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## A new species of *Pleurothallis* (Orchidaceae: Pleurothallidinae) in subsection *Macrophyllae-Fasciculatae* found in Carpish Montane Forest Regional Conservation Area, Peru

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### Abstract

A new species of *Pleurothallis* belonging to subsection *Macrophyllae-Fasciculatae* was discovered in the Carpish Montane Forest Regional Conservation Area, Huánuco, Peru. *Pleurothallis carpishensis* is described, illustrated, and compared to *P. radula*, from which it is differentiated by the flowers borne from a depressed spathaceous bract resting on a navicular concavity on the leaf, the oblong-lanceolate, apiculate petals, with large papillae on the margins, the triangular, subacute lip, with a basal, widely ovate and emarginate, papillose-verrucose callus, with two oblique, lateral and marginal keels.

**Key words:** Carpish, Huánuco, montane forest, neotropics, orchids, taxonomy

### Introduction

Within *Pleurothallis* Brown in Aiton (1813: 211) as circumscribed by Pridgeon *et al.* (2005), subsection *Macrophyllae-Fasciculatae* (Luer 2005) represents by far the most species-rich group with 266 to 336 described species, depending on synonymy, constituting approximately 49% of the genus (Wilson unpubl. [continuously updated checklist of *Pleurothallis*]). Species from this group are distributed from southern Mexico [e.g. *P. acutipetala* Schlechter (1912: 353)] south to Paraguay [e.g. *P. alopex* Luer (1976: 46)] and east to Trinidad and Venezuela [e.g. *P. archidiaconi* Ames (1925: 29)]. Within the group, some species have very wide distributions, such as *P. rhopalocarpa* Schlechter (1922: 43) [syn. *Acronia cordata* subsp. *rhopalocarpa* (Schlechter 1922: 43) Luer (2005: 116)] that occurs throughout the Andes, while other species have very narrow distributions and can be considered endemic to particular geographic areas, such as *P. minutilabia* Mark Wilson, Tobar & Á.J.Pérez (2018: 222) or *P. nangaritzae* M.M.Jiménez, Tobar & Mark Wilson (2016: 358), both currently known only from restricted areas of Zamora Chinchipe, Ecuador.

A consistent characteristic of species in *Pleurothallis* subsection *Macrophyllae-Fasciculatae* is a prominent labellum. While the dimensions, morphology, texture, and positioning of this lip vary among the species, the presence of such a visible lip is almost universal (Wilson *et al.* 2018, Figure 1), the only exception being *P. minutilabia*. Most of these species exhibit a “glenion” (Wilson *et al.* 2016, Figure 7; Wilson *et al.* 2022, Figs. 3, 10, 13, and 17) in the basal region of the lip. Exceptions include *P. rhopalocarpa* where the basal region of the lip appears to consist exclusively of hydrophobic tissue; *P. minutilabia*, where the highly vestigial, apparently glenion-free lip is adpressed to the base of the gynostemium or “column”; and a group of species, typified by *P. crateriformis* C.Schweinfurth (1951: 88), where the glenion either has been lost entirely or where the secretory tissue of the glenion has merged with that of the central lip in the labellar cavity or sulcus.

Based upon publications over the last 17 years since Luer (2005) published his monograph on *Acronia*, the discovery rate of new species in subsection *Macrophyllae-Fasciculatae* has been greater than in any other infrageneric grouping within *Pleurothallis*, especially in Ecuador and Colombia. However, this is particularly the case from the numerous areas of Peru that have not been studied by botanists familiar with subtribe Pleurothallidinae. Here we describe and illustrate a new species of *Pleurothallis* in subsection *Macrophyllae-Fasciculatae* from the Carpish Montane Forest Regional Conservation Area (hereafter, Carpish Montane Forest), Peru, that exhibits a very restricted distribution and a very unusual glenion-free lip. The species is compared to the most morphologically similar species in the subsection, *P. radula* Luer (1979: 177), and to another somewhat morphologically similar species from the same geographic region, *P. crucifera* Luer & Hirtz (Luer 1996: 157). We also speculate briefly on the role of the glenion and the consequences for the pollination mechanism in species with glenion-free labella such as in this species and *Pleurothallis rhopalocarpa*.

## Material and Methods

Specimens were collected in the Carpish Montane Forest Regional Conservation Area, Huánuco department, Peru (Figure 1) under permit RD N°D000163-2021-MIDAGRI-SERFOR-DGGSPFFS-DGSPF, granted by Servicio Nacional Forestal y de Fauna Silvestre (SERFOR). Vouchers were dried as herbarium material and flowers preserved in spirits were deposited in the USM herbarium.



**FIGURE 1.** Panoramic view of Carpish Montane Forest Regional Conservation Area. Photo by Michel Cotrina.

The types of morphologically similar species deposited at AMES, MO and SEL were consulted using virtual resources. Available descriptions of related species (Luer 1979, 1986, 1996, 2005, Pupulin *et al.* 2021), as well as high-quality photographs, were reviewed and compared with the new species.

The description and drawings were prepared from dissected specimens. Floral and vegetative structures were measured from fresh and preserved material. Digital images were photographed with a Canon® Rebel 80D camera

equipped with a Canon EF 100mm f/2.8L Macro USM lens and a pressurized Raynox DCR-250 mm super macro lens. A digital composite line drawing was then made (lines and stippling) in Procreate illustration application for iPad 6th generation tablet computer (Bogarín *et al.* 2019), and the images were used to create a composite plate in Adobe Photoshop® CC 2020. A map of the occurrence of the new species was prepared using QGIS 3.10 software (Development Team 2022). The new species was described following the botanical terminology by Beentje (2016) and Stearn (2004).

## Taxonomy

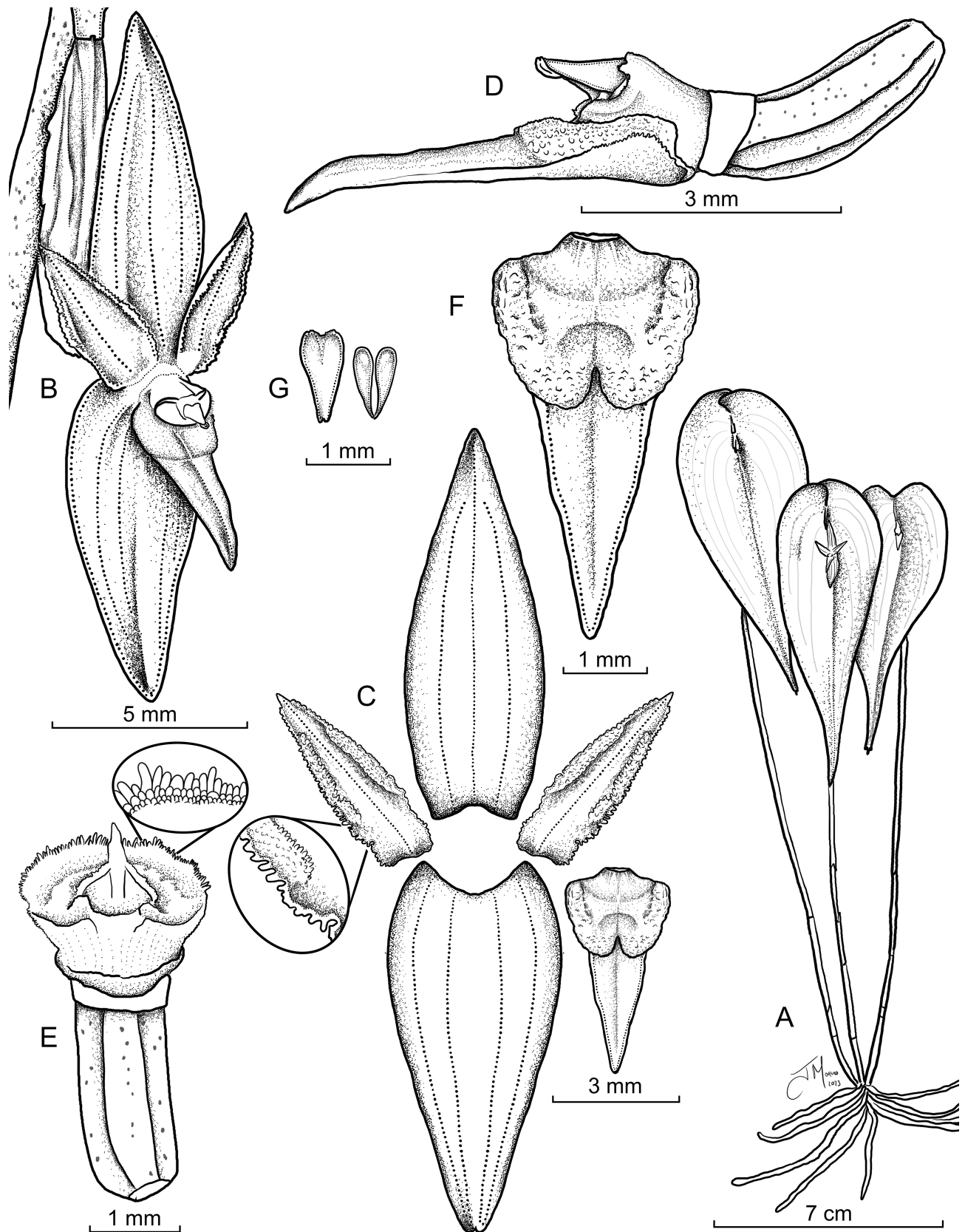
*Pleurothallis carpishensis* Ocupa, M.M.Jiménez & Mark Wilson, *sp. nov.* (Figures 2–3)

**Type:**—PERU. Huánuco: Prov. Huánuco, Distrito Chinchao, Área de Conservación Regional Bosque Montano de Carpish, cerca del caserío Santa Rosa de Quives, 1722 m, 22 March 2022, *L. Ocupa 301* (holotype: USM!).

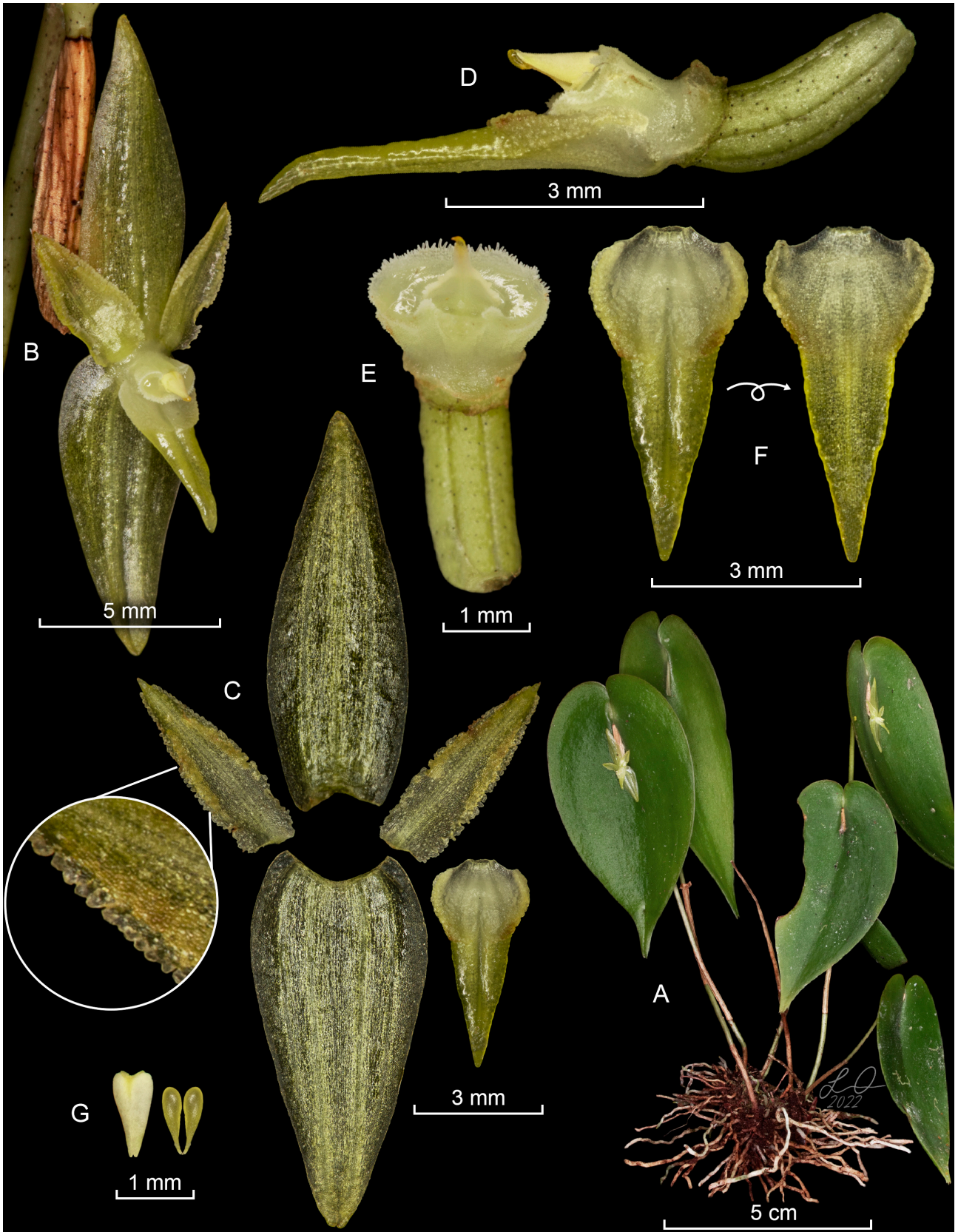
Morphologically similar to *P. radula* but is distinguished by the inflorescence that arises from a depressed, oblong, obtuse spathaceous bract (*vs.* erect, oblanceolate and sub-truncate), dorsal sepal lanceolate (*vs.* ovate to ovate-elliptic), petals oblong-lanceolate, apiculate, with large papillae on the margins (*vs.* narrowly lanceolate, acute and serrate), a triangular, sub-acute lip (*vs.* ovate to oblong-ovate, acute), with a callus broadly ovate and emarginate, papillose- verrucose (*vs.* callus glabrous, 1 mm long) and column edge surrounding stigmatic surfaces ciliate (*vs.* slightly papillate).

**Description:**—Epiphytic *herb*, caespitose, up to 23 cm tall, *roots* ca. 1.0 mm in diameter, slender, flexuous. *Ramicauls* suberect to erect, terete, ca. 8.0–20.0 cm long, 0.9–1.1 mm in diameter, curved at the apex, forming an angle of about 90° in the abscission layer, enclosed by two papyraceous, sulcate, pale brown, tubular sheaths, upper sheath ca. 20.0–23.0 × 3.0 mm, basal sheath ca. 8.0–12.0 × 3.0 mm, unifoliate. *Leaves* borne at the apex of the ramicaul, pale green, thinly coriaceous, deflexed toward the stem, concave, narrowly ovate, apically somewhat falcate, with a navicular concavity at the base of the spathe, margins involute, acuminate, tridentate sometimes with a longer central tooth, ca. 5.2–9.3 × 2.9–3.7 cm, base sessile, cordate, lobes unequal, sometimes overlapping. *Inflorescence* a solitary flower, resting on a navicular concavity at the base of the bract and borne from a depressed, conduplicate, oblong, obtuse spathaceous bract at the base of the leaf, ca. 8.5–9.5 mm long, striate, yellowish-green, becoming light brown, dry-papyraceous when mature, dotted with black, concealing peduncle, pedicel and floral bract; *peduncle* terete, up to 3 mm long; *floral bracts* infundibuliform, membranaceous, 3.5–5.0 mm long; *pedicel* terete, ca. 4.0–5.0 mm long; *ovary* terete, pale green, somewhat incurved, 6-furrowed, ca. 2.7–3.0 mm long, with black dots all over the surface. *Flowers* resupinate, spreading, yellow-hyaline, column white, anther cap cream, pollinia yellow; *dorsal sepal* erect, slightly concave, lanceolate, sub-acute, 8.0–10.3 × 3.2–3.8 mm, 3-veined; *lateral sepals* connate into a reflexed, ovate-lanceolate synsepal, centrally concave-channeled, obtuse, minutely emarginate, 8.0–10.0 × 4.5–4.8 mm, each half 2-veined; *petals* porrect, shallowly concave, oblong-lanceolate, apiculate, thickened apex, with large papillae on the margins, 4.5–6.0 × 1.5–2.0 mm, single-veined, abaxially 1-keeled; *lip* thick, fleshy, triangular, channeled in the midline, sub-acute, apex sometimes slightly recurved, 4.5–5.0 × 2.0–2.5 mm, with three incomplete nerves, abaxial side foveolate, adaxial side cellular-papillose, without glenion; callus basal, widely ovate, emarginate, occupying 1/3 of the lip length, waxy, papillose-verrucose, the papillae irregularly coarse, especially at the margins, 1.7 × 2.3 mm, with two oblique, lateral, marginal and elevated keels; *column* short, stout, terete, ca. 1.0 × 2.0 mm, periphery of stigmatic surfaces ciliate, rostellum apical, rostellar flap long, linear, obtuse; *anther* apical, incumbent, papillose at the margins, anther cap cucullate, long-ovate, sub-cordate, 2-celled, 1.2 × 0.5 mm; *stigma* apical, reniform; *pollinia* 2, narrowly obovoid, complanate, 0.8 mm long, brought together by a minute viscidium.

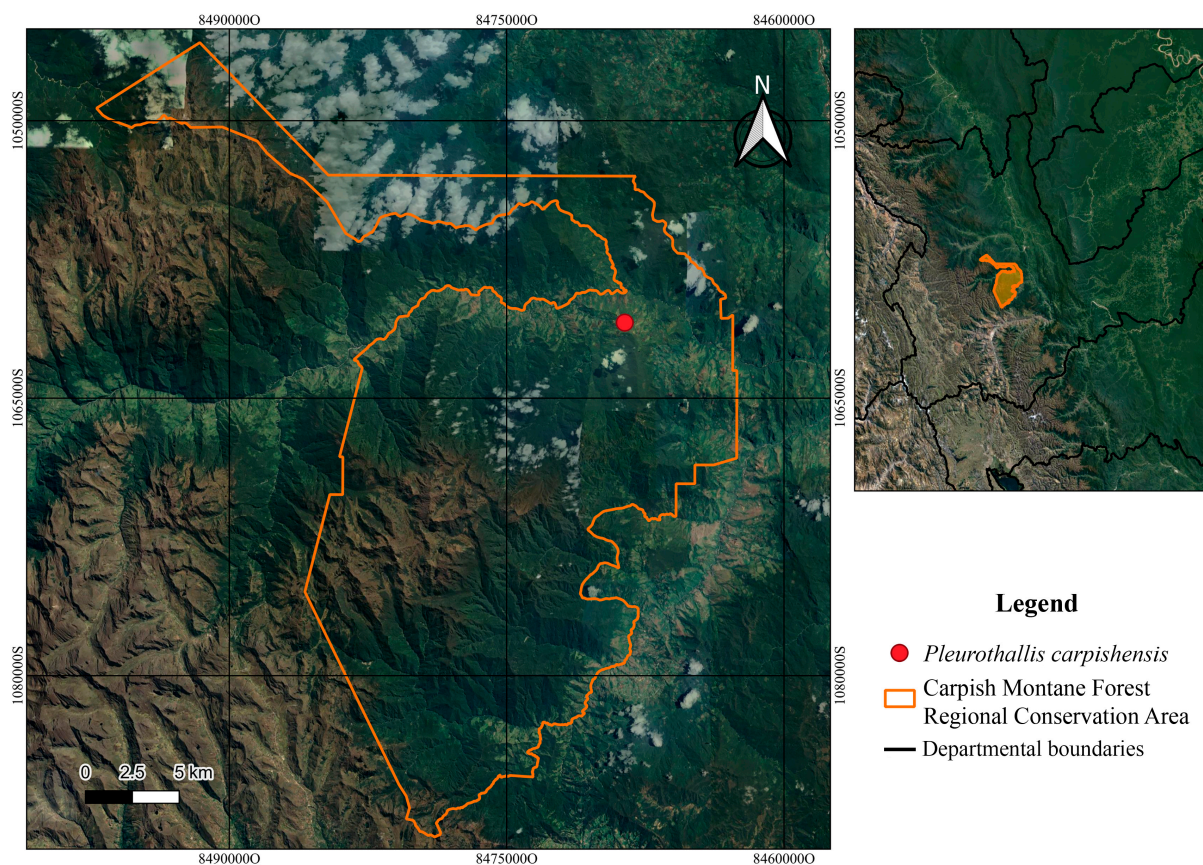
**Distribution and ecology:**—*Pleurothallis carpishensis* is known only from a small area on the eastern slope side of the central branch of the Peruvian Andes, forming part of the ecosystem known as the Yunga montane forest (MINAM 2018, 2019), between 1720 and 1730 m elevation. This locality corresponds to the Carpish Montane Forest, located in the district of Chinchao, in the department of Huánuco (Figure 4). Individuals of this species grow as epiphytes on branches located in the tree canopy, especially in the zone IV (Johansson 1974), at ~8 m above the ground (Figure 5). The flowering of this species occurs, at the beginning of the rainy season, between March and April, and during the dry season, between August and September.



**FIGURE 2.** Illustration of *Pleurothallis carpishensis* Ocupa, M.M.Jiménez & Mark Wilson. **A.** Habit. **B.** Flower. **C.** Dissected perianth. **D.** Lip, column and ovary, lateral view. **E.** Column. **F.** Lip, adaxial view. **G.** Anther cap and pollinarium. Illustrated by S. Moreno from the holotype.



**FIGURE 3.** Composite plate of *Pleurothallis carpishensis* Ocupe, M.M.Jiménez & Mark Wilson. **A.** Plant. **B.** Flower. **C.** Dissected perianth. **D.** Lip, column and ovary, lateral view. **E.** Column. **F.** Lip, adaxial (right) and abaxial (left) views. **G.** Anther cap and pollinarium. Prepared by L. Ocupe-Horna.



**FIGURE 4.** Location map of *Pleurothallis carpishensis* Ocupa, M.M.Jiménez & Mark Wilson in the Carpish Montane Forest Regional Conservation Area. Prepared by L. Ocupa-Horna.

**Etymology:**—In reference to the type locality, the Carpish Montane Forest Regional Conservation Area, Huánuco, Peru, where this species was discovered.

**Conservation status:**—This species is only known from the type collection in central Peru. The status of the population present in the Carpish Montane Forest is unknown; however, the habitat of this species may be affected by anthropogenic activities, such as deforestation and burning of trees, which occur in the area (Figure 6). Until a more comprehensive assessment can be made, the species should be considered "Data Deficient" (DD) according to the IUCN criteria (IUCN 2019).

**Taxonomic Discussion:**—*Pleurothallis carpishensis* can be distinguished by the pale yellow-to-hyaline flowers, that are borne from a depressed spathaceous bract that lies over a navicular concavity on the leaf, by petals oblong-lanceolate, apiculate, with large papillae on the margins and a triangular, sub-acute lip, with a callus basal, widely ovate, emarginate, waxy, papillose-verrucose, with two oblique, lateral and marginal keels.

Among all the species belonging to *Pleurothallis* subsection *Macrophyllae-Fasciculatae*, *P. carpishensis* is most similar morphologically to *P. radula* from Costa Rica (Figure 7), sharing characteristics such as the ovate to lanceolate leaves, deeply cordate at the base with the basal lobes sometimes overlapping, the solitary flowers, erect dorsal sepal, reflexed, single-veined petals and the thick and fleshy lip. However, *P. carpishensis* is easily differentiated from *P. radula* by the smaller plants, up to 23 cm tall (*vs.* up to 50 cm tall), ovary 2.7–3.0 mm long (*vs.* 4.0–6.0 mm long), dorsal sepal 8.0–10.3 mm long (*vs.* 12–14 mm long), synsepal 8.0–10 × 4.5–4.8 mm (*vs.* 12.0–14.0 × 7.0 mm), petals 4.5–6.0 mm long (*vs.* 8.0–9.5 mm long), lip with a callus widely ovate, emarginate, papillose-verrucose, 1.7 × 2.3 mm (*vs.* glabrous, callus 1 mm long), without glenion (*vs.* glenion slightly raised above callus) and the ciliate periphery of the stigmatic surfaces (*vs.* slightly papillate).

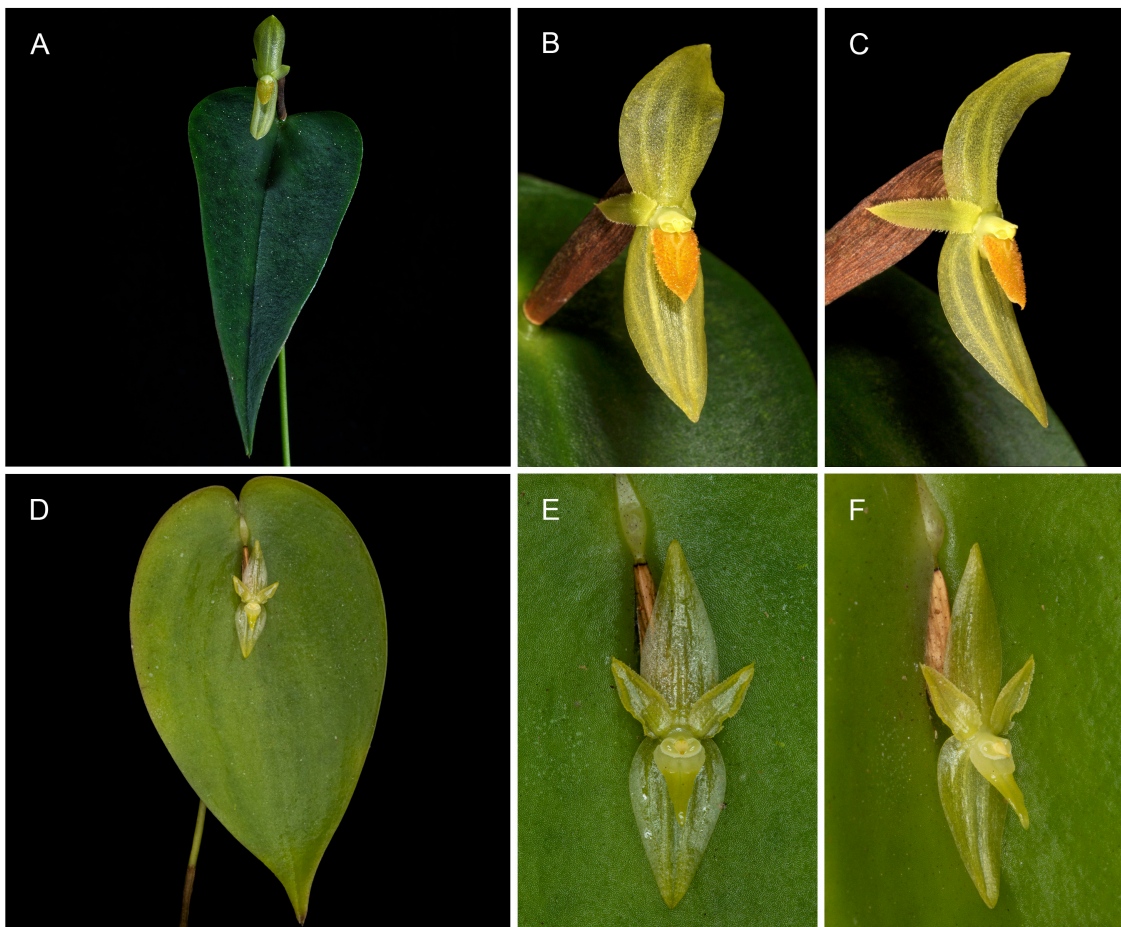
As in many species of *Pleurothallidinae*, the leaves of *P. carpishensis* show vegetative variability. Therefore, some individuals have leaves ranging from ovate to ovate-lanceolate, and occasionally falcate near the apex, with the apex acute to shortly acuminate, with the basal lobes cordate and sometimes overlapping (Figure 8A–B). However, a peculiar characteristic in *P. carpishensis* are the apices of the ramicaul, since these are curved, forming an angle of approximately 90°, before the leaf abscission layer (Figure 8C), unlike other *Pleurothallis* species of the same subsection, which generally have leaves attached to a non-angulate ramicaul.



**FIGURE 5.** Habitat of *Pleurothallis carpishensis* Ocupa, M.M.Jiménez & Mark Wilson. **A.** Close-up to tree canopy branches. **B.** *P. carpishensis* growing *in situ*. Photos by L. Ocupa-Horna.

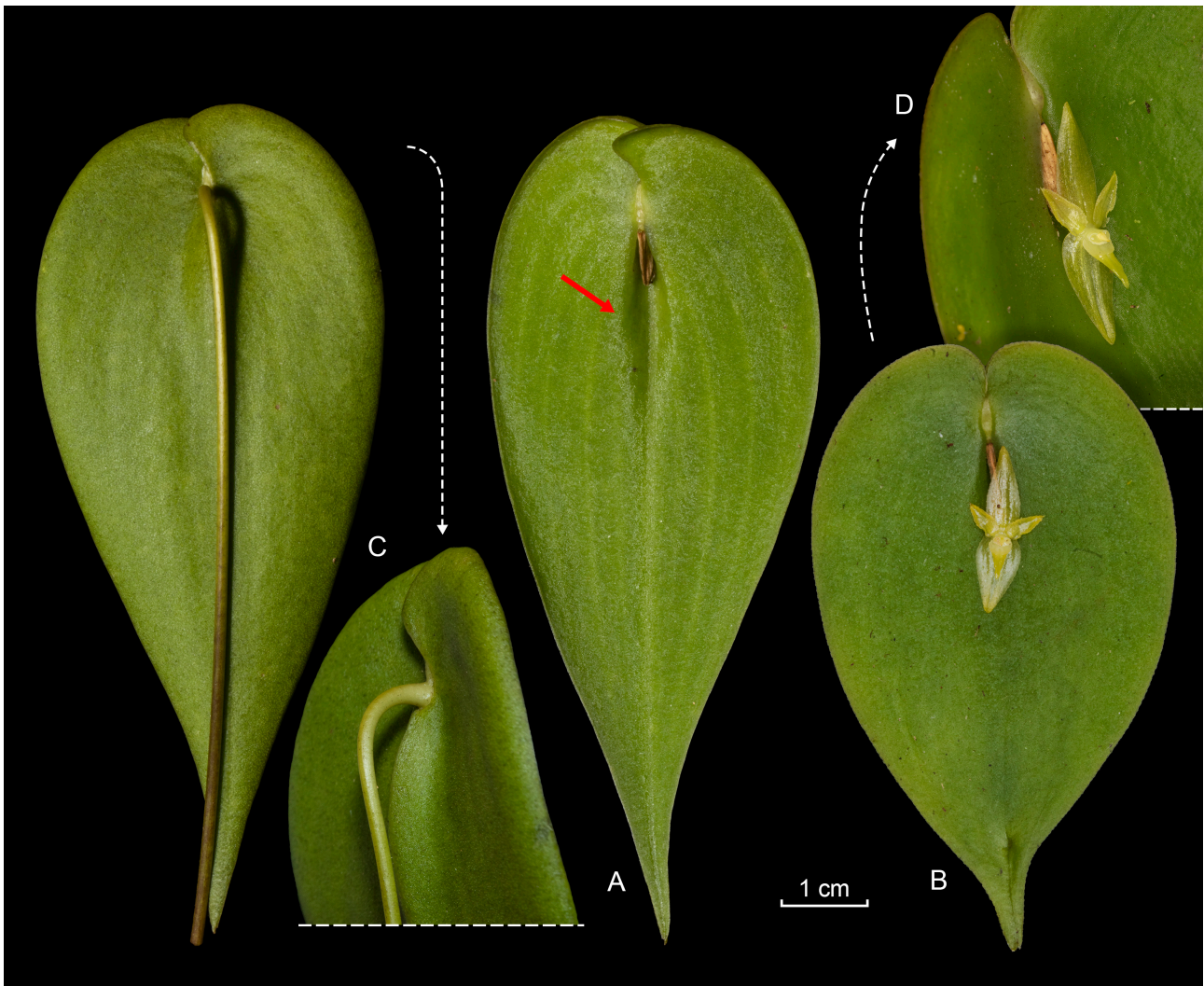


**FIGURE 6.** Habitat of *Pleurothallis carpishensis* Ocupa, M.M.Jiménez & Mark Wilson impacted by deforestation and tree burning. Photo by L. Ocupa-Horna.



**FIGURE 7.** Comparison of a morphologically similar species. A–C. *Pleurothallis radula*. D–F. *P. carpishensis*. Photos by P. Aratoun (A), R. Parsons (B–C), L. Ocupa-Horna (D–F).

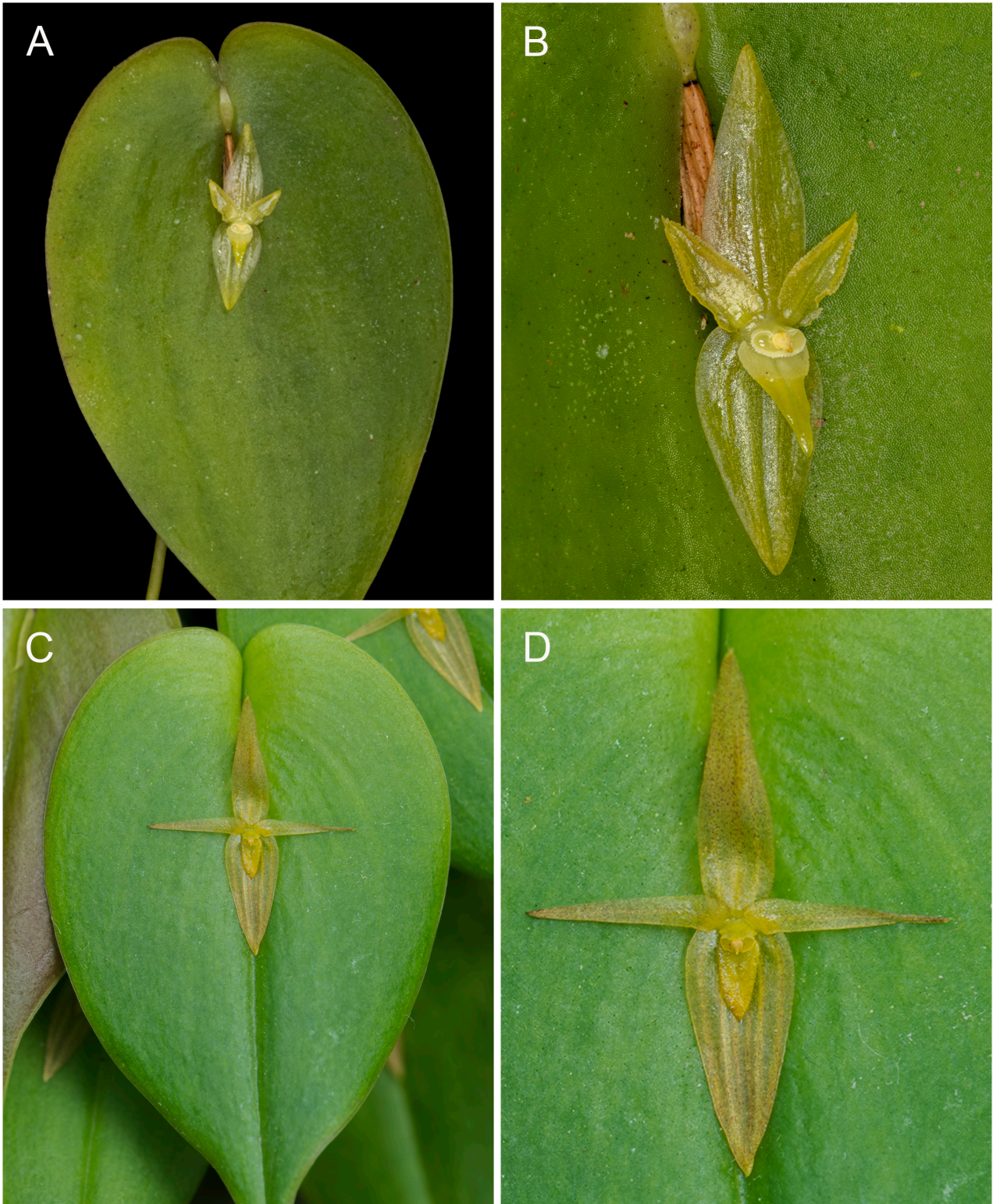




**FIGURE 8.** A. Leaf narrowly ovate, with overlapping basal lobes and detail of the concavity (red arrow). B. Ovate leaf, with non-overlapping basal lobes. C. Leaf, abaxial view and detail of the apex of the ramicaul. D. Detail of the flower above the concavity. Prepared by L. Ocupa-Horna.

Interestingly, in some species of subsection *Macrophyllae-Fasciculatae*, the single-flowered inflorescences are borne from an erect spathaceous bract (Pupulin *et al.* 2021) [e.g. *P. longipetala* Bogarín & Belfort (2021: 265), *P. phyllocardia* Reichenbach (1866: 97), *P. radula*, *P. rectipetala* Ames & C. Schweinf. (1925: 32)], that emerge from a horizontal to erect leaf or leaf deflexed toward the ramicaul. Nevertheless, in *P. carpishensis* the flower is borne from a depressed spathaceous bract that lies over a navicular concavity on the leaf (Figure 8, red arrow). This concavity is as long as the flower which overlies it (Figure 8D). This makes the species unmistakable, compared to the other *Macrophyllae-Fasciculatae* occurring in Peru.

Since *P. radula* is not found in Peru, field botanists in that country need to distinguish *P. carpishensis* from the most morphologically similar species to be encountered in that country, in this case *P. crucifera*. *Pleurothallis carpishensis* is similar to *P. crucifera* in the coriaceous, ovate, acute leaves, the yellow-brown, glabrous flowers, that rest on the leaf and the long, acute petals (Figure 9). However, *P. carpishensis* differs from *P. crucifera* by the length of the ramicauls (8.0–20.6 cm long vs. 5.0–10.0 cm long), arrangement and direction of the leaves (reflexed vs. spreading), with attenuate, tridentate (vs. acute) apex, the floral bracts long-conical in shape, 3.5–5.0 mm long (vs. tubular, 5.0–6.0 mm long), the pedicels 4.0–5.0 mm long (vs. 6.0–8.0 mm long), the flowers hyaline, yellow concolor (vs. light yellowish or brown flowers), arrangement and direction of the petals (porrect vs. spreading), the lip without glenion (vs. large glenion), and the stigma ventral, reniform (vs. apical, sub-rectangular), with margins of stigmatic surface ciliate margins (vs. papillose-erose margins).



**FIGURE 9.** Comparison of morphologically similar species. **A–B.** *P. carpishensis* Ocupa, M.M.Jiménez & Mark Wilson. **C–D.** *Pleurothallis crucifera* Luer & Hirtz. Photos by L. Ocupa-Horna (A–B), H. Rice (C–D).



**FIGURE 10.** A–C. Flowers of *Pleurothallis rhopalocarpa* Schltr. **D.** *P. carpishensis* Ocupe, M.M.Jiménez & Mark Wilson illustrating absence of glenion. Photos by A. Kay † (A), F. Lopez-Machado (B), J. Varigos (C), and L. Ocupe-Horna (D).

Within *Pleurothallis* subsection *Macrophyllae-Fasciculatae*, most species exhibit a glenion at the base of the lip, located below the apically located viscidium of the pollinarium. Morphologically, the glenion appears to be a small secretory structure (Wilson *et al.* 2016, Wilson *et al.* 2022) and we hypothesize that the glenion aids in pollinator positioning for optimal pollinarium acquisition and subsequent deposition on another flower. Yet surprisingly some species, such as *P. carpishensis*, *P. minutilabia*, *P. rhopalocarpa*, and the *P. crateriformis* complex appear to lack such structure. In *P. rhopalocarpa*, a very widely distributed species, the lateral margins produce copious quantities of liquid (Figure 10A–C) that is presumably a nectar reward, and this species may have evolved to permit more flexible pollinator positioning during pollinarium acquisition than occurs in species with a glenion. On the other hand, *P. carpishensis* neither possesses a glenion nor secretes nectar-like liquid from the medial and apical regions of the lip (Figure 10D), suggesting a unique pollination strategy yet to be elucidated. In addition, *P. carpishensis* exhibits ciliate-papillate margins around the stigmatic surfaces of the column (Figure 3E) and the petals (Figure 3C), both of which are rare in *Macrophyllae-Fasciculatae*. The ciliate papillae could be involved in secretion of volatiles involved in pollinator attraction, but determination of their function will require additional study.

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