., 1200 m, July 27, 2017, *Da-Ming Huang s.n.* (TAI286833).

Terrestrial. Plant creeping. Rhizome absent. Pseudobulbs arising from basal node of previous pseudobulb, cylindric, elongate, about 3 cm long, 2–6 mm in diameter, ascending, dull-purple, fleshy, with membranous sheaths at base of pseudobulb. Leaf cordate, 2–9 cm long, 1.5–5 cm wide, fleshy, with 3 major veins canaliculated above, elevated beneath, bright-green mottled with indistinct dark-violet spots/patches, violet underneath. Petiole short, channeled, about 0.5 cm long. Inflorescence erect, 10–18 cm tall, bearing 1 or 2 sheathing scales, laxly 12-flowered. Floral bracts lanceolate, membranous, 4–6 mm long. Pedicel and ovary 0.7 cm long. Flowers non-resupinate, about 2 cm across, green but marked with violet-brown stripes, sepals and petals spread in fan-like formation. Sepals narrowly obovate or spatulate, 9.5 mm long, 2.7 mm wide, much narrower than petals, acute to shortly apiculate, mottled with 1 dark major and 2 minor violet stripes. Petals narrowly obovate, 9–10 mm long, 3.7 mm wide, acute, mottled with 1 dark major and 2 minor violet stripes. Lip uppermost, oblong, concave, 1.35 cm long, 6 mm wide, slightly 3-lobed, margins short hairy along their length, base shortly spurred; disc with 2 ridges covered by long dense villose hairs, hairs growing from aperture of spur and ceasing at base of midlobe; lateral lobes round; median lobe broad, green, suborbicular, emarginated,



**Fig. 3. *Neottia cinsbuensis*** T.P. Lin & D.M. Huang. **A:** Plant body and inflorescence. **B:** Front view of flower. **C:** Upper sepal. **D:** Lateral sepal. **E:** Petal. **F:** Labellum. **G:** Cross-section of lip base. **H:** Side view of column and anther. **I:** Enlargement of column head. **J:** Top view of column showing clinandrium (cl) and rostellum (r). **K:** Front view of column with rostellum uplifted to show stigma. **L:** Pollinia. cl, clinandrium; r, rostellum; st, stigma.



**Fig. 4.** *Nephelaphyllum tenuiflorum* Blume. **A:** Plant body and inflorescence. **B:** Flower. **C:** Upper sepal. **D:** Lateral sepal. **E:** Petal. **F:** Side view of column and labellum. **G:** Labellum slightly spread-out. **H:** Flattened midlobe of labellum. **I:** Papillae. **J:** Cross-section of lip showing 2 keels. **K:** Side view of column and anther. **L:** Front view of column and anther. **M:** Front view of column showing rostellum (r) and stigma (st). **N:** Longitudinal section of column. **O:** Top view of column showing clinandrium (cl) and rostellum (r). **P:** Spur. **Q:** Anther cap and pollinia. **R:** Pollinia. **S:** Cross-section of column. cl, clinandrium; r, rostellum; st, stigma.

**Table 1.** List of features which can be used to separate *Nephelaphyllum cristatum* from *N. tenuiflorum*.

	<i>N. tenuiflorum</i> (A)	<i>N. cristatum</i> (B)
Epichile of labellum	3 rows of separate fleshy papillae, sometimes fused to form short plate-like keels	Papillae are bunched not in 3 rows
Hypochile of labellum	Proximal to central part finely pubescent, distal part ornamented with 3 low warty keels (Pedersen <i>et al.</i> 2014); epichile with a high tuft of fat papillae, hypochile with long pubescence in 2 rows (Aver., 2013)	Disc with 3 ridges obscured by long villose hairs, hairs densest at base, progressively thinning out and short in the middle, with a hump of prominent, stiffly erect tuft-like papillae
Inflorescence	3~15 flowers	3~5 flowers

with 3 rows of separate fleshy tuft-like papillae, these sometimes fused to form short plate-like keels; spur 3~3.5 mm long, club-shaped. Column 5.5 mm tall, 3~3.5 mm wide, slightly winged along sides, with fine streaks and speckles underneath. Rostellum thickened, rounded. Capsule reflexed, ellipsoid, ridged, 2.5~3 cm long.

**Ecology:** Grows in humid evergreen broadleaf forests, commonly in shady wet places on deep soils rich in humus at about 1200 m.

**Flowering time:** July-August.

**Distribution:** Taiwan, Vietnam, Thailand, Malacca Peninsula, S. China, Indonesia.

**Note:** This is an addition of a new genus to the native orchids of Taiwan. *Nephelaphyllum* has about 11 species (Pedersen *et al.*, 2014). This species was found by the junior author in Aug. 2015 in a bamboo stand in Hsinchu County, but the flower was not observed until summer 2017. The only known population was small, of about 30 individuals and was almost wiped out because of snow damage in 2016. Fortunately, a small population of 10 was found in a location very close to the original one; most are young seedlings. *Nephelaphyllum* also occurs in Hong Kong, but *N. cristatum* Rolfe was used instead, because Barretto *et al.* (2011) considered Hong Kong's plant to differ from *N. tenuiflorum*. The laminate crest of the epichile is often the major focal point when considering which species of *Nephelaphyllum* a plant is. Here we list characteristics to separate *N. cristatum* from *N. tenuiflorum* based on Barretto *et al.*'s (2011) work (Table 1).

Based on features listed in Table 1, the plants found in Taiwan are same to *N. tenuiflorum* instead of *N. cristatum*, thus *N. tenuiflorum* should be the name to be used for these plants in Taiwan.

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