

TWO NEW SPECIES OF *NEOTTIA* (ORCHIDACEAE) FROM INDIA

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Neottia dihangensis M.Bhaumik and *N. confusa* M.Bhaumik (Orchidaceae) from Arunachal Pradesh, India are described and illustrated.

Keywords. Arunachal Pradesh, India, *Listera*, *Neottia*, new species, Orchidaceae.

INTRODUCTION

A botanical survey was conducted in the core zone of Dihang Dibang Biosphere Reserve of Arunachal Pradesh, India, during July and August 2010. Amongst the plants collected were many specimens of the genus *Neottia* Guett. (Orchidaceae). These were compared with the descriptions in the available literature (Hooker, 1890; King & Pantling, 1898; Chen, 1981; Chen & Luo, 2002; Pearce & Cribb, 2002; Chen *et al.*, 2009) and with authentic herbarium material at CAL, ASSAM and ARUN [Herbarium of Botanical Survey of India, Arunachal Pradesh Regional Centre, Itanagar]. Two collections could not be matched with any known species of *Neottia* and are therefore described as new. The other collections of this genus have been identified as *Neottia alternifolia* (King & Pantl.) Szlach., *N. acuminata* Schltr. and *N. divaricata* (Panigrahi & P.Taylor) Szlach.

SPECIES DESCRIPTIONS

1. *Neottia dihangensis* M.Bhaumik, *sp. nov.* Fig. 1.

Species nova *Neottia nanchuanicae* (S.C.Chen) Szlach. affinis sed foliis sessilibus, minoribus (usque ad 2 cm longis), pedunculis longioribus (> 10 cm longis), inflorescentia multiflora (12–27 floris), epichili lobis non imbricatis, lobulis 3 rotundatis instructis differt. – Type: India, Arunachal Pradesh, Upper Siang District, Sitoma camp–Ruitala camp, 3600 m, 22 vii 2010, *Bhaumik* 36874 (holo CAL; iso ARUN).

Terrestrial, autotrophic, 30–40 cm tall. *Roots* fascicled, hairy. *Stem* below the leaves terete to semi-terete, 8–13 cm tall, ridged, yellowish green; sheath solitary in lower part of the stem. *Leaves* 2, sessile, opposite, 7–9 cm above ground, below the middle of the plant; lamina broadly ovate, 1.8–2 × 1–1.3 cm, membranous, upper surface

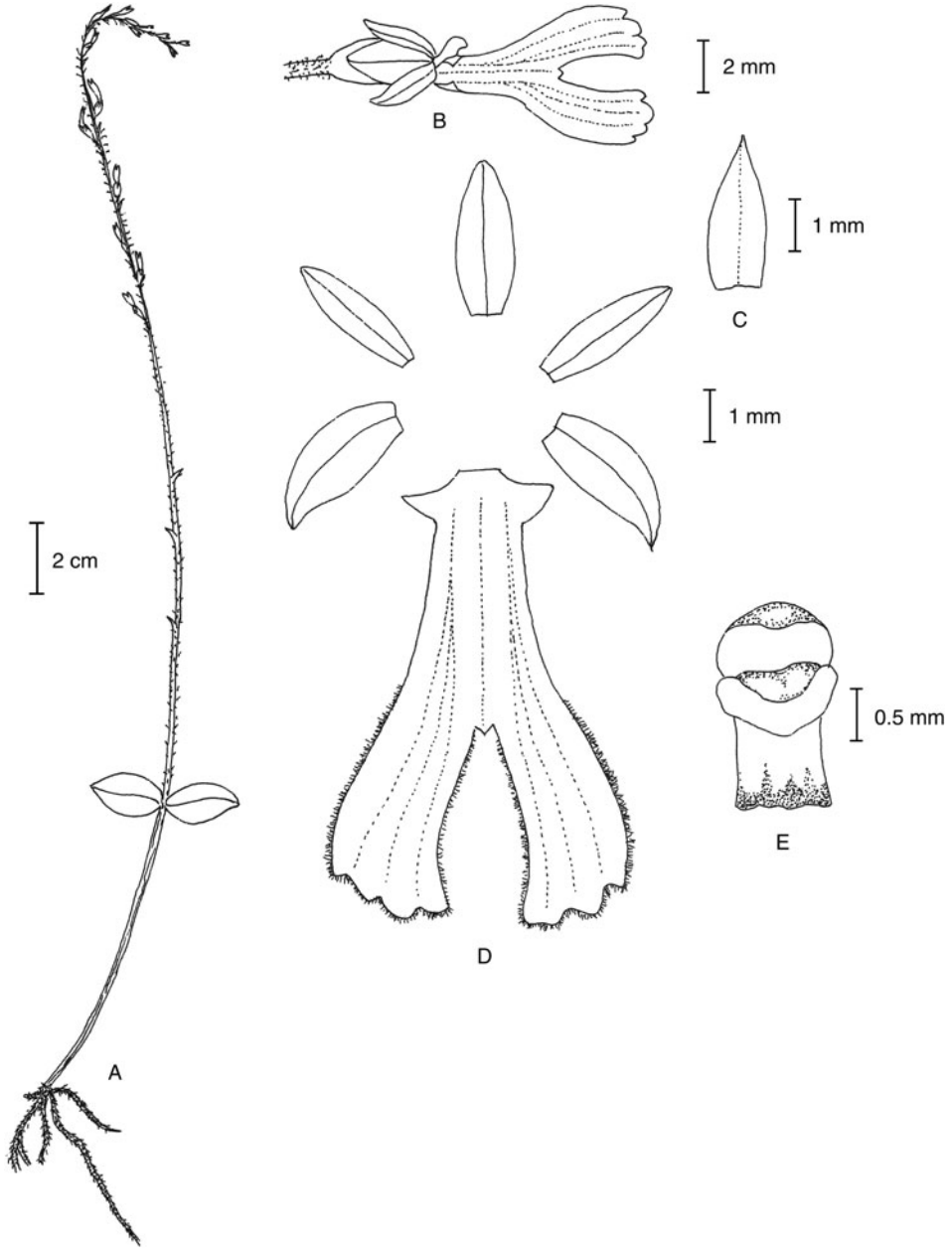


FIG. 1. *Neottia dihangensis* M.Bhaumik. A, habit; B, flower; C, floral bract; D, floral parts; E, column.

dark green, paler beneath, base rounded, apex acute, with 3 pairs of prominent primary veins and 2–4 pairs of faint secondary veins, margins undulate. *Inflorescence* a 12–27-flowered raceme; peduncle 13–19 cm tall, laxly glandular hairy; peduncular

bracts 3–5, lanceolate, 2–4 × 0.5–1 mm, membranous, acuminate; rachis 8–12 cm long, densely glandular hairy. *Floral bracts* elliptic-lanceolate, 2.5–3.2 × 1–1.2 mm, acuminate, 1-veined, greenish. *Flowers* green, on terminal part of the inflorescence; sepals and petals strongly reflexed and therefore parallel to the ovary; pedicel 3–5 mm long, densely hairy; ovary oblong, 2–3 × 1.5–1.8 mm, greenish, angular, glabrous. Dorsal *sepal* broadly ovate-elliptic, c.3 × 1 mm, acute, lateral sepals obliquely ovate, c.3.2 × 1 mm, membranous, acuminate, 1-veined. *Petals* lanceolate, c.3 × 0.5 mm, acute, 1-veined, membranous. *Lip* subobovate, 8–9 × 3–6 mm, hypochile with two lateral triangular auricles c.1 mm long, mesochile gradually broadened below the deeply bilobed epichile; lobes parallel and not overlapping, oblong, c.3 × 1.5 mm, faintly 2–3-veined, margins papillose all around, terminating with three rounded lobules, a short median triangular tooth in the sinus. *Column* straight, perpendicular to the lip, stout, 1.5–1.8 mm long, without foot.

Distribution. India, Arunachal Pradesh. Known only from the type collection.

Habitat and ecology. Temperate semi-dense bamboo, *Rhododendron* and *Abies* forest floor near the forest edge. Flowering in July.

Conservation status. Least Concern (LC). The species grows in the primary forest of Dihang Dibang Biosphere Reserve far from any human habitation. There are no immediate threats to the survival of the species. However, only one patch of 6–10 individuals was seen during our exploration.

Etymology. The specific epithet is derived from its geographical origin, namely the Dihang Dibang Biosphere Reserve.

Note. This species is similar to *Neottia nanchuanica* (S.C.Chen) Szlach. and *N. microphylla* (S.C.Chen & Y.B.Luo) S.C.Chen, S.W.Gale & P.J.Cribb in the leaves below the middle of the plant, the floral bracts obovate, ovate-lanceolate to elliptic-lanceolate, the flowers green, pale green to greenish white, the lip subobovate to obovate, and the epichile with a short tooth in the sinus. Of these it is more similar to *Neottia nanchuanica*, but differs in the sessile and smaller leaves (up to 2 cm long), longer peduncles (more than 10 cm long), inflorescence 12–27-flowered, and epichile lobes not overlapping and terminating with three rounded lobules. It also shows some resemblance to *Neottia wardii* (Rolfe) Szlach. in the papillose-ciliate epichile margin but differs in its many-flowered raceme, the lip without lamellae and the epichile lobes terminating with rounded lobules. A comparison of the new species with *Neottia nanchuanica* and *N. microphylla* is given in Table 1.

2. *Neottia confusa* M.Bhaumik, sp. nov. Fig. 2.

Species nova *Neottia tizanensi* (Fukuy.) Szlach. similis sed caule ad medium usque foliato, labio, minore, triangulari, integro, 1.2–1.5 cm longo, breviter unguiculato, hypochilo lato et epichilo integro, ad apicem non incisurato nec emarginato

TABLE 1. A comparison of *Neottia dihangensis* with *N. nanchuanica* and *N. microphylla*

Character	<i>Neottia dihangensis</i>	<i>Neottia nanchuanica</i>	<i>Neottia microphylla</i>
Plant height	30–40 cm	25–31 cm	5–11 cm
Stem below the leaves	8–13 cm tall, ridged, yellowish green	Slender with 1–2 sheaths near base	Glabrous, 0.6–2 cm long
Leaves	Broadly ovate, 1.8–2 × 1–1.3 cm, base rounded, apex acute	Broadly ovate or ovate-cordate, 3.2–6 × 3–6 cm, base broadly cuneate or shallowly cordate, apex obtuse or acute	Orbicular-ovate, 6–8 × 7–9 mm, glandular hairy on both sides, base broadly truncate, apex obtuse-acute
Inflorescence	12–27-flowered; peduncle 13–19 cm long, laxly glandular hairy; rachis 8–12 cm long, densely glandular hairy; peduncular bracts 3–5	10–19-flowered; peduncle 6–10 cm long, pubescent; rachis 8–13 cm long, densely glandular hairy; peduncular bracts 3	3–4-flowered; peduncle 2.6–6 cm long, glabrous; rachis 1.6–3 cm long, sparsely pubescent; peduncular bract 1
Floral bracts	Elliptic-lanceolate, 2.5–3.2 × 1–1.2 mm, acuminate	Ovate-lanceolate, 3.5–4.5 mm long, acuminate	Subovate or ovate-lanceolate, 3–4 × 2 mm, acute
Flowers	Green; pedicel 3–5 mm long, densely hairy; ovary oblong, 2–3 × 1.5–1.8 mm	Pale green; pedicel 5–9 mm long, pubescent; ovary narrowly elliptic, 2.5–4 mm long	Greenish white; pedicel 1.5–2 mm long, glabrous; ovary 1.5–2 mm long
Dorsal sepal	Broadly ovate-elliptic, c.3 × 1 mm, acute; lateral sepals obliquely ovate, 3.2 × 1 mm, acuminate	Oblong or narrowly elliptic, 2.8–3 × 1 mm, obtuse; lateral sepals ovate-oblong, oblique, c.3 × 1.5 mm	Oblong-ovate, c.3.5 × 1.5 mm, obtuse; lateral sepals lanceolate-ovate, slightly oblique
Petals	Lanceolate, c.3 × 0.5 mm, acute, 1-veined, membranous	Sublinear or narrowly oblong, c.2.6 × 0.8 mm	Oblong-ovate, similar to dorsal sepal but shorter and narrower

TABLE 1. (*Cont'd*)

Lip	Subobovate, 8–9 × 3–6 mm, hypochile with two lateral triangular auricles c.1 mm long, mesochile gradually broadened below the deeply bilobed epichile; lobes parallel, oblong, c.3 × 1.5 mm, faintly 2–3-veined, margins papillose all around, terminating with three rounded lobules, a short median tooth in the sinus	Subobovate, 7–9 × 3.5–6.5 mm, narrowing at base into a claw, apex deeply 2-lobed; lobes parallel or slightly incurved and overlapping towards apex, subobovate to oblong, 2.5–3 × 1.5–2.2 mm, margin ciliate, apex obtuse, sinus with a short tooth between lobes; claw 0.7–1.3 mm wide, with a pair of subobovate or subsquare auricles near base	Obovate, cuneate, c.5–5.5 × 3.5 mm, bilobed at apex, with an indistinct keel from base terminating in a short tooth in the sinus, lobes broadly oblong, c.1.4 × 1.6 mm, 3-veined, margins nearly entire
Column	Straight, 1.5–1.8 mm long	Suberect, c.2 mm long	Suberect, 1.5–2 mm long

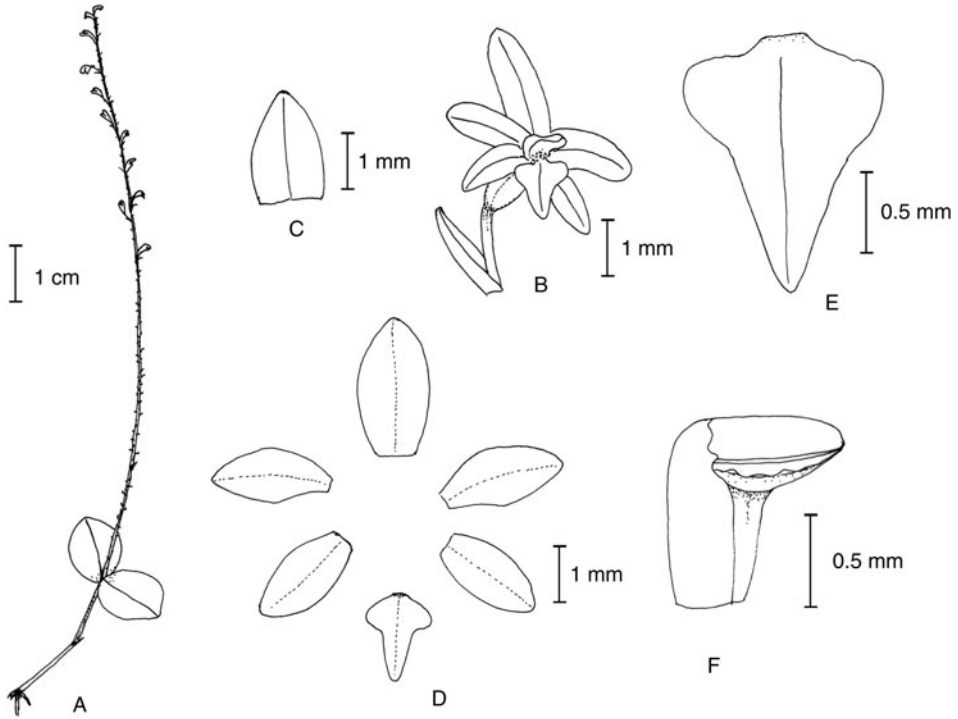


FIG. 2. *Neottia confusa* M.Bhaumik. A, habit; B, flower; C, floral bract; D, floral parts; E, lip; F, column.

differt. – Type: India, Arunachal Pradesh, Upper Siang District, Sitoma camp–Ruitala camp, 3200–3800 m, 22 vii 2010, *Bhaumik* 36891 (holo CAL; iso ARUN).

Terrestrial, autotrophic, 12–15.5 cm tall. *Stems* below the leaves terete to semi-terete, ridged, 2–5.5 cm long; sheath solitary or sometimes absent. *Leaves* opposite, sessile, borne much below the middle, broadly ovate-orbicular to ovate-elliptic, 8–12 × 6–11 mm, rounded to subacute at apex, primary veins in five pairs. *Inflorescence* a raceme, 15–20-flowered; peduncle terete, glandular hairy, 0.5–2.2 cm long; peduncular bracts 2–3, sometimes absent, elliptic-ovate, c.2.2 × 0.9 mm, acuminate; rachis 3.5–5 cm long, densely glandular hairy. *Floral bracts* oblong-lanceolate, 1.5–2 × 0.6–1.2 mm, acute to acuminate, semi-membranous, greenish, 1-veined. *Flowers* greenish, 3–4 × c.2 mm; pedicel and ovary 2–3 mm long, glabrous. *Dorsal sepal* elliptic-oblong, 2–2.5 × 0.8–1.3 mm, rounded at apex, indistinctly 1-veined; *lateral sepals* 1.8–2 × 0.6–1 mm, elliptic-oblong, rounded to subacute. *Petals* obliquely elliptic-oblong, c.2.2 × 1 mm, rounded at apex, veins not distinct. *Lip* simple, triangular in outline, minutely clawed, 1.2–1.5 × c.1 mm, hypochile expanded on both sides forming pseudoauricles, mesochile gradually narrowed into

TABLE 2. A comparison of *Neottia confusa* with *N. taizanensis*, *N. biflora* and *N. morrisonicola*

Character	<i>Neottia confusa</i>	<i>Neottia taizanensis</i>	<i>Neottia biflora</i>	<i>Neottia morrisonicola</i>
Plant height	12–15.5 cm	11–16 cm	10–13 cm	4–20 cm
Stems	Ridged; sheath solitary or absent	Slender, with 1 sheath	1-sheathed towards base	Cylindric, slender
Leaves	Sessile, borne much below the middle, broadly ovate-orbicular to ovate-elliptic, 8–12 × 6–11 mm, rounded to subacute at apex	Subsessile, borne above the middle, deltoid or ovate or ovate-suborbicular, c.2 × 2.5 cm, base cuneate or triangular-cuneate, apex acute	Subsessile, borne above the middle, unequal in size, larger one 1.2–1.8 × 0.8–1.4 cm, smaller one 1–1.5 × 5–7 mm, both rounded at base, acute at apex	Sessile, borne at the middle, ovate or ovate-orbicular, 1.5–2 × 1.2–1.8 cm, base rounded, apex acute
Raceme	15–20-flowered	Subdensely 11–13-flowered	1–2-flowered	Subdensely 2–5-flowered
Peduncle	Glandular hairy, 0.5–2.2 cm long; peduncular bracts 2–3, sometimes absent, elliptic-ovate, c.2.2 × 0.9 mm, acuminate; rachis 3.5–5 cm long, densely glandular hairy	2–4 cm long, pubescent, sterile bracts 1–4; rachis 2.5–5 cm long	2–2.5 cm long, pubescent, lacking sterile bracts; rachis very short, sparsely pubescent or glabrous	2–5 cm long, pubescent; rachis 2–6 cm long, pubescent
Floral bracts	Oblong-lanceolate, 1.5–2 × 0.6–1.2 mm, acute to acuminate	Ovate-lanceolate, c.3 × 1–1.5 mm, acute	Ovate-lanceolate, 3–5 × c.8 mm, acute, shorter than pedicel	Ovate-lanceolate, 6–7 × c.3 mm, apex obtuse, inconspicuously 3-veined
Flowers	Greenish, 3–4 × c.2 mm; pedicel and ovary 2–3 mm long, glabrous	Small, resupinate; pedicel and ovary erect, 6–9 mm long, glabrous	Resupinate; pedicel 4–6 mm, nearly glabrous; ovary 4–5 mm long, glabrous	Resupinate, 15–20 mm in diameter; pedicel 4–5 mm; ovary c.3.5 mm long

TABLE 2. (Cont'd)

Character	<i>Neottia confusa</i>	<i>Neottia taizanensis</i>	<i>Neottia biflora</i>	<i>Neottia morrisonicola</i>
Sepal	Dorsal sepal elliptic-oblong, 2–2.5 × 0.8–1.3 mm, rounded at apex; lateral sepals 1.8–2 × 0.6–1 mm, elliptic-oblong, rounded to subacute	Dorsal sepal narrowly ovate, c.2 × 0.7 mm, glabrous, 1-veined, apex acute or subacute; lateral sepals oblong, falcate, c.2.5 × 1 mm, glabrous, subacute	Dorsal sepal ovate-elliptic, 6–7 × 1.2–1.8 mm, outer surface carinate, apex obtuse; lateral sepals linear-lanceolate, c.7 × 1 mm, similar to dorsal sepal	Sepals not spreading widely, similar, ovate-lanceolate, 7–8 × 2–2.5 mm, 1-veined, apex acute
Petals	Obliquely elliptic-oblong, c.2.2 × 1 mm, rounded at apex	Linear or spatulate-linear, c.2.3 × 0.3 mm, glabrous, apex subacute	Linear, c.6.5 × 1 mm, apex obtuse or acute	Linear-lanceolate, 6–7 × 1–1.5 mm, 1-veined, apex acute
Lip	Simple, triangular, minutely clawed, 1.2–1.5 × c.1 mm, hypochile expanded on both sides forming pseudoauricles, mesochile gradually narrowed into a triangular epichile	Erect, spatulate, 3.5–4.5 × c.1.3 mm, base cuneate, narrowing to c.0.5 mm wide, 3-veined, apex emarginate	Spreading forward, cuneate, 8–10 × 4–5.5 mm, apex truncate-rounded and shallowly notched, usually with a minute tooth at notch; disk with groove at base, midvein slightly thickened	Pendulous or spreading forward, broadly cuneate, 9.5–10 × 5–6.5 mm, with 3 inconspicuous veins, base concave and slightly channelled, margin recurved, apex truncate or shallowly notched or emarginate
Column	Stout, straight, 0.8–1 mm long	c.1.5 mm long	Slightly arcuate, 3–4 mm long	c.3 mm long

a triangular epichile. *Column* stout, straight, 0.8–1 mm long, curved at apex, without foot.

Distribution. India, Arunachal Pradesh. Known only from the type collection.

Habitat and ecology. Growing on moss-covered moist forest floor in the temperate to subalpine zone. The forest is dominated by shrubby *Rhododendron* species and occasional *Abies* trees. About 10–15 individuals of the orchid species at three different places have been seen growing scattered along with *Neottia acuminata* Schltr., *Juncus* species and many other herbaceous elements. It flowers and fruits in July and August.

Conservation status. Least Concern (LC). Like *Neottia dihangensis* this species also grows in the primary forest of a conserved area, namely Dihang Dibang Biosphere Reserve, far from any human habitation. There are no immediate threats for the survival of the species.

Etymology. In the genus *Neottia* (including *Listera* R.Br.) the lips are usually bilobed or entire and apically emarginate and are often longer than the sepals and petals. Simple and comparatively short lips, as found in *Neottia confusa*, are rather atypical in the genus. Consequently, the specific epithet *confusa* is coined.

Notes. *Neottia confusa* has a simple and small lip with an undivided epichile and therefore resembles the two holomycotrophic species *N. acuminata* and *N. taibaishanensis* P.H.Yang & K.Y.Lang. However, its autotrophic habit with two distinct opposite leaves rather indicates a close affinity with *Neottia taizanensis* (Fukuy.) Szlach., *N. biflora* (Schltr.) Szlach. and *N. morrisonicola* (Hayata) Szlach. where the epichile is shallowly notched or emarginate. Its expanded hypochile base can be considered as a pair of auricles, and the entire epichile shows that the new species is distinct from the other species. It is most similar to *Neottia taizanensis* but differs in its leaves borne below the middle of the plant, and the lip smaller, triangular, entire, 1.2–1.5 cm long, minutely clawed, hypochile wide, epichile entire and neither notched nor emarginate at apex.

Listera R.Br. and *Neottia* Guett. have been treated as separate genera for the last two centuries mainly due to differences in their habit. In recent studies all *Listera* R.Br. species have been moved into *Neottia* Guett. (Szlachetko, 1995). *Neottia confusa* is somewhat intermediate between the genera *Neottia* Guett. and *Listera* R.Br. A comparison of *Neottia confusa* with *N. taizanensis*, *N. biflora* and *N. morrisonicola* is given in Table 2.

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