

## THE GENUS *PALMORCHIS* (ORCHIDACEAE: NEOTTIAE) IN PERU: A TAXONOMIC SYNOPSIS INCLUDING FOUR NEW SPECIES AND A NEW RECORD

ALEXANDER DAMIÁN PARIZACA<sup>1,2,4</sup> & LUIS A. TORRES MONTENEGRO<sup>3</sup>

<sup>1</sup> Facultad de Ciencias Ambientales, Universidad Científica del Sur, Lima, Perú

<sup>2</sup> Posgrado en Botánica Tropical, Facultad de Ciencias Biológicas, Universidad Nacional Mayor de San Marcos, Av. Venezuela, Cdra 34 s/n, Lima, 15081, Perú

<sup>3</sup> Herbarium Amazonense (AMAZ), Facultad de Biología, Universidad Nacional de la Amazonía Peruana, Iquitos 16002. Perú

<sup>4</sup> Author for correspondence: [ldamian@cientifica.edu.pe](mailto:ldamian@cientifica.edu.pe)

**ABSTRACT.** A taxonomic synopsis of Peruvian *Palmorchis* with six accepted species is provided including four new species (*P. blancae*, *P. liberolabellata*, *P. loretana* and *P. yavarensis*) and a new record previously reported only for Ecuador (*P. imuyaensis*). This overview is the result of a review of local herbaria, taxonomic literature, and a field study of the genus. An artificial key for all Peruvian *Palmorchis* species is presented, as well as photographs and a map of known localities in Peru.

**RESUMEN.** Se presenta una sinopsis taxonómica de *Palmorchis* peruanas con seis especies aceptadas, incluyendo cuatro nuevas especies (*P. yavarensis*, *P. blancae*, *P. liberolabellata* y *P. loretana*) y un nuevo registro (*P. imuyaensis*) previamente reportado sólo para Ecuador. Este resumen es el resultado de la revisión de herbarios locales, literatura y el estudio de campo del género. Se presenta una clave artificial para todas las especies de *Palmorchis* peruanas, así como fotografías y un mapa de todas las localidades conocidas en Perú.

**KEY WORDS:** Amazonian lowlands, Neottieae, Orchidaceae, *Palmorchis*, Perú

**Introduction.** The genus *Palmorchis* Barb.Rodr. was proposed by Barbosa Rodrigues in 1877 to describe two Brazilian species, *Palmorchis pubescens* Barb.Rodr. and *Palmorchis sobralioides* Barb.Rodr., possessing a palm-like habit (fide Barbosa Rodrigues, “very similar to *Geonoma* palm [Arecaceae]”). Currently the genus encompasses 34 species found in Central and South America, including Trinidad (Pridgeon *et al.* 2005, Szlachetko *et al.* 2018). According to Dressler (1993a,b), *Palmorchis* species are terrestrial plants with slender, reed-like stems, several to many, 2-ranked or spiral, pleated leaves; inflorescence is terminal or lateral, of several flowers, usually produced one at a time; sepals and petals are similar, spreading; the slender column is enfolded by the lip and united with it basally along its mid-nerve; and four, soft pollinia.

*Palmorchis* is one of several poorly known orchid genera of the New World (Hágsater *et al.* 1996). Plants of this genus look like small palm seedlings or forest

grasses and can be easily overlooked when not in flower. Furthermore, the flowers last only a few hours; to find *Palmorchis* in flower, as Dressler (1984) noted, “you should be either lucky or persistent”. The taxonomic position of *Palmorchis* has been a subject of debate since its description (Hoehne 1945, Schweinfurth & Correll 1940, Szlachetko & Baranow 2014). Recent molecular phylogenetic studies reveal that *Palmorchis* is one of the most primitive Epidendroideae, sister to tribe *Neottieae* (Chase *et al.* 2003, Rothacker 2007). However, further studies and sampling are necessary to better assess this evidence.

In Peru, *Palmorchis* was first recorded in 1928 by Rudolf Mansfeld, who described *Neobartlettia lobulata* Mansf. [= *P. lobulata* (Mansf.) C. Schweinf. & Correll] (Fig. 1) based on a specimen collected in the eastern part of the country (Loreto). Since then, a few individuals have been recorded, mainly represented by sterile specimens from mixed lowland forest and

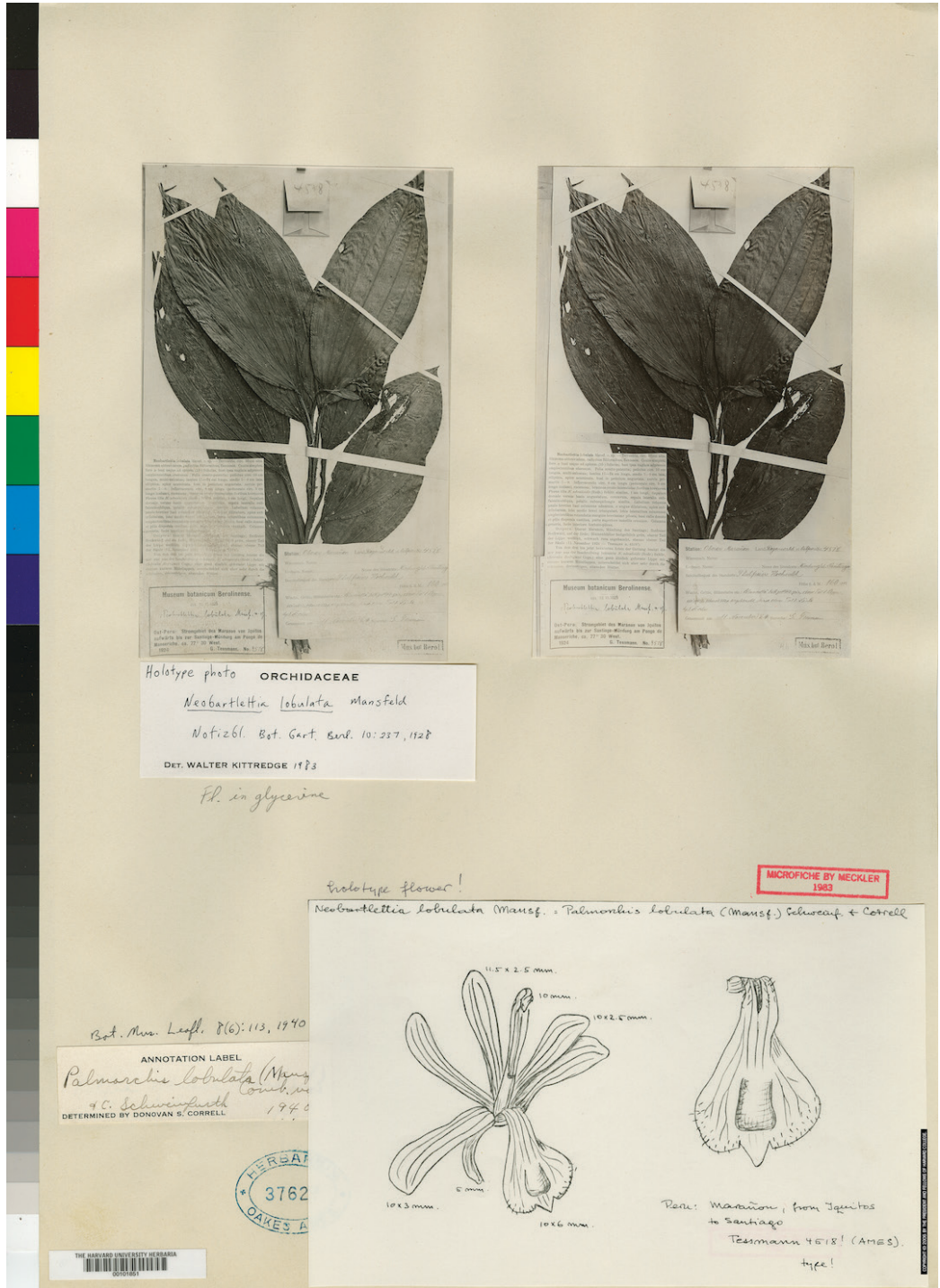


FIGURE 1. Photograph of the holotype of *Palmorchis lobulata* (Mansf.) C. Schweinf. & Correll held at AMES (00101851, 00083175). Reproduced with kind permission of the Director of Harvard University Herbarium.

palm-dominated wetlands (known as *aguajales*). Until this work, only *P. lobulata* was reported for the country (Brako & Zarucchi 1993). Nevertheless, a detailed study of available herbarium material reveals a higher diversity of *Palmorchis*. The present study recognizes six species of *Palmorchis* for Peru, including one new record and four new species (Fig. 2). A taxonomic synopsis, an artificial key, and a map of all known localities for Peruvian *Palmorchis* are provided in this work, as well as comparative notes with their close relatives.

**Materials and methods.** For the taxonomic treatment, protologues were obtained from Tropicos (2016), names were checked in the IPNI (2016) database, and

currently accepted scientific names and synonyms were based on Govaerts *et al.* (2016). Herbarium specimens deposited at USM and AMAZ were revised, as well as high-quality images of herbarium specimens at CUZ, FLAS, AMES, RB, F, US, P, and MO. In August 2016 the first author carried out field work in Peru's Amazon lowlands in the Department of Loreto. When available, specimens were photographed *in situ* using a Nikon D7100 with a Micro Nikkor 60-mm lens. Descriptions and measurements were carried out using a Euromex SB-1903 stereomicroscope. Line illustrations were prepared from alcohol-preserved available material, digital photos and rehydrated flowers, and processed with Adobe Photoshop CC v. 14.0.

### Taxonomic treatment

#### KEY TO THE PERUVIAN SPECIES OF *PALMORCHIS*

- |   |                           |
|---|---------------------------|
| 1. Plant small, up to 30 cm tall; leaves narrowly elliptic, 3-veined; flowers white   | <i>P. imuyaensis</i>      |
| 1a. Plant large, 40–60 cm tall; leaves broadly elliptic to obovate; 5–9 veined; flowers greenish to yellowish                 | 2                         |
| 2. Flowers with tepals >2 cm long, narrowly lanceolate; lip with midlobe 9–10 mm long, densely pubescent                      | <i>P. yavarensis</i>      |
| 2a. Flowers with tepals <2 cm long, oblong-elliptic to obovate; lip with midlobe <4 mm long, glabrous                         | 3                         |
| 3. Inflorescence lateral; lip free from the column, midlobe bilobed; column overall glabrous                                  | <i>P. liberolabellata</i> |
| 3a. Inflorescence terminal; lip united to the column by a membrane down the midline, midlobe simple; column densely pubescent | 4                         |
| 4. Lip obovate, midlobe rounded, callus with 5 thickened keels  | <i>P. blancae</i>         |
| 4a. Lip obtriangular, midlobe oblong to ovate, callus without thickened keels   | 5                         |
| 5. Leaves 17–24 × 7–9 cm midlobe triangular, lateral lobes sparsely pilose, callus subquadrate, cushion-like                  | <i>P. lobulata</i>        |
| 5a. Leaves 9–18 × 3–4.9 cm; midlobe oblong, lateral lobes glabrous, 2 fleshy ridges   | <i>P. loreтана</i>        |

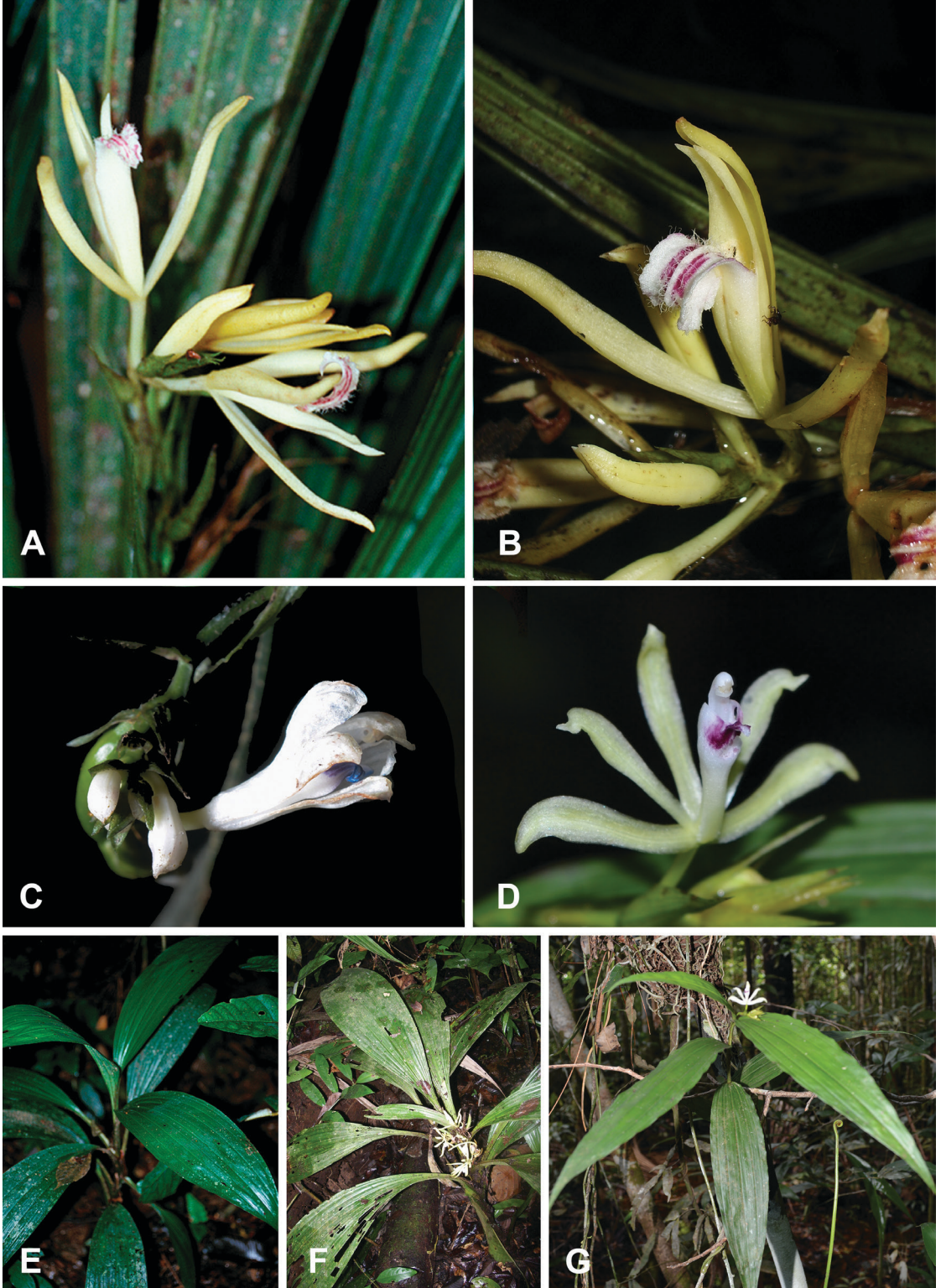
#### 1. *Palmorchis blancae* Damián, *sp. nov.*

TYPE: PERU. Madre de Dios: Tambopata, 15 km E. de Puerto Maldonado, Albergue “Cusco Amazónico”. 5 April 1986. B. Leon & I. Bohorquez 895 (holotype: USM!). Fig. 3.

Most similar to *P. nitida* Dressler, from which it differs by the inflorescence bearing a long basal bract, 8.0 cm long (*vs.* 3.5–5.0 cm) and the lip distinctly 3-lobed ornamented by 5 prominent keels (*vs.* shallowly 3-lobed with 7 thickened keels), densely pubescent below the middle with ciliate margins (*vs.* glabrous lip with entire margins).

*Herb* up to 55 cm tall. *Roots* slender, 0.23 cm wide. *Stems* cane-like, up to 33 cm long, 0.5 cm in diameter, with 4 leaves. *Leaves* plicate, 5-veined, broadly elliptic, acuminate, cuneate at the base, 15.0–19.0 cm long, 6.0–8.0 cm wide; petiole up to 4 cm long. *Inflorescence* up to 5 cm long, terminal, few-flowered,

with 1 foliaceous bract at base, narrowly lanceolate, acuminate, 8 cm long. *Floral bracts* 6.0 mm long, 3.0 mm wide, broadly triangular, acute. *Peduncle* 24 mm long, pedicel and ovary 8 mm long. *Dorsal sepal* 11 mm long, 1.5–2.0 mm wide, linear-oblongate, acute, concave, 5-veined, thickened in the middle. *Lateral sepals* 10 mm long, 2 mm wide, oblongate, oblique, subfalcate, acute, 5-veined. *Petals* 10 mm long, 2 mm wide, obliquely ligulate-oblongate, acute, 7-veined, apical margin slightly erose, thickened on the outer margins. *Lip* 10 mm long, 4 mm wide when spread; united with the column for about 2 mm; densely pubescent below the middle with ciliate margins, constricted on the apical quarter with 5 main veins running from the base close to the apex, thickened in apical half; the middle lobe 2.5 mm long, 3.0 mm wide, transversely elliptic, rounded, margins crenulate; lateral lobes semicircular. *Column* pubescent, slender, terete, up to 8 mm long, densely pubescent on the ventral surface below the middle, *anther* conic, 1 mm



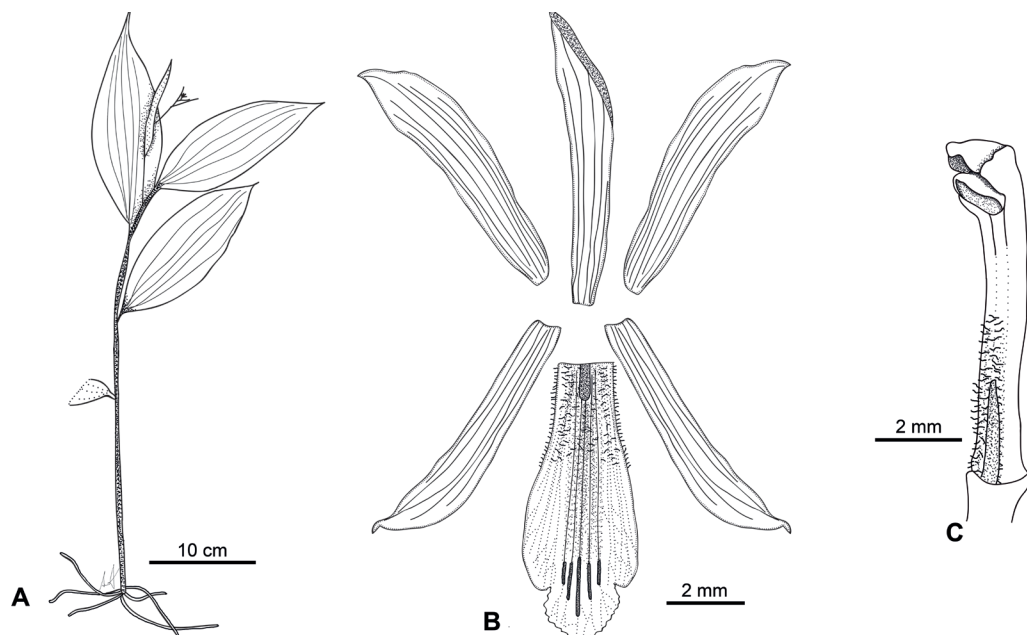


FIGURE 3. *Palmorchis blancae* Damián. A. Plant, B. Dissected perianth, C. Column. Drawn from the holotype (B. León & I. Bohorquez 895 USM!) by A. Damián.

long, *pollinia* ellipsoid, paired, 0.9 mm long, *stigma* oblong, emergent. *Fruit* not seen.

**DISTRIBUTION:** Endemic to Peru, where it is known from a single collection in the understory of mature lowland forest in easternmost Madre de Dios (Fig. 9). Given that the locality is close to the Peru-Bolivia border, it is likely that the species occurs in similar habitat in Pando, Bolivia.

**ETYMOLOGY:** Dedicated to Blanca León, who collected the plant that served as the holotype.

*P. blancae* belongs to a small group of *Palmorchis* species characterized by the inflorescence subtended by a basal bract, which resembles somewhat a spatha; and lip with 3 to 7 thickened keels (Table 1). Two species exhibit this combination of features: *P. nitida* and *P. fractiflexa* Szlach. & Baranow. The latter is easily distinguished by its overall glabrous lip with short pubescence close to the base and entire basal margins (vs. densely pubescent below the middle with conspicuous ciliate margins), constricted below the middle (vs. on the apical quarter), with 3 lamellae reaching the apex, much

higher in the midlobe (vs. 5 main veins not reaching the apex, thickened in apical half).

Another similar species is *Palmorchis puber* (Cogn.) Garay, which differs in the wide obtriangular lip with an obscure middle lobe, and with 2 inconspicuous lamellae below the apex (vs. obovate lip with 5 thickened veins).

2. *Palmorchis imuyaensis* Dodson & G.A. Romero, *Lindleyana* 8(4): 197. 1993

**TYPE:** ECUADOR. Sucumbios: Laguna de Imuya, October 1991, C.H. Dodson & G.A. Romero 18922 (Holotype: MO ex RPSC, Isotypes: AMES, SEL). Fig. 1–2,4.

*Palmorchis imuyaensis* is most similar to *P. puber*, but distinguished from the latter in the spathulate lip (vs. obtriangular to obovate-obtriangular) without lamellae on the disc (vs. 2 low lamellae below 3-lobed apex) and conspicuous triangular apex (vs. short, truncate apex).

**DISTRIBUTION:** Ecuador and Peru (Fig. 4).

Left, FIGURE 2. Representative species of Peruvian *Palmorchis*. A-B, E-F. *Palmorchis yavarensis* sp nov. Damián & Torres [H. Beltrán et al 5698 USM!; I. Huamantupa 14065 AMAZ!], C. *Palmorchis imuyaensis* Dodson & G.A. Romero [Damián & Mitidieri 4040 UFV!], D, G. *Palmorchis loreтана* sp nov. Damián & Torres [M. Ríos et al. 4268, AMAZ!]. Photographs: A, E: R. Foster; B, F: I. Huamantupa; C: A. Damián; D: T. Mori; G: L. Torres.

TABLE 1. Characters separating Peruvian *Palmorchis* species.

Character	<i>Palmorchis blancae</i>	<i>Palmorchis imuyaensis</i>	<i>Palmorchis liberolabellata</i>	<i>Palmorchis lobulata</i>	<i>Palmorchis loreтана</i>	<i>Palmorchis yavarensis</i>
Plant size (cm)	55	30	40	50	40–50	50
Leaf shape	broadly elliptic	narrowly elliptic	broadly elliptic	elliptic to ovate-elliptic	oblong-elliptic	broadly elliptic to obovate
Leaf size (cm)	15–19 × 6–8	13–17 × 1.5–3.0	37–48 × 7–9	24.0 × 9.0	9–18 × 3.0–4.9	65–70 × 10–11
Leaf veins	5	3	5	7–9	5	5–7
Inflorescence	terminal	terminal	lateral	terminal	terminal	terminal
Flowers	unknown	white with blue lip	green-yellowish	yellowish green	pale yellowish-green, purple lip	yellowish with red lines lip
Sepals size (mm)	10–11 × 1.5–2.0	8–10 × 2–3	8–10 × 2	13 × 2.5	6–8 × 1	27–30 × 2–3
Petals (mm)	10 × 2	9.5 × 2.5	8.0–8.5 × 2.0	11 × 2	5–8 × 1	22–25 × 2
Lip size (mm)	10 × 4	9.0 × 4.5	8 × 5	10 × 6	5–8 × 3	23–25 × 8
Lip shape	obovate, 3-lobed, midlobe rounded	spathulate, 3-lobed, midlobe ovate	obovate, 3-lobed, midlobe bilobulate	obtriangular, 3-lobed, midlobe triangular	obtriangular, 3-lobed, midlobe triangular	oblanceolate, 3-lobed, midlobe long
Lip callus	5 thickened veins	v-shaped	5 thickened veins	subquadrate cushion-like	2 parallel tall fleshy ridges	3 thickened veins, with a furrow in the midlobe
Column (mm)	8 mm, densely pubescent below the middle	10mm, densely pubescent	10 mm, shortly pubescent near the base	11 mm, densely pubescent	8 mm, densely pubescent	15 mm, densely pubescent

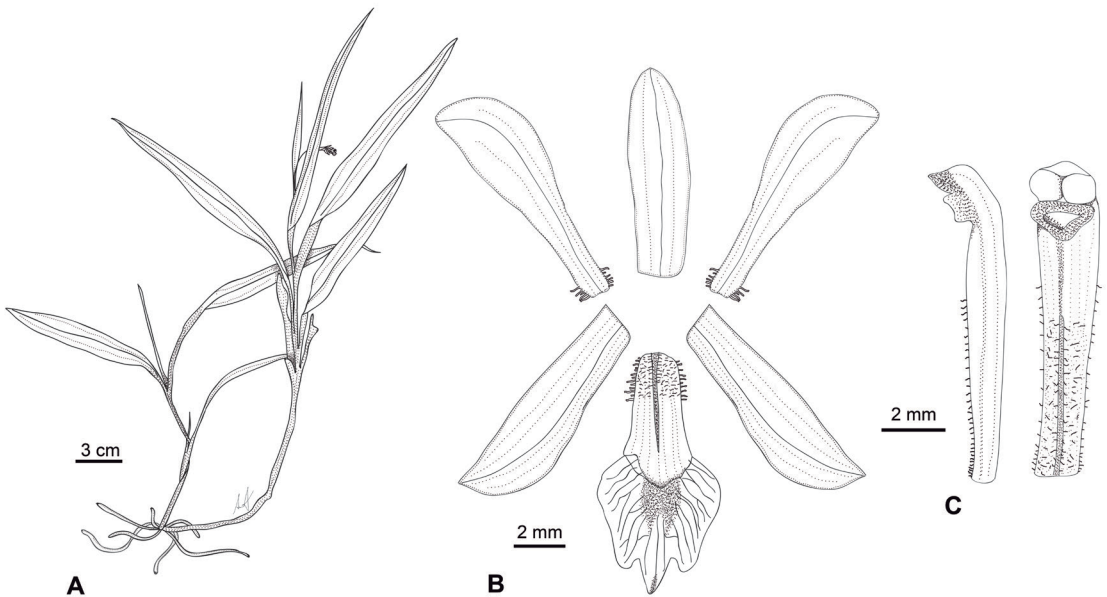


FIGURE 4. *Palmorchis imuyaensis* Dodson & G.A. Romero. A. Plant, B. Dissected perianth, C. Column on ventral and lateral view. Drawn from *Damián & Mitidieri 4040 UFV!* by A. Damián.

SPECIMENS EXAMINED: Perú. Loreto: Maynas, Dist. Las Amazonas, Yanayacu, 3°27'46.22"S 72°16'15.06"W, 100 m, 16 August, 2016, A. Damián, N. Mitidieri, R. Cahuachi & M. Segundo 4040 (UFV!).

The Peruvian specimen shows some notable differences from the Ecuadorian type (Dodson & Romero-Gonzales 1993), especially in flower morphology. First, the leaves are shorter and narrower, 13.0 × 1.5 mm (vs. 16.0 × 3.0 mm). The flowers are slightly shorter as well, with sepal dimensions of 8.0–9.0 × 2.0–3.0 mm (vs. 10.0 × 2.5–3.0 mm). Moreover, the petals and lip are minutely ciliate at the base with a column densely pubescent on the lower part (vs. petals, lip and column glabrous). This species can be distinguished from other *Palmorchis* species by the small plants, narrower leaves which are 3-veined, flowers white with petals ciliate at the base, column densely pilose, lip margins glabrous and pilose at base (feature presented here), with a V-shaped cavity on the upper side just ahead of the keel, and iridescent blue broadly triangular midlobe (Table 1).

### 3. *Palmorchis liberolabellata* Damián, *sp. nov.*

TYPE: PERU. Cusco: La Convención, Dist. Echarati,

11°46'53.40»S; 72°42'6.00» W. Bosque colinoso disturbado, 400 m. H. Beltrán, W. Nauray, R. De la Colina, L. Acurio, J. Tenteyo 3204 (holotype USM!). Fig. 5.

*Palmorchis liberolabellata* is similar to *P. prospectorum*, from which it is easily distinguished by its glabrous floral bracts and flowers (vs. pubescent floral bracts, sepals, lip and column); smaller flowers with sepals 8.5–10.0 mm long (vs. >25.0 mm long); lip free from the column (vs. lip united with the column by a membrane down to the middle of its length), and callus formed by 5 main veins thickened in the upper part (vs. 3 main thickened veins).

*Herb* at least 40 cm tall. *Roots* not seen. *Stems* terete, 0.6 cm in diameter, with 5 leaves toward the apex. *Leaves* broadly elliptic, plicate, with 5 prominent veins on the underside, petiolate, not articulated to the sheath, oblong-elliptic, acuminate at the apex, cuneate at the base, 37–48 cm long including the petiole, 7–9 cm wide. *Inflorescence* axillar, 3–6 cm long, many flowered, congested. *Peduncle* 0.8–1.0 cm long, with 2 ovate bracts close to the base, 1.2–1.5 cm long. *Flowers* produced one to two at a time, green-yellowish; *flowers bracts* ovate, acute, glabrous, 1.0–1.5 cm long, 0.3–0.5 cm wide. *Pedicel* and *ovary*, 6–8 mm long. *Dorsal*

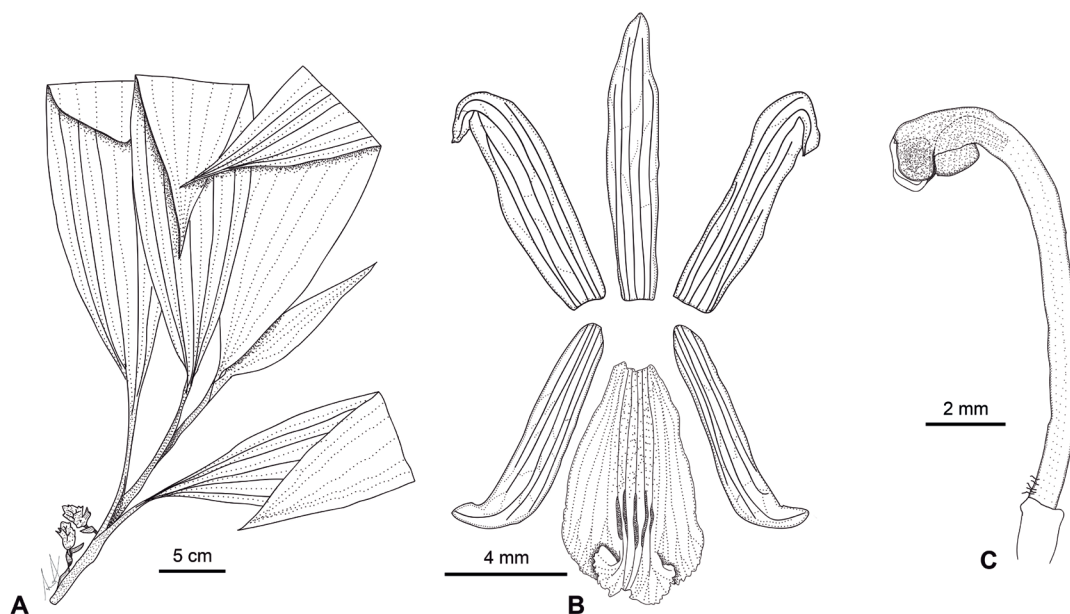


FIGURE 5. *Palmorchis liberolabellata* Damián. A. Plant, B. Dissected perianth, C. Column on ventral and lateral view. Drawn from the holotype (H. Beltrán 3204 USM!) by A. Damián.

*sepal* oblong-elliptic, acute at the apex, 5-veined, 10 mm long, 2 mm wide. *Lateral sepals*, oblong, obtuse, falcate, slightly erose at the apex, 5-veined, 8 mm long, 2 mm wide. *Petals* oblong, acute, 8.0–8.5 mm long, 2.0 mm wide, subacute, falcate at the apex, 5-veined. *Lip* 7.5 mm long, 4.5 mm wide, free from the column, obovate, distinctly 3-lobed near the apex, with 5 veins running from the base of the lamina towards the apex, distinctly thickened below the base of the midlobe, glabrous, midlobe bilobed, lobes broadly rounded, erose, lateral lobes semicircular. *Column* 10 cm long, terete, slightly arcuate, shortly pubescent on the ventral surface near the base, *anther* flattened conic, 1 mm long, *pollinia* ellipsoid, paired, acute, 0.6–0.8 mm long, *stigma* transversely oblong, emergent. *Fruit* not seen.

**DISTRIBUTION:** Endemic to Peru, where it is known only from the type locality in the understory of bamboo-dominated lowland forest in the department of Cusco (Fig. 9).

**ETYMOLOGY:** The epithet refers to the free lip from the column, an atypical feature among the genus.

Among the *Palmorchis* species with lateral inflorescences and bilobulate midlobe lips, *P. liberolabellata* is easily distinguished by its combination of glabrous floral bracts and lip, the latter also free from the column and bearing 5 thickened keels on the disk (Table 1).

Although *P. prospectorum* Veyret might be the closest relative to *P. liberolabellata*, it differs notably in its larger flowers and 3-veined thickened lip densely pubescent that is united to the column almost to its middle length. In addition, *P. prospectorum* is endemic to French Guiana and Surinam, where it grows as terrestrial herb in swamp forest, while *P. liberolabellata* has been reported from southeastern Peru, in the lowlands of Cusco, growing in a disturbed ‘pascal’ forest dominated by the bamboo *Guadua sarcocarpa* (Poaceae).

*Palmorchis deceptoris* Veyret & Szlach. and *P. powellii* (Ames) C.Schweinf. & Correll also possess the main features of the informal group of *Palmorchis* species described above. However, both can be distinguished from *P. liberolabellata* by the densely pubescent subtrilobed lip with not well-defined lateral lobes. The disc of the lip of *P. powellii* is similar to

the one found on *P. liberolabellata*, bearing 5 long thickened veins. However, on *P. powellii* the middle vein extends to the apex of the midlobe, while in *P. liberolabellata* the main veins are only thickened close to the middle of the lamina, and none reach the midlobe. On the other hand, *P. deceptoris* presents 3 long thickened veins that are congested along the midvein, while *P. powellii* and *P. liberolabellata* bear 5 spreading thickened veins. *Palmorchis deceptoris* is believed to be endemic to Colombia, where it has been recorded near the Caunapi River, probably in swamp forest, while *P. powellii* is native to Mesoamerica (Costa Rica, Panama), where it grows in damp places with dense shade.

4. *Palmorchis lobulata* (Mansf.) C.Schweinf. & Correll, Botanical Museum Leaflets 8:113. (1940: 113). *Neobarlettia lobulata* Mansfeld (1928: 237).

**TYPE:** PERU. Loreto: Cuenca del Marañón, desde Iquitos hasta el Estuario Santiago en el Pongo de Manseriche, 160 m. 11 November 1924. *G. Tessmann 4518* (holotype: B, destroyed, lectotype AMES!, selected by Szlachetko *et al.* 2018). Fig. 6.

*Palmorchis lobulata* is most similar to *P. guianensis* (Schltr.) C.Schweinf. & Correll, from which it differs in having broader leaves, 4.7–9.0 cm wide (*vs.* 3.5–4.0 cm), lip with pilose margins in front (*vs.* glabrous, entire margins), lateral lobes rounded to truncate (*vs.* obtuse to rounded), subquadrate cushion-like callus and midlobe small, triangular (*vs.* narrower midlobe with an axial thickening and globose termination).

**DISTRIBUTION:** Colombia, Ecuador and Peru (Fig. 9).

**ADDITIONAL SPECIMENS EXAMINED:** Peru. Huanuco: Pachitea, Dtto. Honoria, Bosque Nacional de Iparia, 300–400 m, 21 February 1967, *J. Schunke 1652* F (photo)!; Loreto: Dist. Alto Nanay, Santa María de Nanay, Trocha a piusco, 130 m, 9 March 1968, *J. Schunke 2517* F (photo)!; Ucayali: Prov. Coronel Portillo, Dist. Iparia. Bosque nacional de Iparia: región de bosque seco tropical a lo largo del río Ucayali cerca del pueblo de Iparia (unos 80 km. arriba de la confluencia con el río Pachitea), 300 m, 26 agosto 1968, *J. Schunke 2693* F (photo)!; Prov. Purús, Dist. Purús, cuenca del río Curanka, afluente del río Alto Purús, cerca de la comunidad Nativa Colombiana. 11



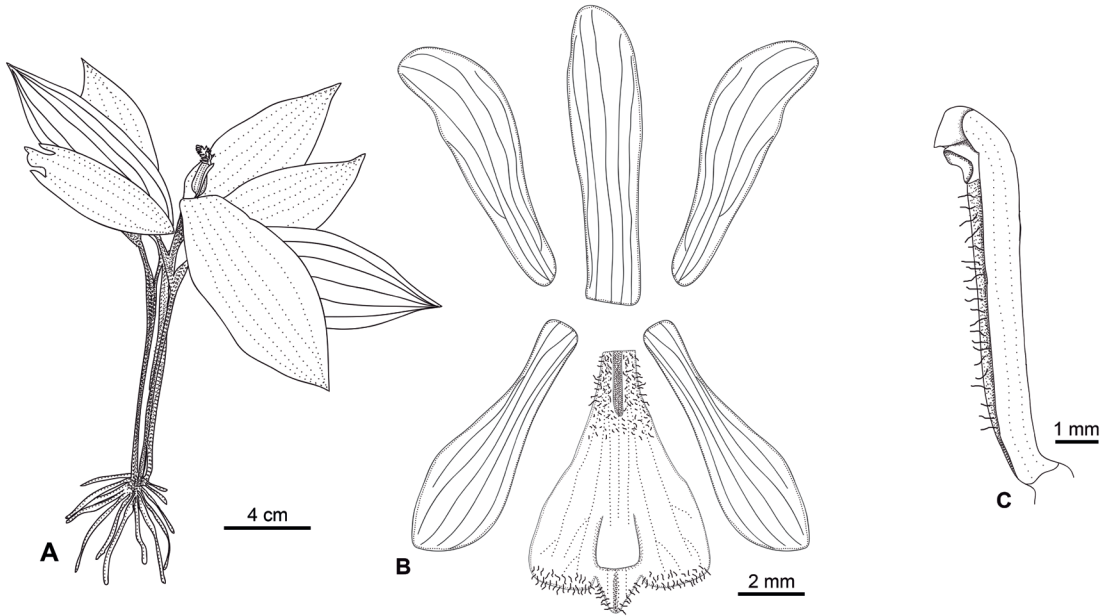


FIGURE 6. *Palmorchis lobulata* (Mansf.) Schweinfurth & Correll. A. Plant, B. Dissected perianth, C. Column on lateral view. Drawn from *Graham & Schunke 809 F!* by A. Damián.

February 2000, 10°04'00.0"S 71°06'00.0"W, 300–350 m, *Graham & Schunke 809 F!*.

According to the key presented by Szlachetko & Baranow (2014) and the description and illustration published by Dodson & Dodson (1980), the lip midlobe of *P. lobulata* is truncate. However, this disagrees with the original description (it states: “*lobo medio brevi triangulari*”), the detailed flower drawing of the holotype by L. Garay (AMES) and its treatment for Ecuador (Garay 1978), as well with the work of Schweinfurth & Correll (1940) which proved that the lip of this species is actually triangular.

Peruvian specimens of *P. lobulata* are scarce, usually infertile and with several misidentifications. We did our best to gather all the specimens available of this species and we include only those with flowers present. However, several specimens revised were fruiting or with immature buds, making them impossible to study rigorously. We managed to dissect a couple of flowers (*Graham & Schunke 809*) and some difference between the type and the latter specimen are noticeable. First, the leaves are shorter, 10.0–4.7 cm (vs. 24.0 × 9.0 cm). Moreover, the flowers are slighter smaller as well, 11.0–13.0 × 2.5–3.0 (vs. 8.0–9.0 × 2.5–3.0). Finally, the lateral lobes are distinctly truncate

with a small triangular midlobe which is pilose and has a low midvein that is thickened (vs. lateral lobes rounded, more or less truncate, midlobe glabrous without thickened veins) (Table 1).

##### 5. *Palmorchis loreтана* Damián & Torres, *sp. nov.*

TYPE: PERU: Loreto: Requena, Dist. Soplín, quebrada Yanayacu-Río Blanco. Campamento Wiswincho, 05°48'36.00"S 73°51'56.00"W, 10 October 2014. *M. Ríos, T. Mori, N. Pitman, L. Torres & C. Vriesendorp 4268* (holotype: AMAZ!). Fig. 7.

*Palmorchis loreтана* is most similar to *P. sobralioides*, from which it differs in its smaller flowers, tepals 5–8 mm long (vs. tepals 20 mm long); densely pubescent lip below the middle (vs. glabrous); midlobe oblong, acute, with three low thickened keels (vs. triangular-ovate, obtuse, without keels) and callus with two fleshy tall ridges (vs. four elevated, small, protuberances).

Terrestrial herb, 40–50 cm tall. *Roots* not seen. *Stems* cane-like, up to 16 cm long, 0.25 cm in diameter, with 4 leaves towards the apex. *Leaves* light green, plicate, with 5 prominent veins on the underside, oblong-elliptic, acuminate at the apex, narrowing to the

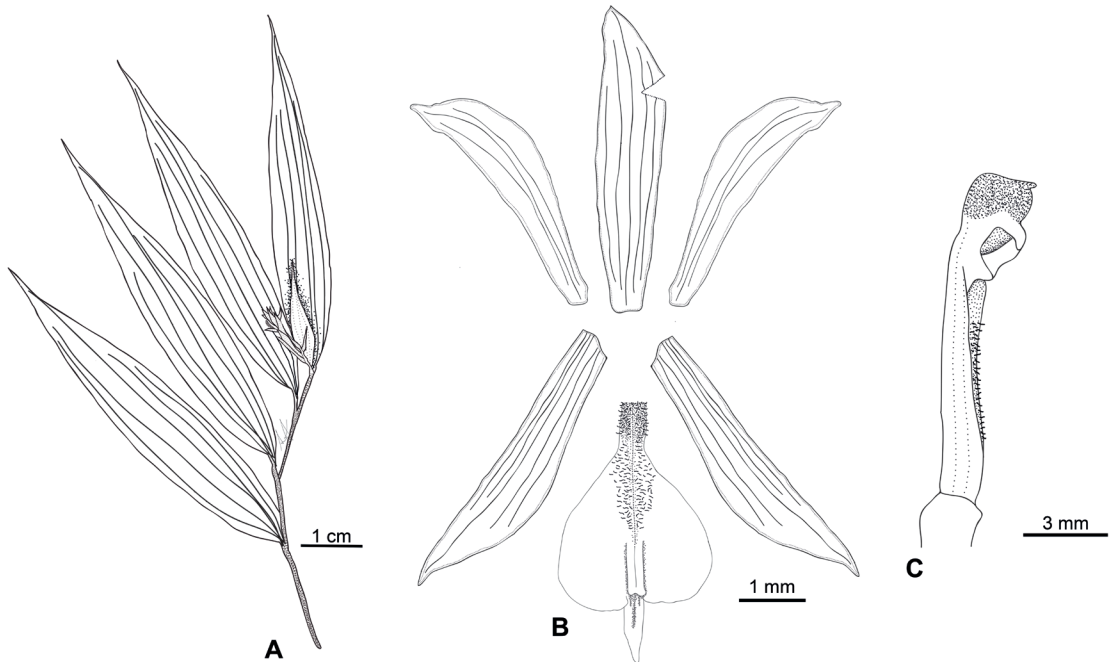


FIGURE 7. *Palmorchis loreтана* Damián & Torres. A. Plant, B. Dissected perianth, C. Column. Drawn from the holotype (*M. Ríos et al.* 4268, AMAZ!) by A. Damián.

junction with the petiole, 9.0–18.0 cm long and 3.0–4.9 cm wide; petiole up to 1.5 cm long. *Inflorescence* up to 4.5 cm long, terminal, few-flowered. *Floral bracts* 12–19 mm long, narrowly triangular, acuminate, pedicel and ovary 5 mm long. *Flowers* pale yellowish-green, small. *Dorsal sepal* 6–8 mm long, 1 mm wide, oblong-elliptic, acute, concave, 5-nerved. *Lateral sepals* 6–8 mm long, 1 mm wide, oblanceolate, oblique, subfalcate, acuminate, central nerved thickened externally, 5-nerved. *Petals* 5–8 mm long, 1 mm wide, obliquely oblanceolate to oblong-oblanceolate, acute, obscurely 5-nerved. *Lip* 5–8 mm long, 3 mm wide when spread, narrowly obtriangular, 3-lobed at the apex; united with the column at its base for about 1 mm; base of the lip densely pubescent and spread along the main axis up to the middle of the lip; callus with two parallel, approximate fleshy ridges, upcurved apically; midlobe of the lip with three conspicuous thickened keels. *Column* pubescent, slender, terete, up to 4.5–8.0 mm long; anther flattened subconic, 1.5 mm long, *pollinia* ellipsoid, subacute, 0.8–1.0 mm long, *stigma* transversely oblong, emergent. *Fruit* not seen.

PARATYPE: PERU. Loreto: Putumayo, Dist. Yaguas,

Inventario Rápido de la cuenca del río Yaguas. NE de Iquitos y Pebas en las esquinas del trapezoide de Colombia. Drenaje del bajo Putumayo. En la boca de la quebrada Cachimbo, tributario S del bajo Yaguas, a 44 km O de la unión Yaguas-Putumayo. 02°43'42.8"S 70°31'31.7"W. Bosque de planicie inundable. 94 m. 27 October 2010. I. Huamantupa, Z. Cordero, N. Pitman & R. García 14698B (AMAZ!)

ETYMOLOGY: In reference to the Peruvian Department of Loreto, where the type specimen was collected.

DISTRIBUTION: Endemic to Amazonian Peru, where it is known from two localities in the department of Loreto, at altitudes between 90–100 m in the Yaguas and Tapiche watersheds. At both localities the species was recorded growing in the understory of floodplain forest on relatively poor soils (Fig. 9; García Villacorta *et al.* 2011, Torres Montenegro *et al.* 2015). These sites are relatively close to the Colombian and Brazilian borders, and the species likely occurs in similar habitat in those countries.

ADDITIONAL SPECIMENS EXAMINED: ECUADOR. Napo: Yasuni river. 30 min. upstream from Garzacocha.

Primary rain forest. Terra firme. Alt. 200 m. 01°03'0.00"S 75°28'12.00"W, 11 April, 1983. *J. E. Lawesson, T.Lassoe & P. M. Jorgensen 43445* (AAU!). BRASIL, Est. do Pará, Mpio. Faro, 06/01/1920. *A. Ducke 14663 BR!*; Est. do Amazonas, Mpio. Manaus, Reserva Forestal Ducke, *Kinupp, V.F. & Pereira F.N. 2015* (210109 INPA!).

As the diagnosis states, *P. loretana* is quite similar to the poorly known *P. sobralioides*. Although minimal, the prologue of this latter species by Barbosa Rodrigues (1877) and later, the extended version of Cogniaux (1893) including Barbosa's drawings, are clear enough to differentiate it from *P. loretana*. Both authors indicate in their description of the early species a 3-lobed lip, with broad lateral lobes and a minute, ovate-triangular, acute midlobe, with four small protuberances. In contrast, *P. loretana* has a conspicuous oblong, acute midlobe with three low keels, and callus bearing two tall parallel ridges (Table 1). In addition, *P. sobralioides* is known to have a glabrous column while *P. loretana* is densely pubescent on the ventral surface.

Another important difference between these two species lies in their distribution. *Palmorchis* species are in the great majority restricted in range, with some notable exceptions like *P. silvicola* L.O. Williams and *P. powellii*, which disjunctions reported from Costa Rica to Ecuador and Colombia. A comprehensive study is needed in order to corroborate the South American populations. For example, we studied an Ecuadorian specimen cited as *P. sobralioides* (*Lawesson et al. 43445*, AAU!). A close look at the plant, which has the combination of narrower 3-veined leaves, (1.0–1.5 cm wide) and blue flower lip, pointed us to *P. imuyaensis*, whose holotype was found not far away (Imuya, Sucumbíos). Specimens of *P. sobralioides* are known from Pará and Manaus (Brazil), while *P. loretana* seems to be endemic to the northeastern lowland forest of the Peruvian Amazon (Loreto). We were able to compare photos of the flowers of our plant and *P. sobralioides* (Ribeiro *et al.* 1999, 210109 INPA). Flowers of the latter look robust, with a tiny midlobe lip bearing 4 obscure protuberances and some blue color at the midlobe of the lip, a feature not reported before (*vs.* slender flowers, long midlobe and purple colored midlobe of *P. loretana*).

#### 6. *Palmorchis yavarensis* Damián & Torres, *sp. nov.*

TYPE: PERU. Loreto: Mariscal Ramón Castilla, Dist. Yavari, margen izquierda del río Yavari, entre Colonia Angamos y Lago Preto, Quebrada Limerá, 04°30'53.37"S, 71°54'2.77"W 9 April 2003, *H. Beltrán, R. Foster, N. Pitman, R. García, C. Vriesendorp & M. Ahuite 5698* (holotype: USM!, isotypes: F!, AMAZ!). Fig. 8.

*Palmorchis yavarensis* is most similar to *P. maguirrei* Szlach., S.Nowak & Baranow, from which it is distinguished by its glabrous bracts (*vs.* pubescent); linear-lanceolate glabrous sepals with acuminate apex, 27–30 × 2–3 mm, (*vs.* oblong, acute and pubescent along adaxial midvein, 21 × 4 mm); and distinctly 3-lobed lip, scarcely pubescent, with ciliate margins and 3 thickened main veins from the base to near the middle of the midlobe (*vs.* subtrilobed, with entire margins, pubescent along the midvein, and a single thick ridge along midvein).

*Herb* 60 cm tall. *Roots* not seen. *Stems* cane-like, 0.8 cm in diameter, with 8 leaves. *Leaves* plicate, 5–7-veined, broadly elliptic to obovate, acuminate, cuneate at the base, 65–70 cm long including the petiole, 10–11 cm wide. *Inflorescence* terminal, 8.0–9.7 cm long, many-flowered. *Peduncle* 6.0–7.5 cm long, with 1–2 lanceolate bracts. *Flowers* yellowish, simultaneous. *Floral bracts* 16.0–17.5 cm long, triangular, acuminate. *Pedicel* and *ovary* 9–12 mm long. *Sepals* similar, 27–30 mm long, 2–3 mm wide, linear-lanceolate, acuminate, obscurely 7-veined. *Petals* 22–25 mm long, 2 mm wide, linear-lanceolate, acuminate, 5-veined. *Lip* 23–25 mm long, 8 mm wide; distinctly 3-lobed; united to the column for 1.0–1.5 mm; sparsely pubescent all over, especially at the base and along the middle of the lamina, the margins ciliate, with 3 thickened main veins running from the base to near the middle of the midlobe; middle lobe 9–10 mm long, narrowly ligulate, acute, densely pubescent, recurved, margins undulate, upper part with a distinct longitudinal furrow; lateral lobes obliquely triangular-ovate, broadly obtuse. *Column* slender, terete, 15 mm long, densely pubescent below the stigma. *Anther* sub-conic, 1.5 mm long, *pollinia* ellipsoid, paired, 1 mm long, *stigma* transversely oblong; *fruit* not seen.

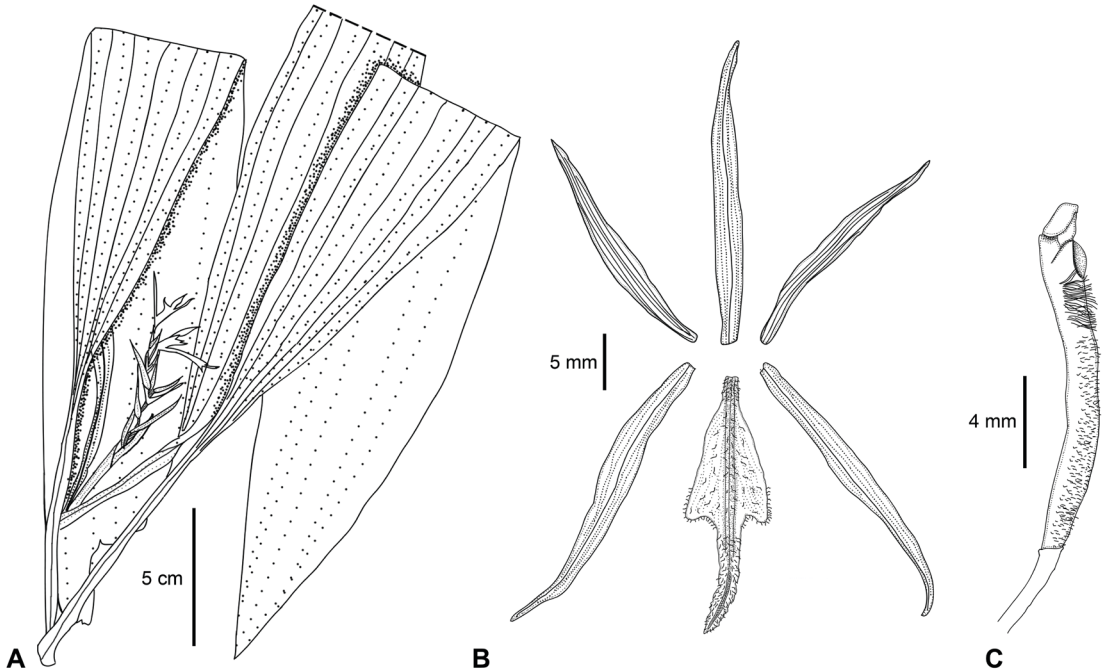


FIGURE 8. *Palmorchis yavarensis* Damián & Torres. A. Plant, B. Dissected perianth, C. Column. Drawn from the holotype (*H. Beltran et al.* 5698 USM!) by A. Damián.

PARATYPES: PERU. Loreto: Putumayo, Dist. Yaguas, NE de Iquitos y Pebas, en la esquina del trapezoide de Colombia. Drenaje del Bajo Putumayo. Quebrada Lupuna, tributario N del medio Yaguas, Bosque colinoso de tierra firme, 2°36'38.20"S 71°29'8.70"W. 161 m, 15 octubre 2010. *I. Huamantupa, Z. Cordero, N. Pitman & R. Garcia* 14065 (AMAZ); Ucayali: Padre Abad, Dist. Padre Abad, Carretera al caserío San Miguel y Mapuya, 12 a 17 km de la Aguaytía, 09°05'00.0"S 75°26'00.0"W, 350 m, 10 August 2004, *J. Schunke & J. G. Graham* 16290 F!

ETYMOLOGY: The new species was named after Yavarí, a proposed reserved Zone in Loreto, highlighting that the first records were made there.

DISTRIBUTION: Endemic to Peru, where it is known from two localities in Loreto (Yavarí and Yaguas watersheds) and one in Ucayali (Ucayali watershed). All known specimens were collected in the understory of mature lowland forest. The Loreto localities are very close to the Brazilian and Colombian borders; the species is likely to occur in similar habitat in those countries (Fig. 9).

*Palmorchis yavarensis* belongs to a small complex of species characterized by robust plants with large leaves and a distinct narrow acuminate lip (Table 1). Two members of the complex are *P. carlos-parrae* Szlach. & Baranow and *P. maguirrei*, from which *P. yavarensis* differs in its glabrous bracts and lip morphology. *Palmorchis carlos-parrae* from Colombia has the largest flowers of the genus with sepals 32 mm long and lip 26 mm long, entire and glabrous with a broad midlobe, 4 mm wide. *Palmorchis yavarensis*, on the other hand, has sepals and lip up to 30 and 25 mm long respectively, the lip is scarcely pubescent, especially along the middle of the lamina, and the midlobe is 1.5 mm wide. Moreover *P. yavarensis* has obliquely triangular-ovate lateral lobes with ciliate margins, while *P. carlos-parrae* presents falcate, acute entire lateral lobes.

This species was first reported as "*Palmorchis* sp." by Pitman *et al.* (2003) on a rapid biological inventory of the Yavarí river valley in the Amazonian lowlands of northeastern Peru (Loreto). Later that year, Foster *et al.* (2003) published a rapid color guide including a photograph of this species, in which its yellowish big flowers and large lip are clearly visible (Fig. 2A).

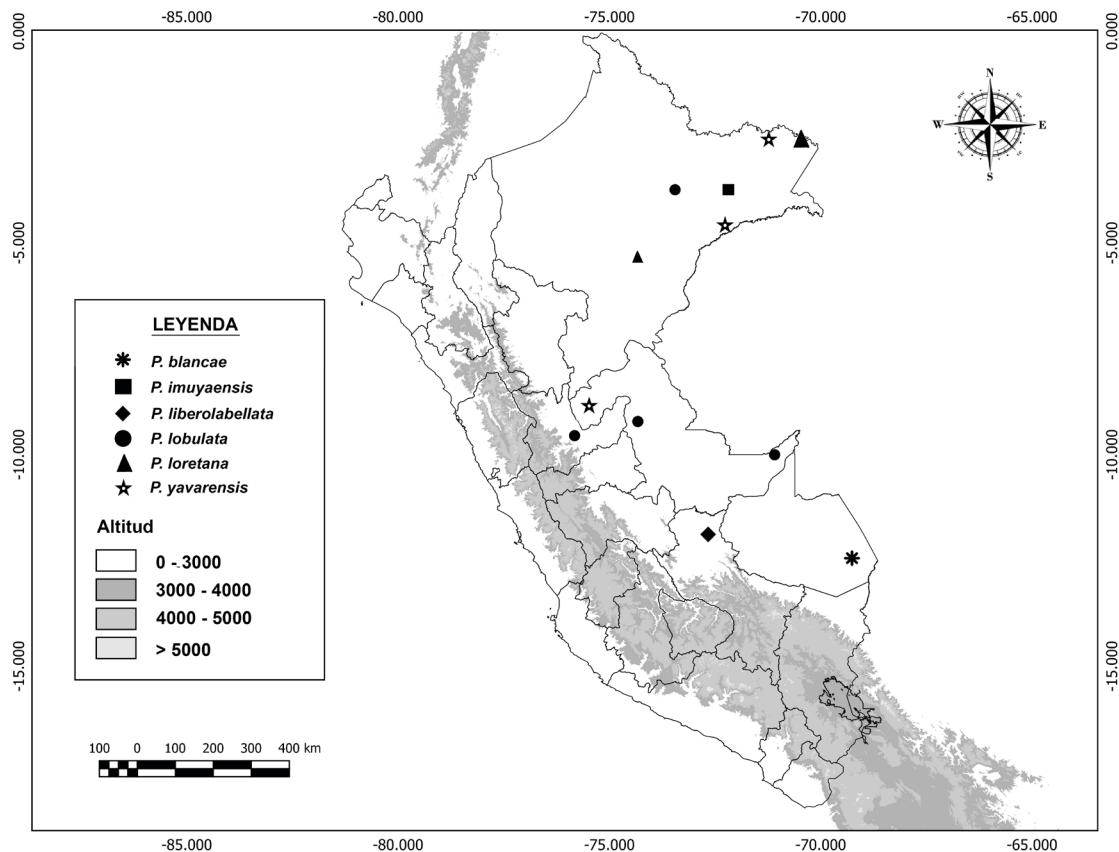


FIGURE 9. Map showing the known Peruvian localities for *Palmorchis*.

After almost a decade, the species was found again in the same department, this time in the headwaters of the Yaguas River, close to the Peru-Colombia border (García-Villacorta *et al.* 2011). We were unable to dissect the flowers of this plant. However, the detailed photos provided by the collector are sufficient evidence to place this specimen in the concept of *P. yavarensis*.

**ACKNOWLEDGEMENTS.** We would like to express my gratitude to FONDECYT and UCSUR for their support of the project "Genetic and morphological characterization of species of *Vanilla* (Orchidaceae) in Peru" during which the specimen *P. imuyaensis* was collected. Thanks to Luis Sanches Saldaña (AMO) for help in obtaining literature; to personnel at USM, AMAZ and F for granting access to their collections, especially to James Graham, Nigel Pitman and Asunción Cano; to Nicole Mitidieri for her invaluable support and her useful comments on this paper; and to J. Janovec (BRIT) for his friendship and trust since the early days of the *Vanilla* project.

#### LITERATURE CITED

- Barbosa Rodrigues, J. (1877). *Genera et Species Orchidearum Novarum, Vol I* (pp. 169–171). Sebastianópolis, Brasil.
- Brako, L. & Zarucchi, J. (1993). Catalogue of the Flowering Plants and Gymnosperms of Peru. *Monographs in Systematic Botany of the Missouri Botanical Garden*, 45, 414–425.
- Chase, M. W., Barrett, R. L., Freudenstein, J. W. & Cameron, K. (2003). DNA data and Orchidaceae systematics: a new phylogenetic classification. Pp. 69–89 In: K. M. Dixon, S. P. Kell, R. L. Barrett & P. J. Cribb. (Eds.), *Orchid conservation: a global perspective*. Kota Kinabalu, Sabah, Malaysia: Natural History publications.
- Cogniaux, A. (1893). Orchidaceae. Pp. 1–672 In: C. F. P. von Martius, A. W. Eichler & I. Urban (Eds.), *Flora brasiliensis*. Typographia Regia, Monachii.
- Dodson, C. H. & Dodson, P. M. (1980). Orchids of Ecuador. *Icones Plantarum Tropicarum*, 2, 101–200.
- Dodson, C. H. & Romero-González, G. (1993). Three new orchid species from Eastern Ecuador. *Lindleyana*, 8(4), 193–197.
- Dressler, R. L. (1984). *Palmorchis* in Panama: with a new species where least expected. *Orquidea (Méx.)*, 9(2),

- 213–230.
- Dressler, R. L. (1993a). *Field guide to the orchids of Costa Rica and Panama*. Ithaca, USA: Cornell University Press.
- Dressler, R. L. (1993b). *Phylogeny and classification of the orchid family*. Portland, USA: Dioscorides Press.
- Foster, R., Beltrán, H., Vriesendorp, C., García, R. & Pitman, N. (2003). *Plantas llamativas del Yavari*. Rapid Color Guide #162. Chicago, IL: The Field Museum. Available online at <http://fieldguides.fieldmuseum.org/guides/guide/162>
- Garay, L. A. (1978). Orchidaceae. Cyripedioideae, Orchidoideae, Neottioideae. In: G.W. Harling & B. Sparre (Eds.), *Flora of Ecuador* 225(1). Stockholm, Sweden: University of Goteborg.
- García-Villacorta, R., Huamantupa, I., Cordero, Z., Pitman, N. & Vriesendorp, C. (2011). Flora y vegetación/Flora and vegetation. Pp. 86–97, 211–221 & 278–306 In: N. Pitman, C. Vriesendorp, D. K. Moskovits, R. von May, D. Alvira, T. Wachter, D. F. Stotz & A. del Campo (Eds.), *Perú: Yaguas-Cotuhé*. Rapid Biological and Social Inventories Report No. 23. Chicago, IL: The Field Museum.
- Govaerts, R., Bernet, P., Kratochvil, K., Gerlach, G., Carr, G., Alrich, P., Pridgeon, A. M., Pfahl, J., Campacci, M. A., Holland Baptista, D., Tigges, H., Shaw, J., Cribb, P., George, A., Kreuz, K. & Wood, J. (2016). *World checklist of Orchidaceae*. Kew: Royal Botanic Gardens. Available from: <http://apps.kew.org/wcsp/> [Accessed: 12 March 2016].
- Hågsater, E., Dumont, V. & Pridgeon, A. M. (1996). *Orchids: status survey and conservation action plan*. Gland, Switzerland: IUCN.
- Hoehne, F. C. (1945). *Palmorchis*. *Flora Brasílica*, 12(2), 203–209.
- IPNI, The International Plant Names Index. (2016). Published on the Internet <http://www.ipni.org> [Accessed 1 July 2016].
- Mansfeld, R. (1928). *Plantae Tessmannianae peruvianae VII. Notizblatt des Botanischen Gartens und Museums zu Berlin-Dahlem*, 10, 237–239.
- Pitman, N., Beltrán, H., Foster, R., García, R., Vriesendorp, C. & Ahuite, M. (2003). Flora y vegetación/Flora and vegetation. Pp. 52–59, 137–143 & 188–218 In: N. Pitman, C. Vriesendorp, D. Moskovits (Eds.), *Perú: Yavari*. Rapid Biological Inventories Report No. 11. Chicago, IL: The Field Museum.
- Pridgeon, A. M., Cribb, P. J., Chase, M. W. & Rasmussen, F. N. (2005). *Genera Orchidacearum. Volume 4. Epidendroideae (Part One)*. Oxford: Oxford University Press.
- Ribeiro, J. E. L. d S., Hopkins, M. J. G., Vicentini, A. (1999). *Flora da Reserva Ducke. Guia de identificação das plantas vasculares de uma floresta de terra firme na Amazônia Central*. Manaus, Brasil: INPA-DFID.
- Rothacker, E. P. (2007). *The Primitive Epidendroideae (Orchidaceae): Phylogeny, character evolution and the system of Psilochilus (Triphoreae)* (A dissertation presented in Partial Fulfillment of the Requirements for the degree Doctor of Philosophy). Ohio State University, Ohio, USA.
- Szlachetko, D. L. & Baranow, P. (2014). Revision of the genus *Palmorchis* (Orchidaceae-Vanilloideae-Triphoreae) in Colombia. *Phyton* (Horn. Austria), 54 (1), 47–70.
- Szlachetko D. L., Baranow, P. & Dudek, M. (2018). Materials Towards Taxonomic Revision of the Genus *Palmorchis* (Orchidaceae). *Systematic Botany*, 43(1), 130–152.
- Schweinfurth, C. & Correll, D. (1940). The Genus *Palmorchis*. *Botanical Museum Leaflets*, 8, 109–119.
- Torres Montenegro, L., Mori Vargas, T., Pitman, N., Ríos Paredes, M., Vriesendorp, C. & Johnston, M. K. (2015). Vegetación y flora/Vegetation and flora. Pp. 96–109, 278–289 & 376–419 In: N. Pitman, C. Vriesendorp, L. Rivera Chávez, T. Wachter, D. Alvira Reyes, Á. del Campo, G. Gagliardi-Urrutia, D. Rivera González, L. Trejejo, D. Rivera González & S. Heilpern (Eds.), *Perú: Tapiche-Blanco*. Rapid Biological and Social Inventories Report No. 27. Chicago, IL: The Field Museum.
- Tropicos. (2016). Tropicos.org. Missouri Botanical Garden, published on the internet; <http://www.tropicos.org> [Accessed 10 July 2016].