

Three new species of the genus *Gomphichis* (Orchidaceae, Spiranthoideae) from Colombia

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The orchid genus *Gomphichis*, which belongs to the subtribe Prescottiinae, includes approximately 30 species in the Neotropics. The present paper describes and illustrates three new species in the genus: *G. schneideri* Szlach., S. Nowak & Paluchowska, *G. epiphytica* Szlach., S. Nowak & Paluchowska and *G. renziana* Szlach., S. Nowak & Paluchowska. A distribution map of the new species is included along with notes on their habitats. A dichotomous identification key to all *Gomphichis* species in northern South America is provided. It seems that the new species are endemic in the Cordillera Oriental in the Colombian Andes. The specimens were collected in the Department of Cundinamarca, which includes the Tropical Andes biodiversity hotspot.

Introduction

Notes on Colombian biodiversity

The flora and fauna of Colombia are very rich and diverse, and contain a high number of endemic taxa. This results from a unique combination of factors, such as e.g. meteorological conditions (mainly temperature and humidity; see Forero 1988). The territory of Colombia can be divided into five natural regions: the Andes, the Pacific coast, the Caribbean coast, the Llanos (plains), and the Amazon rainforest (Devillers & Devillers-Terschuren 1996, Davis *et al.* 1997). Amazonia, tropical Andes, and Pacific coast are the centers of plant diversity in the country. These areas are also very rich in orchid species, which constitute approximately 10% of the Colombian vascular plant flora (Kress 1986, Davis *et al.* 1997). Some parts of Colombia

belong to South American biodiversity hotspots, e.g. Tropical Andes, which in terms of species numbers is the richest and most diverse place in the world (Mittermeier *et al.* 2004). One of the Colombian departments belonging to the Tropical Andes is Cundinamarca, where the specimens reported here were collected. The multiplicity of ecosystems in the Tropical Andes, ranging from tropical wet and moist forests, dry forests, grasslands, woodlands, and cactus stands to thorn scrubs, is partially determined by the very variable topography (snowcapped peaks, steep slopes, deep canyons or isolated valleys).

The amazing biological diversity of the area is under serious threat. Environmental changes in Colombia, caused by both natural (volcanic eruptions, earthquakes) and anthropogenic factors, such as large-scale agriculture, mining, energy production or infrastructure construction, lead inevitably to deforestation (Rodríguez &

Ponce 1999, Young *et al.* 2002, Mittermeier *et al.* 2004). Deforestation together with land erosion, mining and oil exploration, pollution of air and water, over-harvesting and unsustainable tourism development form the most serious threats to the regional biodiversity.

Genus *Gomphichis* (Orchidaceae)

The type species of *Gomphichis*, which was described by Lindley (1840), is *G. goodyeroides*. *Gomphichis* belongs in the subtribe Prescottiinae (Álvarez-Molina & Cameron 2009). The subtribe was described by Dressler (1990) and classified within the tribe Cranichideae (Dressler 1990, 1993). Pridgeon *et al.* (2003), however, did not recognize Prescottiinae as a distinct taxon. Szlachetko (1995) followed Dressler's (1990, 1993) taxonomic concepts, but placed Prescottiinae within the tribe Spirantheae.

Gomphichis occurs from Costa Rica to Bolivia, with few species found in Guyana and Brazil. All species of *Gomphichis* collected in the northern Andean region were also found in Colombia. They occur in three Cordilleras, which are divided by the valleys of the Magdalena and Cauca rivers that constitute barriers for the dispersal of montane plants. It is possible that the three species described here are endemic to the Cordillera Oriental. The key for identification of all species of *Gomphichis* occurring in northern South America provided in this paper aids in distinguishing also the species described here.

The representatives of the genus are terrestrial, occasionally epiphytic, caespitose herbs, characterized by stout, fascicled, and fibrous roots. The stem is simple, erect, and leafy, especially toward the base. The species of *Gomphichis* have several fleshy leaves mostly grouped together near the base. The lower leaves are narrowly elliptic to linear-oblong, acute to acuminate, petiolate, while the uppermost are reduced to herbaceous bracts, present at anthesis. The racemose and multi-flowered inflorescence is terminal, erect and elongate-cylindrical, rarely abbreviated. The flowers are non-resupinate, small, and fleshy. Both sepals, which are free, subequal, and wide-opening, and petals are usu-

ally deflexed from the ovary. In addition the sepals are tomentose or glandular-pilose, rarely glabrous outside. The petals are free, usually narrower than sepals, often ciliate to fimbriate on the margin(s). The labellum is shortly clawed, concave or conduplicate, fleshy, simple or three-lobed, and the disc is thickened or callose, often papillose.

The species of *Gomphichis* thrive between 1700–3600 m a.s.l., in open páramo, damp grassy slopes, cliffs, woodland margins, thickets, and upper montane cloud forest (Pridgeon *et al.* 2003).

Material and methods

A total of 210 specimens collected during the field expeditions carried out by Szlachetko in 2011 and 2012, and by Kolanowska in 2009, 2010 and 2011 were examined under a stereoscopic microscope, and compared with the *Gomphichis* specimens borrowed from AMES, B, BM, COL, CUVC, K, P, VALLE, and W (acronyms according to Holmgren & Holmgren 1998), and their original descriptions.

Key to the *Gomphichis* species known from northern South America

1. Lip distinctly divided into hypochile and epichile 2
1. Lip entire or obscurely divided into wider basal part transferring gradually into a narrower apical part 12
2. Hypochile transversely elliptic, lateral lobes rounded ... 3
2. Hypochile obulate or obreniform, widest at apex, lateral lobes obliquely triangular 8
3. Petals obliquely elliptic, proportion of width of basal part of lip to its length 2:1 *G. longifolia*
3. Petals obliquely lanceolate to oblanceolate, width and length of basal part of lip equal or lip slightly wider ... 4
4. Petals sessile, obliquely oblong-elliptic, attenuate towards apex, lip much thickened in major part *G. traceyae*
4. Petals clawed, obliquely lanceolate to oblanceolate, lip thickened just in center 5
5. Gynostemium strongly sigmoid, with chin-like extension at base *G. cundinamarcae*
5. Gynostemium not sigmoid, lacking extension 6
6. Petals ciliate along outer margin, long-pubescent along inner margin, gynostemium parallel to ovary *G. costaricensis*
6. Petals equally ciliate along both margins, gynostemium perpendicular to ovary 7
7. Petals widest just below middle, epichile elliptic-ovate *G. brachystachys*

7. Petals widest above middle, epichile oblong-ligulate *G. scaposa*
8. Leaves shorter than 1/3 of total plant length 9
8. Leaves longer than 1/3 of total plant length 10
9. Petals broadly elliptic, oblique, distinctly clawed, central part of lip papillate *G. viscosa*
9. Petals oblong-elliptic, subsessile, central part of lip densely hairy *G. bogotensis*
10. Petals oblong, acuminate, ciliate along inner margin, pubescent along outer margin, gynostemium long pubescent on ventral surface *G. hetearioides*
10. Petals broadly elliptic, acute to subobtuse, both margins with similar cover, gynostemium ciliate on ventral surface 11
11. Petals ciliate along both margins, lip papillate in center, gynostemium straight, ciliate on dorsal surface *G. adnata*
11. Petals papillate along both margins, lip ciliate in center, gynostemium geniculate just above base, pubescent on dorsal surface *G. goodyeroides*
12. Lip widest at base 13
12. Lip widest near middle or above 16
13. Lip shortly clawed 14
13. Lip sessile 15
14. Petals obliquely lanceolate, clawed, ciliate on outer surface, pubescent on both margins *G. lancipetala*
14. Petals obliquely oblanceolate, glabrous on outer surface, both margins ciliate *G. foliosa*
15. Petals ligulate-lanceolate, gynostemium elongate, arcuate *G. valida*
15. Petals obliquely elliptic-obovate, gynostemium, short, massive, reflexed *G. caucana*
16. Lip ligulate-pyriform 17
16. Lip not as above 19
17. Lip long-clawed, petals narrowly sagittate, acute *G. macbridei*
17. Lip sessile, petals ligulate or oblong-obovate, obtuse or rounded at apex 18
18. Petals oblong-obovate, clawed, irregularly hirsute on both margins, lip apex papillate *G. crassilabia*
18. Petals ligulate, ciliate on both margins, lip apex hirsute *G. renziana*
19. Plants to 130 cm tall, petals obovate, acute, margins and outer surface pubescent, lip oblong-ovate, distinctly thickened above base and along apical margins *G. epiphytica*
19. Plants to 30 cm tall, petals ligulate, obtuse, lip oblong-ligulate, slightly thickened along margins and at apex *G. schneideri*

Taxonomic treatment

Gomphichis schneideri Szlach., S. Nowak & Paluchowska, *sp. nova* (Figs. 1 and 2)

TYPE: Colombia. Cundinamarca, Páramo de Siberia, alt. 3600 m a.s.l., 24 Feb. 1952, *Schneider 288/5* (holotype COL).

ETYMOLOGY: Dedicated to Martin Schneider, who has created an extensive collection of Colombian plants.

Erect, slender, glabrous plants to 30 cm. Leaves 4, to 4 × 1 cm, basal, rosulate, lanceolate, acute, and sessile, above 4 cauline sheaths. Inflorescence to 8 cm long, densely many-flowered, axis glandular. Flowers small. Floral bracts 8 mm long, ovate-lanceolate, almost glabrous. Ovary 4 mm long, densely glandular. Sepals glandular outside. Dorsal sepal 4.5 × 1.4 mm, oblong-lanceolate to ligulate, subobtuse, concave, 1-nerved. Petals 4 × 1.2 mm, obliquely ligulate, obtuse, concave, densely pubescent on outer margin, 1-nerved. Lateral sepals 4.5 × 1.7 mm, ligulate to ligulate-ovate, concave, obtuse, falcate, concave, 1-nerved. Lip 4 × 1.8 mm, oblong-ligulate in outline, densely pubescent on margins, cochleate and slightly thickened at apex, sessile, basally slightly thickened along margins, 1-nerved. Gynostemium 3.2 mm long, perpendicular to ovary, very slender, ciliate on back surface below anther.

This species is unusual in the genus by having an oblong-ligulate lip with pubescent margins and oblong-falcate, obtuse petals with a pubescent outer margin.

Gomphichis epiphytica Szlach., S. Nowak & Paluchowska, *sp. nova* (Figs. 3 and 4)

TYPE: Colombia. Cundinamarca, Represa del Neusa, cerros y alrededores de la laguna. Epiphytic on shrubs, above lake, W side, below forest and patches of lower páramo, alt. 3100 m a.s.l., 22 June 1957, *Barclay 4190* (holotype COL).

ETYMOLOGY: An allusion to the substrate.

Plants to 130 cm tall, erect, slender, glabrous, enclothed in numerous cauline sheaths. Leaves 4, in the basal sixth of stem, petiolate; petiole 3–5 cm long; blade to 20 × 3.5 cm, linear-oblanceolate, acute. Inflorescence 19 cm long, many-flowered, axis glandular. Flowers small, green. Floral bracts 18 mm long, ovate-lanceolate, acute, glabrous. Ovary to 10 mm long, densely glandular. Sepals densely glandular on outside. Dorsal sepal 8 × 3.5–4 mm, oblong-elliptic to ligulate, acute to shortly acuminate, concave, 1-nerved. Petals 8 × 3.5–4 mm, obliquely oblong-obovate, acute, densely pubescent on both margins and

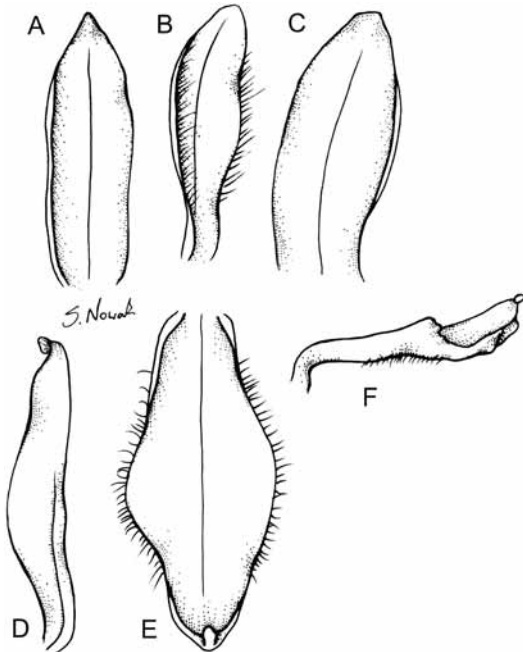


Fig. 1. *Gomphichis schneideri* (from the holotype). — A: Dorsal sepal. — B: Petal. — C: Lateral sepal. — D: Lip from side. — E: Lip. — F: Gynostemium.

outer surface, 3-nerved. Lateral sepals $8 \times 3\text{--}3.5$ mm, ligulate, acute, falcate at base, concave, 1-nerved. Lip to 8.5×1.2 mm at base, 3.2 mm wide at apex, oblong-ovate, distinctly thickened above base and along apical margins, concave, densely pubescent on outer surface, apex shortly apiculate, 3-nerved, both laterals thickened at apex. Gynostemium 5 mm long, perpendicular to ovary, inner surface ciliate above base.

This species appears to be related to the previous one, but differs in having an oblong, ovate-ligulate lip, much broader petals with both margins being ciliate, and the gynostemium ciliate on the inner surface at the base only.

Gomphichis renziana Szlach., S. Nowak & Paluchowska, *sp. nova* (Figs. 5 and 6)

TYPE: Colombia. Cundinamarca, Mpio. Sesquile, vereda Gobernador cerro Covadonga, alt. 3250 m a.s.l., 8 Nov. 1998, M. Acosta, P. Velasco & F. Poveda 94 (holotype COL).

ETYMOLOGY: Dedicated to Jany Renz (1907–1999), an eminent orchid specialist from Switzerland.

Plants to 15 cm tall, erect, very delicate, gla-



Fig. 2. Holotype of *Gomphichis schneideri*.

brous below, glandular in upper part, upper part enclothed by 5 cauline sheaths. Leaves 4, basal, rosulate, sessile, up to 3.5×0.7 cm, linear-lanceolate or linear, acute. Inflorescence 2–3.5 cm long, densely many-flowered. Flowers very small. Floral bracts 6 mm long, ovate-lanceolate, acute, densely glandular. Ovary 4.2 mm long, densely glandular. Dorsal sepal 3.5×1.5 mm, oblong-elliptic, subobtuse, concave, 3-nerved. Petals 3.5×1.2 mm, oblong or narrowly elliptic, obtuse, sigmoid, ciliate on both margins below apex, 1-nerved. Lateral sepals 4×1.6 mm, oblong, falcate to sigmoid, subacute, concave, 1-nerved. Lip 5×2 mm, sessile, narrowly obovate, concave and thin at base, ligulate and thickened towards apex, thickening sulcate, apical part densely pubescent on inner surface, with two small, thick, basal auricles. Gynostemium 2.6 mm long, parallel to ovary, densely ciliate below apex.

This species appears to be related to *G. valida* and *G. crassilabia*. From both it differs, however, by having the lip pubescent in the apical part on the upper surface, and petals which are oblong and rounded at the apex.

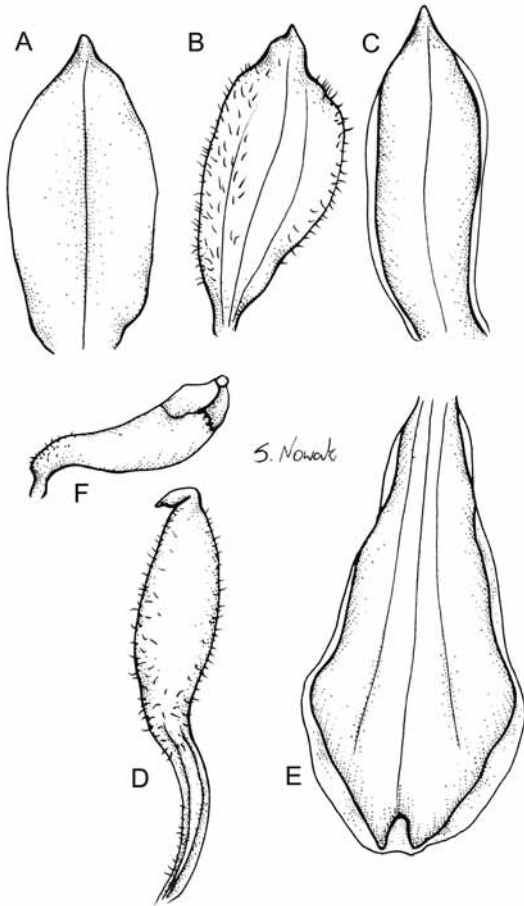


Fig. 3. *Gomphichis epiphytica* (from the holotype). — A: Dorsal sepal. — B: Petal. — C: Lateral sepal. — D: Lip from side. — E: Lip. — F: Gynostemium.

Notes on the habitat

The specimens of the newly described species were collected in the Department of Cundinamarca. Most of Cundinamarca is located in the Cordillera Oriental (Davis *et al.* 1997, Fig. 7). This region is generally cold and humid with fluctuating climate. The average annual temperature and precipitation are between 1 and 10 °C, and between 1000 and 2300 mm, respectively, winds are cold, fog frequent and frost at night possible (Luteyn 1999). *Páramo*, a high-altitude mountain formation between the upper tree-limit and the perennial snow line (3200–5000 m a.s.l.), occurs only in the Andes (Devillers & Devillers-Terschuren 1996, Davis *et al.* 1997, Cuesta & De Bievre 2008). *Páramo* can be divided into



Fig. 4. Holotype of *Gomphichis epiphytica*.

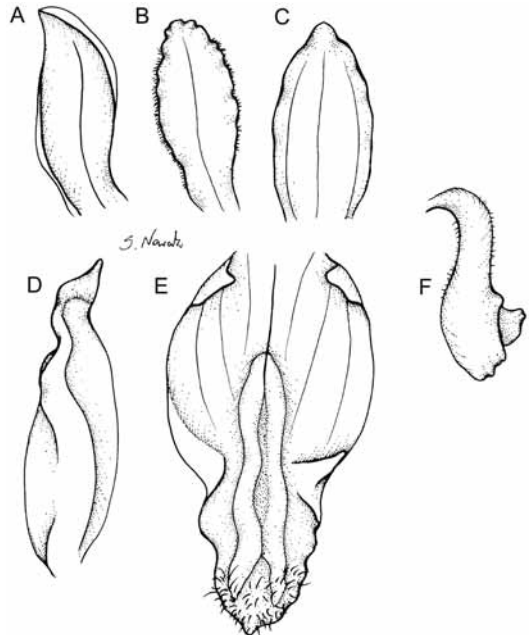


Fig. 5. *Gomphichis renziana* (from the holotype). — A: Dorsal sepal. — B: Petal. — C: Lateral sepal. — D: Lip from side. — E: Lip. — F: Gynostemium.



Fig. 6. Holotype of *Gomphichis renziana*.

three zones: *superpáramo*, grass *páramo* and *subpáramo*, the division being based on altitude and vegetation structure (Luteyn 1999). High biodiversity and the high level of endemism, characteristic for this plant community, result from isolation and fragmentation of *páramo* over the Andean highlands (Keating 1999, Buytaert *et al.* 2006). The plants that live in *páramo* are of course adapted to the specific physical, chemical and climatic conditions such as low temperatures and atmospheric pressure, intense ultraviolet radiation and fast changes in insolation. These conditions determine their slow growth, slow decomposition and low primary productivity. The natural succession of the vegetation takes a long time. Dark peat-soils on which grasses, shrubs and other flowering plants grow prevail in *páramo* (Luteyn 1999, Buytaert *et al.* 2006). Most of the plants have small, thick leaves, flowers growing close to the ground, and deep soil-penetrating root systems (Luteyn 1999). Intensive cattle grazing, cultivation, reforestation with exotic species, and human inhabitation are common in the area (Buytaert *et al.* 2006). These activities have a drastic impact on this

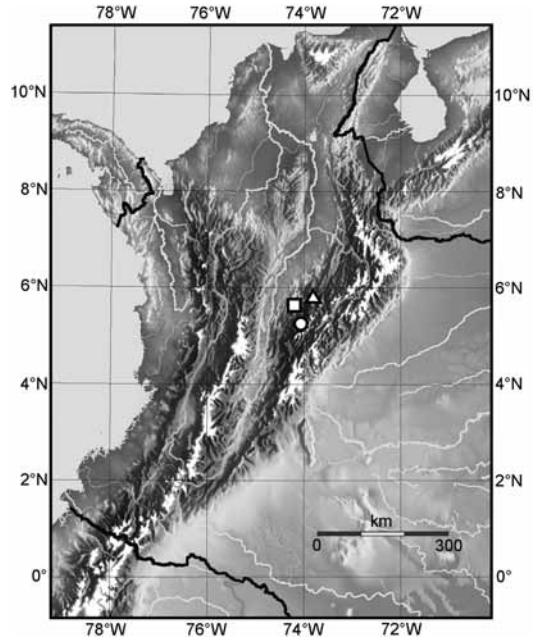


Fig. 7. Distribution of the new species on the three Cordilleras in Colombia (circle: *Gomphichis schneideri*, triangle: *G. epiphytica*, square: *G. renziana*).

ecosystem, especially on the composition and structure of the vegetation (Cuesta & De Bievre 2008), and this is the one of the reasons the orchid species are threatened.

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