

A new synonym of *Neottia alternifolia* (King & Pantl.) Szlach. (Orchidaceae) and lectotypification of its basionym

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A new synonym of *Neottia alternifolia* (King & Pantl.) Szlach. (Orchidaceae) and lectotypification of its basionym

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new synonym,
lectotypification.

ABSTRACT

Neottia motuoensis X.H.Jin, a recently described orchid from China, has been studied, and the morphological characters of the species have been compared to those of *Neottia alternifolia* (King & Pantl.) Szlach. based on protologue, type specimens, and fresh collections from the Indian Himalayan Region. Both species showed identical or overlapping characters and were found conspecific. Additionally, upon reviewing the original materials of the name, it has been determined that the name *Listera alternifolia* King & Pantl. (basionym of *N. alternifolia*) requires lectotypification. Therefore, a lectotype has been selected here for the name.

RÉSUMÉ

Un synonyme nouveau pour Neottia alternifolia (King & Pantl.) Szlach. (Orchidaceae) et lectotypification de son basionyme.

Neottia motuoensis X.H.Jin, une orchidée chinoise récemment décrite, a été étudiée. Ses caractères morphologiques ont été comparés à ceux de *Neottia alternifolia* (King & Pantl.) Szlach. à partir du protologue, de spécimens types et de nouvelles collections de la région himalayenne indienne. Les deux espèces présentaient des caractères identiques ou se chevauchant et étaient donc conspécifiques. De plus, après examen des documents originaux du nom, il a été déterminé que le nom *Listera alternifolia* King & Pantl. (basionyme de *N. alternifolia*) nécessitait une lectotypification. Par conséquent, un lectotype a été sélectionné pour ce nom.

MOTS CLÉS

Orchidaceae,
Neottia,
Chine,
Inde,
Motuo,
Sikkim,
Yumthang,
synonyme nouveau,
lectotypification.

INTRODUCTION

The genus *Neottia* Guettard (1754) [Orchidaceae-Epidendroideae-Neottieae] was initially represented by its myco-heterotrophic members, whereas *Listera* Brown (1813) was represented only by autotrophic species. Later, Szlachetko (1995) recognized three subgenera, *viz.* *Archineottia* Chen (1979), *Listera*, and *Neottia* under the genus *Neottia*. Chase *et al.* (2003) considered *Listera* as the photosynthetic members of *Neottia* and suggested that both the genera *Listera* and *Neottia* should be treated as the same genus based on DNA studies. *Neottia* has the priority, as it is the oldest name. The genus *Neottia* is characterized by its small habit, dense fibrous or fleshy roots, small resupinate flowers, often bilobed ligulate labellum, mostly long and curved column, sectile and naked pollinia (Pridgeon *et al.* 2005; Chen & Jin 2021). The genus comprises 64 species worldwide (Chase *et al.* 2015), distributed in the Himalayas, the Northern Temperate Zone, and south to tropical mainland Asia and the adjacent islands (Pridgeon *et al.* 2005). In India, the genus is represented by 20 species distributed exclusively in the Himalayan region (Singh *et al.* 2019; Kumar & Kumar 2024).

Wen *et al.* (2024) described a new species, *Neottia motuoensis* X.H.Jin, based on the specimens collected from Motuo County, Xizang, China. While describing *N. motuoensis*, the authors (Wen *et al.* 2024) compared their species with *N. yunnanensis* (S.C.Chen) Szlach., but they overlooked *N. alternifolia* (King & Pantl.) Szlach. (basonym: *Listera alternifolia* King & Pantl.), which was also reported from China (Jin *et al.* 2014; Zhou *et al.* 2016). After a critical study of the type specimens and fresh collections of *N. alternifolia*, as well as the protologues of both species, it is concluded that *N. motuoensis* exhibits indistinguishable morphological characteristics from *N. alternifolia*. Therefore, *N. motuoensis* is reduced here as a synonym of *N. alternifolia*. During the examination of the original materials pertaining to the basonym of *N. alternifolia*, i.e., *Listera alternifolia*, it was observed that the name is based on multiple specimens (syntypes). Thus, a lectotype (K000387548) is selected here from the syntypes of *L. alternifolia* (basonym of *N. alternifolia*). A detailed taxonomic study, along with descriptions, phenology, habitat, distribution, and illustrative photo-plates of *N. alternifolia*, is presented here for easy identification. The relationship between the two taxa has also been discussed, along with notes on the typification.

MATERIAL AND METHODS

Taxonomic studies were done based on the specimens housed at various Indian herbaria (ARUN, ASSAM, BSHC, and CAL) and virtual foreign herbaria (AMES, BM, BR, E, K, L, M, P, PE, W, and Z). The live specimens were collected from the North District (now Mangan District) of Sikkim, India, during the field survey in July 2019. Photographs of the specimen were taken using Canon EOS 1300D DSLR Camera. The dissected floral parts were examined under Olympus Stereo-

zoom Microscope SZ2-ILST. The herbarium was prepared as per the standard protocol (Jain & Rao 1977) and deposited at the Central National Herbarium (CAL), Botanical Survey of India, Howrah. Available relevant literatures were consulted for solving taxonomic issues.

ABBREVIATIONS

Herbarium acronyms

AMES	Orchid Herbarium of Oakes Ames, Botanical Museum, Harvard University, Cambridge;
ARUN	Herbarium, Botanical Survey of India, Arunachal Pradesh Regional Centre, Itanagar;
ASSAM	Herbarium, Botanical Survey of India, Eastern Regional Centre, Shillong;
BM	Herbarium, The Natural History Museum, London;
BR	Herbarium, Meise Botanical Garden, Belgium;
BSHC	Herbarium, Botanical Survey of India, Sikkim Himalayan Regional Centre, Gangtok;
CAL	Central National Herbarium, Botanical Survey of India, Howrah;
E	Herbarium, Royal Botanic Gardens, Edinburgh;
K	Herbarium, Royal Botanic Gardens, Kew;
L	Herbarium, Naturalis Biodiversity Center, Leiden;
M	Herbarium, Staatliche Naturwissenschaftliche Sammlungen Bayerns (SNSB), München;
P	Herbier national, Muséum national d'Histoire naturelle, Paris;
PE	Herbarium, Chinese National Herbarium, Institute of Botany, Chinese Academy of Sciences, Beijing;
W	Herbarium, Department of Botany, Naturhistorisches Museum Wien, Wien;
Z	Herbarium of the University of Zürich, Department of Systematic and Evolutionary Botany, Zürich.

TAXONOMIC TREATMENT

Family ORCHIDACEAE Juss.
Subfamily EPIDENDROIDEAE Kostel.
Tribe Neottieae Lindl.
Genus *Neottia* Guett.

Neottia alternifolia (King & Pantl.) Szlach.
(Figs 1; 2)

Fragmenta Floristica et Geobotanica Supplementum 3: 117 (Szlachetko 1995).

Listera alternifolia King & Pantl., *Journal of the Asiatic Society of Bengal. Part 2. Natural History* 65: 126 (King & Pantling 1896). — Type: **India** • Sikkim, Lachen Valley; c. 10000 ft; fl. VII.1895; *Pantling* 390; lectotype (**here designated**): K[K000387548], photo! (Fig. 2a) • islectotypes: AMES[AMES00101004], photo!; BM[BM000095769], photo!; BR[BR0000020451813], photo!; CAL[CAL0000000582, CAL0000000584, CAL0000000585, CAL0000000586, CAL0000000587]; K[K000387550], photo!; L[L0061589], photo!; M[M0226165], photo!; P[P00333381, P00333382], photo!; Z[Z000078031], photo!; W [not found].

Neottia motuoensis X.H.Jin, *Phytotaxa* 645 (2): 186 (Wen *et al.* 2024), **syn. nov.** — Type: **China** • Xizang, Motuo County, Gedang Town, alpine conifer forest; c. 3600 m alt.; 28.VII.2023; *Xiaohua Jin et al.* 40291; holotype: PE (could not be traced even after pers. comm. with the collector and the herbarium curator) • isotype: PE (could not be traced even after pers. comm. with the collector and the herbarium curator).

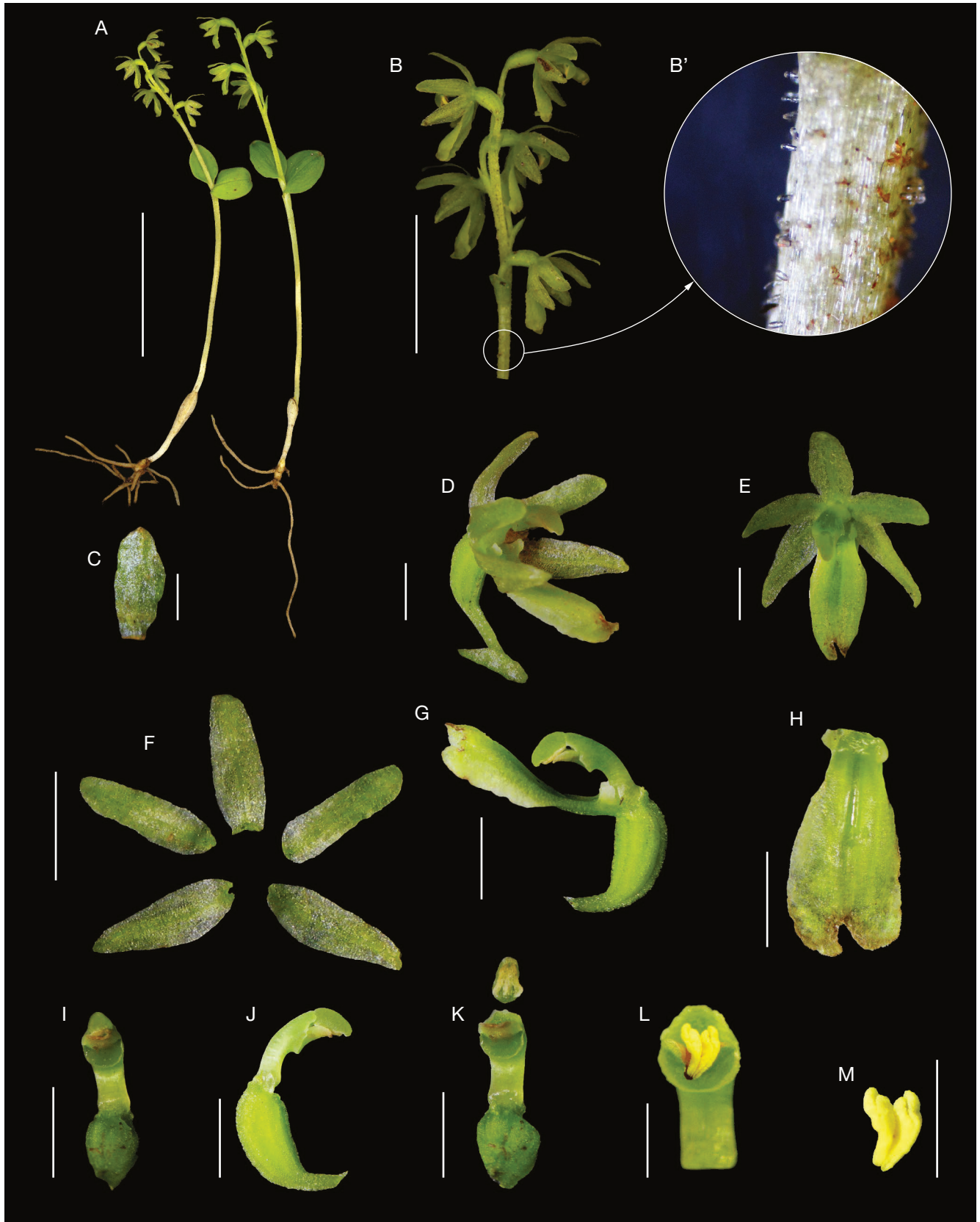


FIG. 1. — *Neottia alternifolia* (King & Pantl.) Szlach.: **A**, habit; **B**, inflorescence; **B'**, magnified view of rachis showing glandular hairs; **C**, bract; **D**, complete flower with bract (lateral view); **E**, complete flower (front view); **F**, sepals and petals; **G**, pedicellate ovary with column and labellum; **H**, labellum (front view); **I**, column with pedicel and ovary (front view); **J**, column with pedicel and ovary (lateral view); **K**, column after removing anther; **L**, column after removing anther cap with pollinia and rostellum; **M**, pollinia. Source: S. Chakraborty & S. Sarkar 40142 (CAL). Scale bars: A, 3 cm; B, 1 cm; C, L, M, 1 mm; D, E, G-K, 2 mm; F, 3 mm.

PHENOLOGY. — Flowering and fruiting are from July–September.

HABITAT. — Terrestrial, growing in shady, moist areas, under the *Rhododendron* trees, marshy alpine places, and open alpine grassland, at an elevation of 3000–4000 m above msl.

DISTRIBUTION. — India (Arunachal Pradesh, Sikkim); China.

ADDITIONAL SPECIMENS EXAMINED. — **India** • Arunachal Pradesh, Dibang Valley, Andra Omkar Camp, Beyond Mipi; 04.07.2002; *M. Bhaumik & M.K. Pathak 4185*; ASSAM[ASSAM, acc. no. 67498, 64628], CAL[CAL0000090543] • Upper Siang, Sikyak-Kanebango Camp; 08.09.2009; *M. Bhaumik 13252*; CAL[CAL0000090542] • West Siang, Trek Junction–Renu-II Pass Slopes; 6.IX.2012; *M. Bhaumik 29373*; ARUN[ARUN, acc. no. 22469, 22470, 22471, 22472] • Sikkim, North District (Mangan District), Lachen Valley; VII.1897; *Pantling 390*; AMES[AMES01941079, photo], BM[BM000095770, photo], BR[BR0000020451820, photo], CAL[CAL0000000583], E[E00394243, photo], K[K000387549, photo], L[L0061588, photo], M (photo), P[P00333383, P00333384, photos], Z[Z000078032, photo] • Zema-II to Log Bridge; 3150 m alt.; 15.VI.1999; *D. Maity & A. Maity 21603*; BSHC[BSHC, acc. no. 31815, 31816, 31817, 31818] • Shingba Rhododendron Sanctuary; 6.VIII.2014; *D.K. Agrawala 38892*; BSHC[BSHC00041594, BSHC00041595] • same data; c. 3500 m alt.; 14.VII.2019; *S. Chakraborty & S. Sarkar 40146*; BSHC[BSHC00043141] • Yumthang (hotspring); 3600 m alt.; 19.VII.1987; *D.C.S. Raju & S. Singh 7722*; BSHC • Yumthang Valley; 3560 m alt.; 13.VII.2019; *S. Chakraborty & S. Sarkar 40142*; CAL[CAL0000266954, CAL0000266955].

DESCRIPTION

Terrestrial autotrophs, uniformly green, small, 8–20 cm tall. Rhizome short, 2–2.5 mm in diameter, with few to numerous unbranched, fibrous, fasciculate roots. Stem 5–14 cm long, 1.5–2 mm in diameter, erect, slender, fleshy, cylindric, terete, uniformly green to yellowish-green, glabrous and smooth, sheathed at base; sheaths 1.2–2 cm long, oblanceolate, rounded at apex, adnate at most of the length to form a tubular shape. Leaves 2, alternate or sub-opposite, lower one borne almost midway along the stem, 6–16 × 3–8 mm, sessile, ovate to ovate-elliptic, truncate at base, entire, acute or subacute to obtuse at apex, conduplicate, glabrous, prominently 3-veined, mid vein and lateral veins converged at apex. Racemes terminal, laxly 3–10-flowered, flowers opening from the base to apex; peduncle 0.5–2.7 cm long, erect, cylindric, puberulent, green; rachis 1.2–3.5 cm long, erect, cylindric, puberulent, green; floral bracts 2.5–4 × 1–1.5 mm, elliptic-lanceolate, subacute at apex, persistent, glabrous, green, 1-veined. Flowers 4–6.5 mm long, 4–7 mm across, small, resupinate, distichous, nodding, spreading, pedicellate, uniformly green to olive green; pedicel and ovary 4–7 mm long, glabrous, ridged, green, abruptly swollen at the ovary region. Dorsal sepal 2.5–4 × 1–1.5 mm, spreading, lanceolate, entire, rounded or subacute at apex, green, concave, glabrous, with prominent midvein, adaxially carinate; lateral sepals similar, slightly falcate. Petals 2.5–4 × c. 1 mm, spreading, narrowly oblong, entire, rounded at apex, green, concave, glabrous, with prominent midvein, adaxially carinate. Labellum 3–5 × 2–2.5 mm, often longer than sepals, oblong-obovate to oblong-oblancheolate, lateral margins ciliate, slightly deflexed apically, 3-veined; lateral veins branched and obscure towards the margins, a thick

glossy depression arising from base and becoming obscure towards the apex; hypochile with two deltoid auricles at base, one at each side, and two small wart-like calli on both sides of the depression at the base; epichile 2-lobed, sinus short, lobules rounded and reflexed. Column 2–2.5 mm long, stout, slightly curved, green; anther terminal, oblong-ovoid, 2-chambered; clinandrium grooved; pollinia 2, mealy, granular; stigma terminal, suborbicular, concave, just below the rostellum; rostellum erect, ligulate, entire, acute or subacute. Capsule small, 4–5 mm long, ellipsoid to ovoid, ridged.

DISCUSSION ON TYPIFICATION OF *LISTERA ALTERNIFOLIA* (BASIONYM OF *NEOTTIA ALTERNIFOLIA*)

The type information of *Listera alternifolia* was mentioned in the protologue as “SIKKIM: Lachen Valley, elevation about 10,000 feet, in flower in July; *Pantling* No. 390”. During the present study, we could locate several specimens with label data “Lachen Valley, elevation about 10,000 feet, in flower in July; *Pantling* 390” in different herbaria worldwide (AMES, BM, BR, CAL, K, L, M, P, Z).

The specimens associated with the label-data “*Pantling* 390” were collected at different times, i.e., “July 1895” and “July 1897”. It is worth mentioning that it was a practice of Robert Pantling to use the same number occasionally for the same taxon gathered at different times (Bhattacharjee & Bandyopadhyay 2022). The species was published in 1896, leading to believe that the collections dated “July 1895” constitute the type materials. King & Pantling (1896), while describing the species, had studied multiple specimens collected from Sikkim. As none of these were designated as ‘type’ or ‘holotype’, all these specimens are the syntypes according to Article 9.6 of ICN (Turland *et al.* 2025).

It is to be noted that the specimens collected in “July 1897” from “9000 feet elevation” are not the types. But, in some major herbaria (BR, E, K, L, Z), these specimens (BR0000020451820, E00394243, K000387549, L0061588, Z000078032) are erroneously annotated as types.

A total of 14 specimens (AMES: 1, BR: 1, CAL: 5, K: 2, L: 1, M: 1, P: 2, Z: 1) with the collection date “July 1895” and “elevation 10,000 feet” were found. Furthermore, CAL possesses more than one type specimen of *L. alternifolia* (five specimens in total). Consequently, the term ‘holo’ used by Pearce & Cribb (2002) should be corrected to ‘lecto’ or ‘lectotype’. But Pearce & Cribb (2002) did not use the phrase ‘designated here’ (hic designatus) or an equivalent, which is mandatory on or after 1st January 2001 for valid lectotypification (fide Art. 7.11 of Madrid Code) and Art. 9.10 of ICN (Turland *et al.* 2025) cannot be applied to correct the typification (first-step lectotypification) done by Pearce & Cribb (2002) as their work has been published in 2002 (after 1st January 2001). However, a W-specimen cited by Pearce & Cribb (2002) could not be traced during the present study. Of the 14 extant type-specimens, one from K (K000387548) is



FIG. 2. — *Neottia alternifolia* (King & Pantl.) Szlach.: **A**, designated lectotype (K000387548) (© The Board of Trustees of the Royal Botanic Garden, Kew); **B**, segregated islectotype (K000387550) (© The Board of Trustees of the Royal Botanic Garden, Kew).

complete in every respect, exhibiting intact flowers and roots and clearly demonstrating the phyllotaxy. The K specimen (K000387548) represents the most comprehensive original material of *Neottia alternifolia*, exhibiting all the characteristics delineated in the protologue of the species (Fig. 2A). Hence, the specimen K000387548 is designated here as the lectotype of *Neottia alternifolia* according to the Articles 9.3, 9.12 of ICN (Turland *et al.* 2025).

A herbarium sheet from K contains two sets (upper and lower) of plant specimens and two label-data with different collection dates “July 1895” and “July 1897”, with two barcode numbers K000387550 and K000387549, respectively. The K-specimen (upper set; three individuals) with barcode K000387550, collected in “July 1895”, directly pasted on the herbarium sheet with year “July 1895”, is the duplicate of the designated lectotype (K000387548). In contrast, another set of specimen (six individual) with barcode K000387549 with year “July 1897”, is a cutout from a different sheet and pasted later, is not the original material of the name as it is post-dated collection. The specimen with barcode K000387550 (islectotype) is distinguished here from K000387549 (non-type material) by a red outline, as depicted in Figure 2B.

DISCUSSION ON THE IDENTIFICATION OF *NEOTTIA MOTUOENSIS*

Neottia motuoensis is a recently described species by Wen *et al.* (2024) based on the specimens collected from Xizang, Motuo County, Gedang Town, China (c. 3600 m) by Xiaohua Jin *et al.* (28 July 2023). Wen *et al.* (2024) noted that it was morphologically close to the Chinese species *N. yunnanensis*. However, while describing the species, the authors (Wen *et al.* 2024) overlooked *N. alternifolia*, which was also reported from China. Detailed study of the type specimens and fresh collections of *N. alternifolia* (collected by SC & SS), and further comparative study of protologue and original illustrations of both the species proved that both are conspecific.

In the protologue of *N. motuoensis*, it is mentioned that the species has a pubescent peduncle and two auricles at the base of the labellum, which is similar to *N. yunnanensis*. But *N. motuoensis* differs from *N. yunnanensis* in having relatively short leaves (c. 1 cm long in *N. motuoensis*, whereas more than 8 cm long in *N. yunnanensis*), short rachis (2 cm long in *N. motuoensis*, whereas c. 15 cm long in *N. yunnanensis*), the number of flowers (c. 7-flowered in *N. motuoensis*, whereas

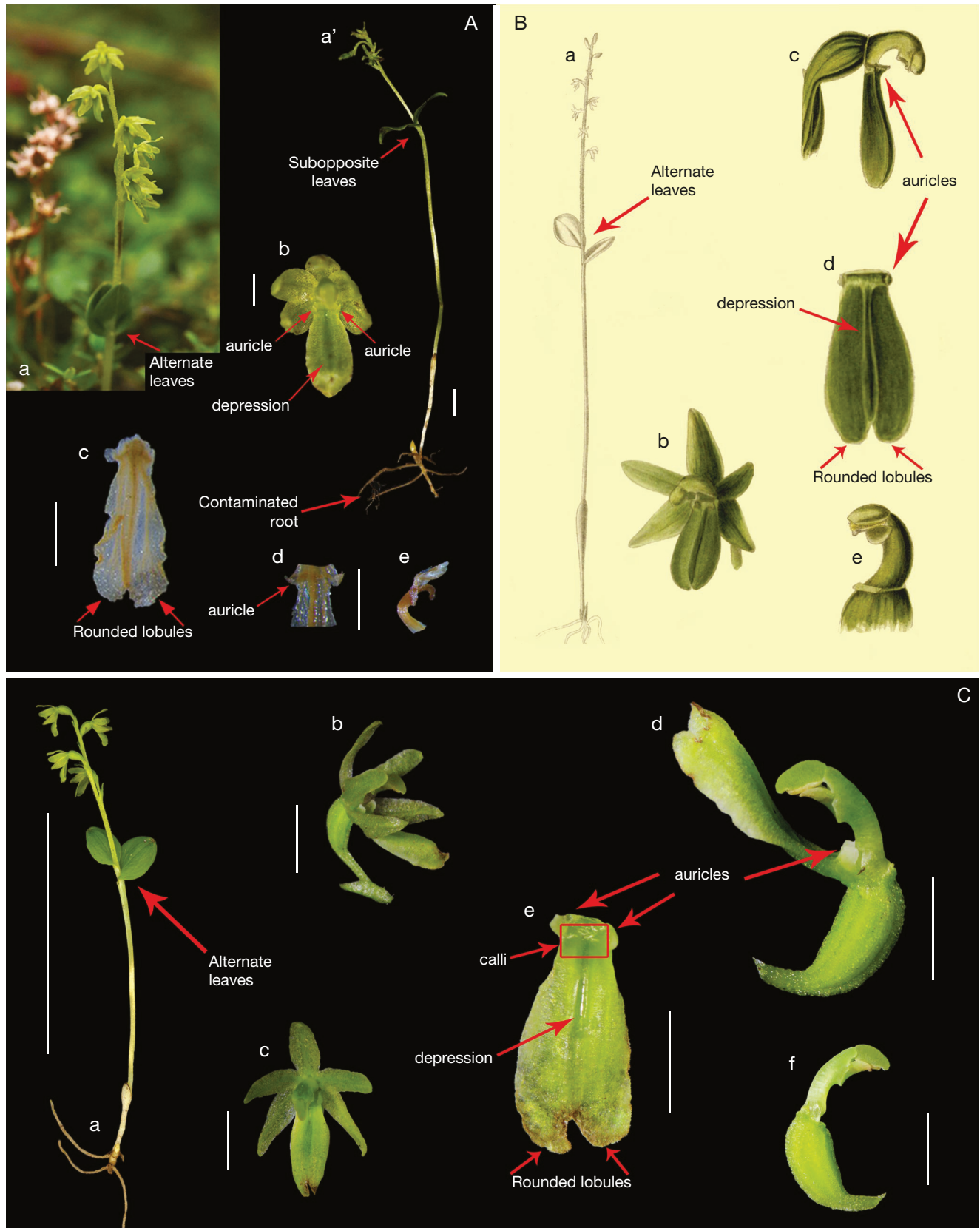


FIG. 3. — Comparative analysis of *Neottia alternifolia* (King & Pantl.) Szlach.: **A**, after Wen *et al.* (2024: figs 1, 2; rearranged): **a**, **a'**, habit; **b**, complete flower; **c**, labellum; **d**, hypochile showing auricles; **e**, column; **B**, after King & Pantling (1898: fig. 341; rearranged): **a**, habit; **b**, complete flower; **c**, labellum attached with column; **d**, labellum; **e**, column; **C**, dissected from S. Chakraborty & S. Sarkar 40142 (CAL0000266954, CAL0000266955): **a**, habit; **b**, **c**, complete flower; **d**, labellum attached with column; **e**, labellum; **f**, column. Scale bars on A: **a'**, 1 cm; **b**-**e**, 1 mm. Scale bars on C: **a**, 5 cm; **b**, **c**, 3 mm; **d**-**f**, 2 mm.

c. 35-flowered in *N. yunnanensis*), lobules of the labellum short and rounded (long, ovate, acute in *N. yunnanensis*). Additionally, *N. motuoensis* has two leaves, which are “almost opposite”. However, the habit photographs of *N. motuoensis* provided by Wen *et al.* (2024: f.1-right & f.2A) clearly demonstrated that the leaves are alternate or subopposite.

After a detailed study of the protologue (King & Pantling 1896) of *Listera alternifolia* (basionym of *Neottia alternifolia*), and relevant literatures (King & Pantling 1898; Pearce & Cribb 2002; Bhaumik & Pathak 2004; Lucksom 2007; Jin *et al.* 2014; Swami 2016), it is found that *N. alternifolia* has 2 alternate or subopposite, more or less obovate or elliptic leaves, 0.6–1.6 cm long; puberulous pedunculate racemes bearing 7–9 distant nodding olive-green flowers arranged in a short rachis; labellum with a pair of auricles at base and rounded lobules at apex. Moreover, the protologues of both taxa confirm the presence of wart-like calli at the base of the labellum. The freshly collected specimens from Sikkim [*S. Chakraborty* & *S. Sarkar* 40142 (CAL0000266954, CAL0000266955)] also exhibit these characters. However, the photograph of *N. motuoensis*, provided by Wen *et al.* (2024: f.2A), shows branching roots, which are probably resulted by contamination from another species (Fig. 3).

Neottia alternifolia is distributed in the states of Arunachal Pradesh and Sikkim of India, and in Gongshan County, Yunnan of China. The type locality of *N. motuoensis* is Gedang, Motuo (Médog) County, Xizang (Tibet), China, which is very close to Arunachal Pradesh, India, and an extended portion of the Eastern Himalayas. Consequently, not only the morphological characteristics but also the geographic distribution of these two species overlaps.

In light of the aforementioned discussion, *Neottia motuoensis* should not be regarded as a distinct species. As *N. alternifolia* has the priority as per Article 11 of ICN (Turland *et al.* 2025), *N. motuoensis* is treated as an heterotypic synonym of *N. alternifolia* in the present treatment.

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