Two *Lepanthes* (*Orchidaceae: Pleurothallidinae*) with strongly reduced corolla

Franco Pupulin, Hugo Medina and Diego Bogarín

Abstract. Two new species of *Lepanthes* with strongly reduced corolla are described and illustrated. *Lepanthes equus-frisiae* from Ecuador is similar to the Colombian *L. micellilabia*, from which it can be distinguished by the free sepals, sparsely trichomatous at the base, transversely rheniform-suborbicular, rounded, concave petals and the subspherical, broadly obtuse lip. *Lepanthes vestigialis* from Costa Rica is distinguished by the small habit, the broadly-ovate, grey-green leaves, the elongate column up to 2 mm long, and the extremely reduced size of petals, its most remarkable character. The lip is completely reduced into an appendix and the petals are ovate to orbicular, trichomatous and very small.

The development of flowers is intimately correlated with their system of pollination. Flowers with a biotic pollination syndrome (which includes most of the Orchidaceae) usually show a series of adaptations to improve attraction of specific pollinators and to increase the success of pollination. Among these, differentiation of showy petals is part of the visual signals that lead to effective fertilization, and specific elaborations of petals are often triggered by the kind of pollinators that evolved with the flowers (Ronse De Craene, 2010). Mechanical correlation between petals and gynostemium, both in the arrangement of petals and their ornamentations, is frequent in the Orchidaceae to maximize the effectiveness of pollinator visits and pollen transfer.

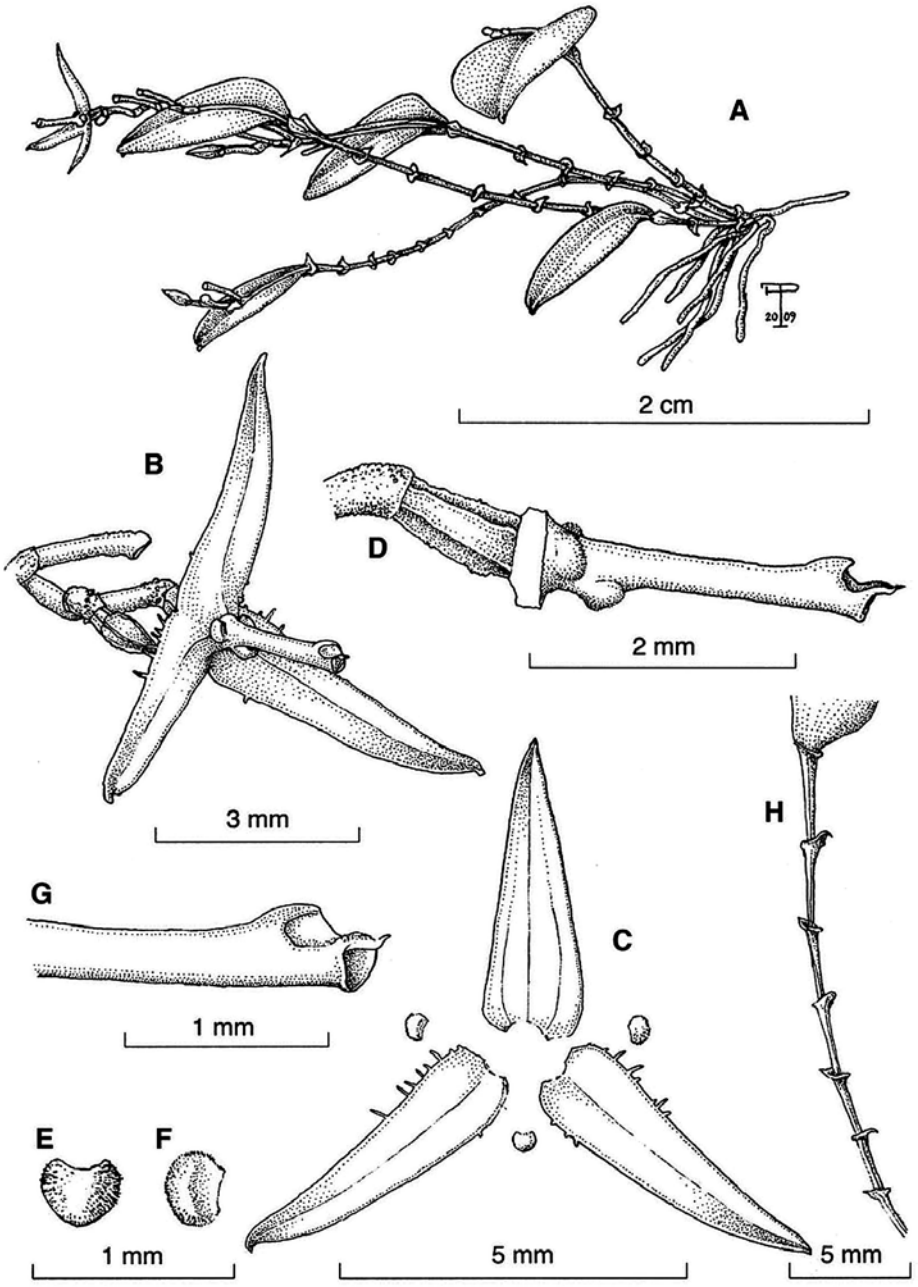
One of the parts of the orchid inner perianth, the median petal or lip, is often highly elaborated, and the presence of this modified petal has been considered one of the key-characters in the evolution of the family. Nevertheless, even though the Orchidaceae are often regarded as typically petaloid flowers, and several genera are amply cultivated because of their showy colored petals, the reduction of petals size and ornamentations is common in the family. Among significant horticultural genera that exhibit a clear tendency toward petals reduction we can quote at least *Bulbophyllum, Coryanthes* and *Gongora*.

With the exceptions of *Neocogniuaxia* Schltr., species of *Brachionidium* Lindl., *Platystele* Schltr., *Restrepiopsis* Luer, and some groups of *Pleurothallis s.l.*, which have petals subequal in size and color to the sepals, the reduction of the corolla parts is almost distinctive of the Pleurothallidinae. Genera like *Dracula* Luer and *Masdevallia* Ruiz & Pav. have very reduced petals compared with the size of the sepals. A species of *Andinia* (Luer) Luer, *A. vestigipetala* (Luer) Pridgeon & M.W. Chase, has microscopic petals (0.6 mm long) that cling to the base of the column, being one of the most interesting examples of petals reduction (Luer 1977). In the case of *Stelis* Sw., as well in other Pleurothallidinae groups, this character is normally associated with petaloidy of sepals, which are usually distinctly pigmented and often provided with elaborate indumenta.

Lepanthes Sw. is one of the largest genera in the Orchidaceae, with almost one thousand species currently accepted, ranging from Cuba to Trinidad in the West Indies, and from southern Mexico to Bolivia, Venezuela, the Guianas and northern Brazil in continental America. Species of *Lepanthes* are mostly characterized by narrow endemic distribution. As it is rational to expect in a large genus with broad geographic distribution, *Lepanthes* presents ample variations in the relative size and arrangements of the floral organs, often resulting in very intricate floral shapes. Most of the species, however, conform to a generalized floral scheme, with subsimilar, triangular to ovate, greenish hyaline sepals, larger, boldly colored, transversely bilobed petals and a small, mostly bilaminate lip encircling the column. The lip is normally provided with an apical or subapical appendix, which proved to play a central role in the pseudocopulatory pollination syndrome documented by Blanco and Barboza (2005). It is still not clear which kind of visual cue actually play the colored petals in the attraction of the male fungus gnats that approach the flowers searching for mate, but the widespread presence in the genus of highly elaborated and showy petals suggests that they are subject to selective pressure.

Among the vast array of variations in the morphology of the corolla, a small group of *Lepanthes* species exhibits a pronounced diminution in petals and lip size, the flowers being basically reduced to a sepaline whorl and a comparatively long and stout gynostemium. This group of probably unrelated species includes *L. isosceles* Luer & R. Escobar, *L. micellilabia* Luer & R. Escobar, *L. pelorostele* Luer & Hirtz, and *L. rigidigitata* Luer & Hirtz. With the exception of the latter species, which has 3-lobed, filiform petals and a bilaminate lip, this informal group is characterized by the presence of extremely condensed, simple petals and lip.

While species of *Lepanthes* with strongly reduced corolla have been described exclusively from northern Andes (Luer & Escobar 1984, 1994; Luer 2004, 2009), including one of the new taxa proposed here, we report in this paper the occurrence of an almost apetalous *Lepanthes* species also from Central America. The broad geographic gap between the known spe-



Lepanthes equus-frisiae Pupulin & Medina. **A** – Habit. **B** – Flower. **C** – Perianth flatten. **D** – Column and lip, lateral view. **E** –Lip. **F** – Petal. **G** – Apex of the column. **H** – Detail of the ramicaul.

Drawing © F. Pupulin from the holotype

Lepanthes equus-frisiae
Flower from the plant that served as the holotype.

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cies of *Lepanthes* with vestigial corolla strongly suggests that the tendency toward secondary apetaly (or apopetaly, Weberling, 1989) evolved more than once (and probably repeatedly) in the genus.

Lepanthes equus-frisiae Pupulin & Medina, **sp. nov.**

A Lepanthi micellilabiae Luer & R. Escobar similis, distincta sepalibus liberis basaliter trichomatibus instructis, petalis transverse rheniformi-suborbicularis rotundatis concavis, labello subsphaerico late obtuso; a Lepanthi rigidigitatae Luer & Hirtz habito caespitoso et inflorescentia congesta praecipue recedit.

Type. Ecuador. Carchi: El Laurel, road to Maldonado, ca. 2.400 m, collected by H. Medina, 1993, flowered in cultivation in the collection of Ecuagenera at Gualaceo, Accession No. 001588, 13 Feb. 2009, F. Pupulin 7795.

Epiphytic, cespitose, suberect to prostrate *herb*, to 3.5 cm tall. **Roots** filiform, flexuous, to 0.3 mm in diameter. *Ramicauls* slender, 13 – 24 mm long, enclosed by 6 – 12 tightening, lepanthiform, scabriuscule sheaths to 4 mm long, the ostia dilated, subacuminate, minutely ciliate along the margins. **Leaf** subcoriaceous, flat, slightly conduplicate, narrowly ovate-elliptic, minutely retuse, 7 – 9 x 4.0 – 8.5 mm, the prominent abaxial midvein protruding within the sinus to form a rounded apicule. **Inflorescence** racemose, distichous, succesively flowered, borne above the leaf, to 11 mm long; peduncle filform, terete, to 6.5 mm long; rhachis zig-zag. *Floral bracts* amplectent, broadly ovate, obtuse, minutely verrucose, ca. 0.7 mm long. **Pedicel** terete, minutely verrucose toward the apex, 1.8 mm long. **Ovary** cylindric-subclavate, 1 mm long, rounded-subwinged in section, the wings membranous. **Flowers** spreading, the sepals pale reddish

brown, the dorsal sepal flushed rose-purple along the central vein, the trichomes on the lateral sepals margins white, the petals pink, the lip and the column rose-purple. **Dorsal sepal** triangular-lanceolate, acute, 3-veined, 5.0 x 1.5 mm, convex at the base, concave toward the apex, connate to the lateral sepals for about 0.7 mm. **Lateral sepals** narrowly lanceolate, subfalcate, acute, 1-veined, 4.5 x 1.2 mm, sparsely cilate along the margins toward the base, more so on the external side, connate at the base 0.5 mm. **Petals** transversely rheniform-suborbicular, rounded, concave, 0.30 x 0.35 mm, finely velutine. **Lip** subspherical, broadly obtuse, 0.3 x 0.4 mm, the base cordate, the adaxial surface concave, adpressed to the column, minutely setose. **Column** elongate, straight, 2.8 mm long, the clinandrium dorsal, the rostellum and the stigma apical. **Anther cap** cucullate, 2-celled. Pollinia 2.

Habitat: Plants of *L. equus-frisiae* have been found in the northern Ecuadorian province of Carchi, where they grow epiphytically in cold and cloud forest with high humidity, at about 2.400 meters of elevation. They have been observed growing on small branchlets in the forest understory, only partially exposed to sunlight.
Distribution: Ecaudor, known only from the type locality.
Derivation of name: From the Latin 'equus', horse, and 'Frisia', the region on the western coasts of Germany and the Netherlands, in reference to the similarity of the flower to the Frisian horse (or 'cheval de frise'), a type of military defensive obstacle first used by Frisians in the late XVIth Century.

Lepanthes equus-frisiae is similar to the Colombian *L. micellilabia* Luer & R. Escobar, from which it can be distinguished by the free sepals, sparsely trichomatous at the base (vs. basally connate, glabrous), transversely rheniform-suborbicular, rounded, concave petals (vs. transversely bilobed, with a marginal tooth between the lobes, flat) and the subspherical, broadly obtuse lip (vs. cordate, acute). Florally, *L. equus-frisiae* is also similar to *L. rigidigitata* Luer & Hirtz, described from Ecuador, which has transversely ovate-hastate, broadly obtuse, flat petals and a transversely subquadrate, truncate, apiculate, glabrous lip. Vegetatively, however, the latter species has a scandent habit, with erect, lax inflorescence, while plants of *L. equus-frisiae* are cespitose, with a pendent, congest raceme.

Lepanthes vestigialis Bogarín & Pupulin, **sp. nov.**

A Lepanthi equus-frisiae Pupulin & H. Medina similis, foliis late ovatis-suborbicularis, sepalis basaliter connatis glabris, petalis planis vel subconvexis, labello elliptico recedit.

Type. Costa Rica. Cartago: Turrialba, Tayutic, Platanillo, slopes of Río Platanillo. 9°49'11"N 83°33'37"W, 700-900 m, 20 February 2004, flowered in cultivation at Jardín Botánico Lankester, A. Karremans 93 (holotype, **CR**).

Epiphytic, cespitose, suberect to prostrate herb, to 2.5 cm tall. **Roots** slender, flexuous, ca. 1 mm in diameter. **Ramicauls** to 1.3 cm long, enclosed by 5–7 lepanthiform, trichomatous sheaths, the ostia slightly dilated, with ciliate margins. **Leaf** subcoriaceous, flat, slightly conduplicate, broadly-ovate to suborbicular, obtuse-rounded, grey-green, minutely emarginate, abaxially provided with a minute, rounded apicule, 8–11 x 10–13 mm, the base shortly cuneate, narrowing into a petiole 1 mm long. **Inflorescence** racemose, distichous, succesively flowered, borne above the leaf, to 15 mm long; peduncle filiform, about 7 mm long. **Floral bracts** conduplicate, ovate, subacute, about 1 mm long. *Pedicel* 2 mm long. **Ovary** subclavate, rounded-subwinged in section, the wings membranous-crenulate, 1 mm long. *Flowers* with the sepals yellowish-pinked, the petals yellowish, the column cream-yellow. **Dorsal sepal** lanceolate, acute, concave toward the apex, 3-veined, 4.0 x 1.5 mm, connate to the lateral sepals for about 0.6 mm. **Lateral sepals** subequal to the dorsal sepal, lanceolate, acute, 3-veined, concave at apex, 4.0 x 1.5 mm, connate at the base 0.6 mm. **Petals** ovate to orbicular, extremely reduced, vestigial, less than 0.5 mm long, trichomatous. **Lip** vestigial, completely reduced into an appendix, less than 0.5 mm long, trichomatous. **Column** elongate, 2 mm long, basally trichomatous, with the anther dorsal, the stigma subapical. **Anther cap** cucullate, 2-celled. Pollinia 2.

Habitat: Epiphytic in premontane wet forest on the Caribbean slopes of Cordillera de Talamanca, Costa Rica, between 700 – 900 m of elevation.

Distribution: Known only from the type locality in Costa Rica.

Derivation of name: From the Latin words, 'vestigial', remnant, in allusion to the extremely reduced size of petals.

Paratypes: Cartago: Jiménez, Pejibaye, Taus, Río Pejibaye, 1 km after the school of Taus, 9°46'51.7"N 83°43'00.4"W, 707 m, premontane rain forest, epiphytic in secondary forest along the banks of the river, 16 October 2009, D. Bogarín 7376 & A. Karremans (JBL-spirit); Cartago: Jiménez, Pejibaye, Tausito, ca. 3.8 km after the deviation point to El Kiri, 9°46'37.8"N 83°46'30.4"W, 1.281 m, premontane rain forest, epiphytic in secondary forest along the road, 30 April 2009, D. Bogarín 6992, M. Fernández, R. Gómez, Y. Kisel, F. Pupulin, P. Renshaw & R. Trejos (JBL-spirit).
Among the species of *Lepanthes* of Costa Rica, *L. vestigialis* is easily distinguished by the small habit (less than 2.5 cm long), the broadly-ovate, grey-green leaves, the elongate column up to 2 mm long, and the extremely reduced size of petals, its most remarkable character. The lip is completely reduced into an appendix and the petals are ovate to orbicular, trichomatous and very small (less than 0.5 mm). It is similar to the geographically distant *L. equus-frisiae* Pupulin & H. Medina, from which it mainly differs in the broadly ovate-suborbicular leaves (vs. narrowly ovate-elliptic) the glabrous sepals, basally connate (vs. free, sparsely trichomatous at the base), and the flat to subconvex petals, provided with sparse, stiff hairs (vs. concave, velutinous).

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Lepanthes vestigialis Bogarín & Pupulin. A – Habit. B – Flower. C – Perianth flaten. D – Column and lip, lateral view. E – Petals. F – Detail of the ramicaul.

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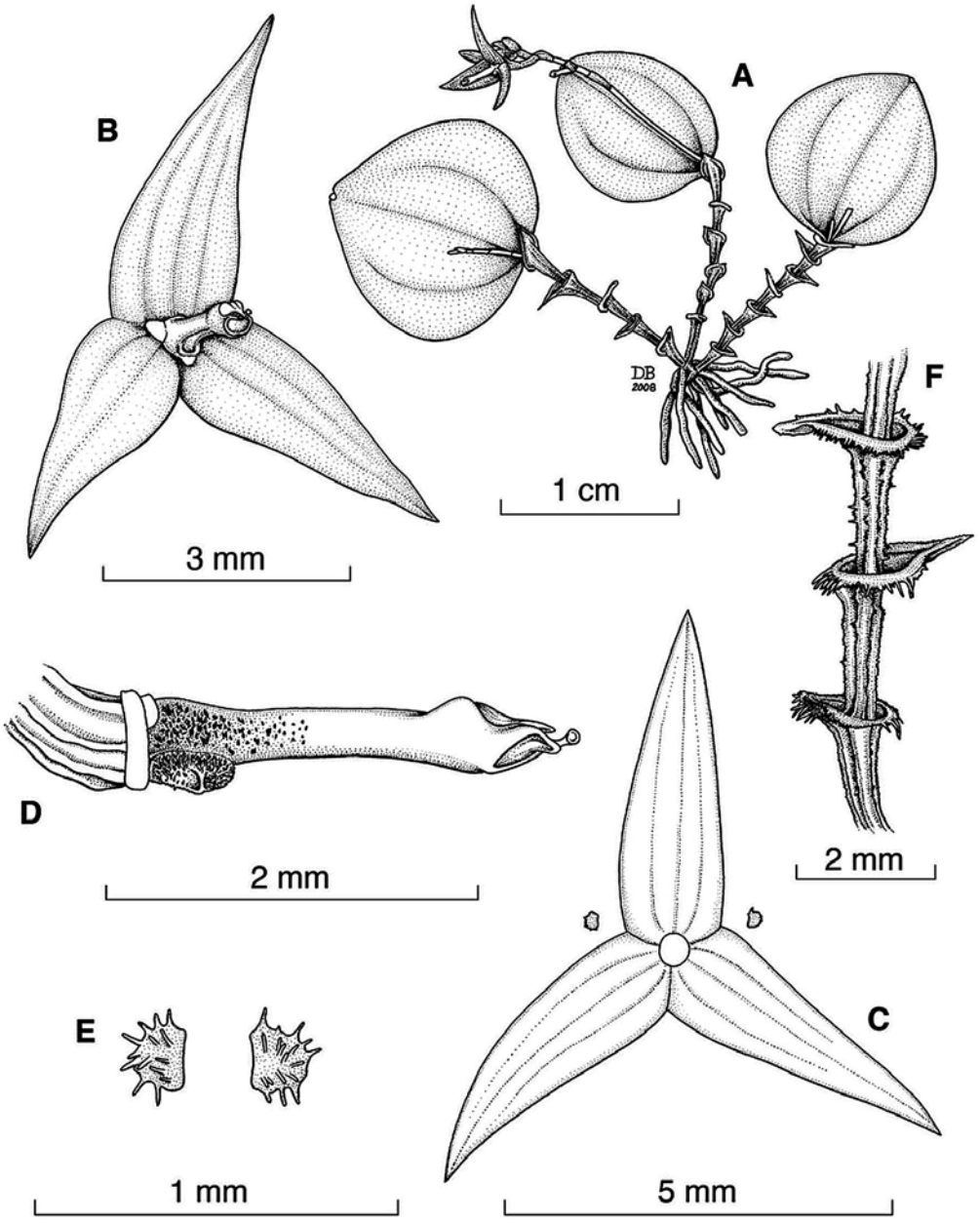

Zeichnung / Drawing © D. Bogarín des Holotyps/ from the holotype

Lepanthes vestigialis
Blüte der Pflanze des Holotyps. / Flower from the plant that served as the holotype.

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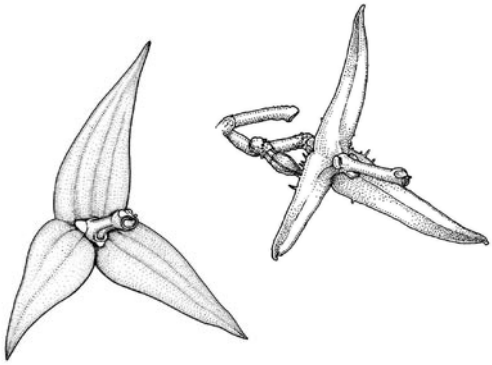

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