

NEW SPECIES OF *PODANDROGYNE* (CLEOMACEAE) II.
TWO SPECIES ENDEMIC TO THE SOUTHWESTERN
AND NORTHERN COLOMBIAN ANDES¹

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Abstract. Two new species, *Podandrogynne laplanadae* from the department of Nariño and *P. nutibarana* from the department of Antioquia are described from the montane cloud forests of Colombia. Species descriptions, illustrations, specimen citations and ecological information are presented, as well as notes about their conservation status.

Resumen. *Podandrogynne laplanadae* (departamento de Nariño) y *P. nutibarana* (departamento de Antioquia) de los bosques montañosos nublados de Colombia son descritas, ilustradas y sus relaciones morfológicas con sus especies afines son discutidas. Se provee información eco-geográfica, y datos acerca del grado de conservación de esta región de los Andes Colombianos.

Keywords: Cleomaceae, *Podandrogynne*, new species, Colombia

The genus *Podandrogynne* Ducke was last revised by Woodson (1948), at which time only nine species were recognized. Currently, 21 species are accepted, taking into account those that have been published or reinstated since then (Cochrane, 1977, 1978, 1997, 2011, 2015; Iltis and Cochrane, 1989). The Colombian and Ecuadorian Andes are the evolutionary center of this genus, 20 species presently being recognized for Colombia (Iltis and Cochrane, 2016) and 11 for Ecuador (Iltis and Cochrane, 1999). An additional 16 new species, all occurring in the northern Andes of Ecuador and Colombia, have been identified but remain unpublished, including the two clearly delimited species of subsection *Podandrogynne* (Cochrane, 2011) described herein. Their discovery contributes not only to the unexpected diversity in this genus but also to the renown of the tropical Andes for their rich biodiversity (Mittermeier et al., 1999; Myers et al., 2000; Rodríguez-Maecha et al., 2004; see Bernal et al., 2016) and high rate of endemism (Hernández-Camacho et al., 1992; Mittermeier et al., 2008; Joppa et al., 2011; Bernal et al., 2016). Apparently, both are rare or at least very local species: more collections are needed, because flowering material is almost unknown. Both are from areas from which many new and apparently endemic plant and animal species are being described. Fortunately, like *P. caucana* Cochrane and *P. chocoensis* Cochrane (cf. Cochrane, 2011) both have been collected in cloud forests protected by a reserve or national park; this is no guarantee for survival, however, given Colombia's history of unlawful coca plant production and guerilla group rapprochement with coca.

Podandrogynne laplanadae Cochrane, *sp. nov.* TYPE: COLOMBIA. Nariño: La Planada Reserve, near Ricaurte, 00°05'N, 78°01'W [sic], 1800 m, "Spindly shrub 1.5 m,

flowers red," 21 December 1987 (fl), A. H. Gentry, O. S. de Benavides, and P. Keating 59645 (Holotype: MO [6669498, barcode MO-2561913; WIS digital image]; Isotype: WIS [barcode v0325283WIS]). Fig. 1.

Herbae vel frutices impariter exiles saepe scandentes, omnino glabri; folia persaepe unifoliolata; flores zygomorphi, in racemos longissimos non particulatim dense dispositi, pedicellis brevibus in angulo recto divergentibus; petala cardinalia vel fuchsina, 6–9 mm, sessilia; flores masculini: androgynophorum 12–20 mm, filamentis 3–10 (14) mm et antheris violaceis pollen auribruneum continentibus; fructus penduli, juniores rubiginosi vetustiores atrosanguinei vel purpurei, anguste oblongi, modice ad latus compressi, apiculati vel rostrati, basi gynophoro 7–10 (13) mm et androgynophoro 13–18 (28) mm instructi, pedicello rigide divergenti vel ad angulum exiguum vel latum deorsum curvato.

Spindly herbs, subshrubs, or shrubs, often scandent, to 1.5 m, glabrous except for young shoots and petioles. Leaves evenly distributed along the stems, 1-foliolate (rarely 2- or possibly 3-foliolate), blades pale beneath, elliptic to narrowly elliptic, 6–24 × 2–11 cm, obtuse or less often broadly cuneate at base, acuminate to long-acuminate or seldom subcaudate-acuminate, membranous, glabrous, with 8–13 (16) lateral veins on either side of the midrib, these ± prominently raised beneath when fresh; petioles 1–14 cm, variegated with garnet-red, irregularly and sparsely glandular-papillate, distally with short stiff, straight or crumpled, gland-tipped hairs 0.05–0.5 mm. Racemes almost subspicate, neither loosely nor densely flowered, elongating to 50 cm in fruit; peduncle 1–12 cm, rachis dark brownish-red, 8–39 cm, curved or flexuous, becoming very elongate, producing up to ca. 216 flowers [pedicels plus pedicel scars], bearing 0 to 60 buds (depending on the age of the inflorescence) and only

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¹The previous article in this series was Cochrane (2011).

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FIGURE 1. *Podandroyne laplanadae* Cochrane. **A**, flowering branch; **B**, teratologic leaf; **C**, functionally staminate flower; **D**, flowering portion of inflorescence in staminate phase; **E**, array of immature fruits, showing range of variation. **A**, **C** from Gentry *et al.* 59645 (isotype, WIS); **B** from Betancur *et al.* 3940 (MO); **D** from Gentry *et al.* 59645 (holotype, MO); **E** left end fruit from Croat 71379 (MO), all others from Restrepo CR515 (WIS).

0 to 6 open flowers at any one time. *Bracts* 0 to 1, leaf-like, 1-foliolate, narrowly elliptic, narrowly oblong-elliptic, or lanceolate, 3–9 × 0.5–2 cm, borne on distinct short petioles 2–7 mm. *Flowers* falling easily, monosymmetric, borne on spreading to spreading-ascending pedicels 7–14 mm (30 mm on Vargas 5251); *sepals* dark red, united for 0.5–1.3 mm at base, ovate (ovate-triangular in bud), sharply acute to acuminate, 2.5–4.5 × 1.5–2.5 mm; *petals* fire-engine red (“fuccia,” sub Betancur *et al.* 3940), ± equal in shape and size, obliquely ovate-oblong or narrowly so (abaxial pair) to oblong or narrowly oblong (adaxial pair), 6–9 × 2.5–3.5 mm, sessile, obtuse to narrowly rounded at apex. Disk a

nectariferous adaxial gland, shallowly 3-lobed, in flower the two lateral lobes circular to widely ovate-elliptic in outline, in fruit (when dried) usually oblong in side view, 1.5–2.3 (3) × 2.3–2.9 × 1.3–1.8 mm, persisting and ± conspicuous in fruit. *Pistillate flowers*: not seen. *Staminate flowers*: androecium exserted, androgynophore reddish, 12–20 mm, filaments normally all fertile, subequal, 3–10 (14) mm; anthers green or violet, 2.6–3.2 mm, pollen golden-brown. *Fruits* dark red or “purple,” pendent, narrowly oblong, (2) 4–6 (9) × 0.7–1.2 cm, somewhat compressed, cuneate at base, acute and apiculate at apex, glabrous; stigma barely differentiated from the style, 0.7–1 mm in diam., true style

0–1.6 mm, forming with the apices of the valves a definite tapering beak 1–4 mm; gynophore 7–10 (13) mm, wiry, continuous and straight with the androgynophore, glabrous; androgynophore 13–18 (27) mm; pedicel typically short, stiffly divergent or usually slightly to widely down-curved, 7–14 (31) mm. *Seeds* (mature seeds not seen) ca. (7) 50–70 per capsule, when young brown (when dried), orbicular, 3.1–3.5 × 2.6–2.8 × 1.3–1.7 mm, evenly compressed (barely beveled), lineate and transverse-rugulose; aril thin-textured, translucent.

Distribution and ecology: *Podandrogynae laplanadae* is locally endemic to southwestern Colombia. With one exception the collections are from or very near La Reserva Natural La Planada (01°09'37"N, 77°9'13"W), located in the Department of Nariño near Ricaurte. A single collection from the Reserva Agua Bonita in the vicinity of the Village of Bitaco in the Department of Valle del Cauca, approximately 310 km to the north-northeast, appears to be this species. According to collectors' notes (the majority of collections are without habitat or frequency data), *P. laplanadae* is "escaso" in "cloud forest," "bosque bajo," and "sotobosque" at 1300–1900 m, but plants are most common at 1800 m. Lying on a ridge that extends from the western flank of the Andean Cordillera, the La Planada reserve ranges between 1200–2300 m in elevation and supports a mosaic of primary and secondary forest surrounded by recently abandoned pastures. The natural vegetation is montane wet forest sensu Holdridge (1967) or "bosque subandino" of Van der Hammen and Rangel-Ch. et al. (1997). More information about the reserve is given in Croat (1992), Orejuela (1987), Rangel-Ch. et al. (1997), Restrepo and Gómez (1998), and Vallejo et al. (2004).

Phenology: Flowering in December and February, fruiting in December, March, and April. Further collecting will show whether flowering occurs during the main dry period (July through August).

Eponymy: The species is named after the Reserva Natural La Planada, the locality where the majority of collections have been made.

Additional specimens examined: COLOMBIA. Dept. Nariño: Mpio. de Ricaurte, Reserva Natural La Planada, 1800 m, without date (fl), *M. Amaya 315* (COL [WIS photo, digital image]); Mpio. de Ricaurte, Reserva Natural La Planada, entre Santa Rosa y la reserva, 01°14'N, 77°58'W, 1300–1700 m, 20 February 1993 (bud, fl), *J. Betancur et al. 3940* (COL [WIS digital image], MO); Reserva Natural La Planada, between Tuquerres and Ricaurte, 7 km above Chucunés along Sendero La Rosa to Potrero de Hermógenes, 01°06'N, 77°53'W [sic], 1800–1850 m, 13 March 1990 (fr), *T. Croat 71379* (MO); Reserva Natural La Planada, 7 km de Chucunés, 01°10'N, 77°58'W, 1800 m, 13 December 1987 (fl), *O. de Benavides 9049* (MO); Reserva Natural La Planada, 7 km de Chucunés, Trocha de Las Cañadas, 01°10'N, 77°58'W, without alt., 16 December 1991 (fr), *R. Giraldo 70* (HUA [WIS photo]); Mpio. de Ricaurte, Reserva Natural La Planada, 1800 m, 1 April 1992 (y fr), *C. Restrepo CR515* (WIS). Dept. Valle del Cauca: Mpio. La Cumbre, Correg. Bitaco, Reserva Agua Bonita, 1700–1900 m, 10–15

December 1998 (fl, fr), *W. Vargas 5251* (HUA [WIS photo], ? Herb. [WIS digital scan]).

Podandrogynae laplanadae is characterized by its often scandent habit, nearly always unifoliolate leaves, and elongated slender inflorescences, as well as by the short-pedicillate, dark red flowers and fruits. In habit *P. laplanadae* appears similar to *P. nutibarana* Cochrane (see the following species), but any seeming relationship between these two species on this basis may well be superficial. They differ from most other species of the genus in having consistently unifoliolate, often small leaves (i.e., 7–12 cm but largest leaves to 15 or 20 cm); often elongate, slender racemes (to 50 cm); and small flowers (floral envelopes 6–15 mm). The two species, however, can be readily distinguished by flower and fruit color, *P. nutibarana* having orange flowers with cream-colored pollen and green to reddish- or yellowish-green fruits. It is less clear from herbarium material in fruit or in which colors have been lost that the two are distinct from one another. In *P. laplanadae* the pedicels are shorter (8–13 instead of 16–20 mm as in *P. nutibarana*) and the flowers a bit smaller (sepals 2.5–4.5 vs. 4.0–6.5 mm, petals 6–9 vs. 8–14 mm, androgynophores 12–20 vs. 26–28 mm). The filaments are the same length in the two species, and the ranges of these measurements, especially for *P. nutibarana*, should not be considered to be completely representative, based as they are on so few flowers. Shapes and dimensions of the fruits are also the same (only two fruiting specimens have been seen for each) except that *P. laplanadae* has a short but definite style, a feature lacking altogether in *P. nutibarana*. Note, however, that parallel variation—the presence or absence of a distinct style—is not necessarily significant in other species of *Podandrogynae*.

Podandrogynae nutibarana Cochrane, *sp. nov.* TYPE: COLOMBIA. Antioquia: Mpio. Frontino, Correg. Nutibara, Nutibara-La Blanquita road, region of Murri, Alto de Cuevas, 06°45'N, 76°20'W, 1700–1800 m, "heavily disturbed, premontane forest. Thin-stemmed (4 cm diam.) tree to 5 m. Petals red-orange. Stamens green. Fruit green suffused maroon. Rare," 19 April 1988 (fl, fr), *J. L. Luteyn, R. Callejas & O. Escobar 12006* (Holotype: HUA [52599; WIS digital images]; Isotypes: NY [WIS digital images], WIS-2 sheets [barcodes v0325583WIS, v0325587WIS]). Fig. 2.

Herbae vel frutices (fortasse scandentes) vel arbusculae graciles, omnino glabrae; folia plerumque unifoliolata; flores zygomorphi, in racemos probabilititer pendulos elongatos non particulatim dense dispositi, rhachidibus prasinis plus minus sigmoidibus vel flexuosis vel arcuatis; petala aurantiaca vel cinnabarina, 8–14 mm, sessilia vel subsessilia; flores masculini: androgynophorum viride, 26–28 mm, filamentis 7–10 mm, antheris viridibus pollen cremeum continentibus; fructus penduli, virides vel virides suffusi castanei (juniores flavovirentes), anguste oblongi, sine rostro non nisi per stigmata apiculati, basi gynophoro 6–8 mm et androgynophoro 20–22 mm instructi, pedicello curvatim ascendenti ad declinato.



FIGURE 2. *Podandroyne nutibarana* Cochrane. **A**, fruiting branches; **B**, trifoliolate leaf; **C**, flowering portion of inflorescence in staminate phase (note pistillode at arrow). A from Luteyn *et al.* 12006 (holotype, HUA); B from Pedraza-P. *et al.* 2191 (WIS); C from color photos taken in the field by María F. González.

Herbs, shrubs (possibly scrambling), or *thin-stemmed trees*, 0.8–5 m, to 4 cm dbh, glabrous. *Leaves* evenly distributed, 1- or occasionally 3-foliolate, blades elliptic, narrowly elliptic, or narrowly oblong-elliptic, less often narrowly oblong, oblong-lanceolate, or lanceolate, 5–18 × 1–5 cm, cuneate to obtuse at base, acuminate to long-acuminate or seldom caudate-acuminate, membranous, glabrous, venation brochidodromous with main lateral veins 7–13 on either side of the midrib; petioles tinged purplish, (0.5) 1–9 cm. *Racemes* probably divergent or possibly pendent, loosely flowered below, variable in length and not particularly floriferous, peduncle 3–9 cm, rachis a clear

lively green, ± straight when young, soon becoming sigmoid, flexuous, or arcuate, if elongate upswept, usually sharply bent upward at the flowering tip, 3–29 cm, producing 26 to 30 flowers and buds [including pedicel scars] during pistillate phase and eventually anywhere from 32 to ca. 95 flowers in staminate or fruiting phase but with only 0 to 4 open flowers at any one time. *Bracts* 0 to 6, leaf-like unless very small, 1-foliolate, narrowly elliptic, narrowly oblong-elliptic, or lanceolate to oblong-elliptic or lanceolate-elliptic, 0.2–14 × 0.1–4 cm, if more than four the distal ones tiny (ca. 0.5–3 mm), quickly reduced upward to microscopic, dark-tipped, hair-like processes or obsolete, obtuse to cuneate or seldom

attenuate at base, acuminate to subcaudate-acuminate or attenuate at apex, borne on short petioles 1–10 mm or if minute, sessile. *Flowers* monosymmetric; pedicels reddish-orange, ascending to spreading (or in fruit declining), 16–24 mm; *sepals* yellow to bright orange, united for ca. 1 mm at base, ovate to ovate-oblong, 4–7 × 1.5–3.5 mm, acute, sinuses between them acute; *petals* (very few available) “red,” red-orange, or bright orange, nearly equal in shape and size, lower (abaxial) pair obliquely elliptic, upper (adaxial) pair elliptic, 8–10 × 3–4 mm (pistillate flowers) or 9–14 × 4–6 mm (staminate flowers), sessile or subsessile (narrowed to a broadly cuneate base or short claw ca. 1–2 mm), obtuse to narrowly rounded at apex. Disk a 3-lobed nectariferous adaxial gland, in lateral view depressed obovate in outline but squared off adaxially, 2.1–2.3 mm (including abaxial band of practically obsolete tissue) × 1.4–1.7 mm thick, in top view transversely trapezoidal in outline, 2.4–2.6 mm across × 1.8 mm wide, furrowed in apposition to the adaxial petals and androgynophore, persisting and somewhat conspicuous in fruit. *Pistillate flowers* (four seen): ovary green, narrowly oblong, 4–5 × 1–2 mm thick, beakless; stigma sessile (i.e., style 0.0–0.3 mm), capitellate, 0.7–1.3 mm in diam.; androgynophore 17–21 mm; gynophore 4–7 mm. *Staminate flowers* (three seen, all mashed): androecium green, well exerted, androgynophore 26–28 mm, filaments all fertile, subequal, proximal pair divaricate in a plane perpendicular to the vertical orientation of the flower as a whole and the shorter, sharply upcurved, median and distal pairs, 7–10 mm; anthers green, 3.8–4.5 mm, pollen cream-color. *Fruits* green or green suffused with maroon, pendent, narrowly oblong, 2–5.5 × 0.7–1.1 cm, slightly compressed, cuneate or broadly so at base, acute to obtuse or rounded and beakless or nearly so (beak a blunt nubbin ca. 0.5–2.5 mm, style undifferentiated and stigma truncate), glabrous; gynophore 6–8 mm, wiry, slightly deflexed (17–42°) relative to the androgynophore, glabrous; androgynophore 20–25 mm; pedicel 18–26 mm, curved-ascending to declined. *Seeds* (mature seeds not seen) ca. 25–115 per capsule, when young brown, orbicular, scalariform; aril (when dried) buff, opaque.

Distribution and Ecology: *Podandrogynone nutibarana* is endemic to the Department of Antioquia, Colombia, being known only from the northern Cordillera Occidental in the area between Nutibara and La Blanquita and in the Parque Nacional Natural Las Orquídeas, in little to heavily disturbed, tropical premontane rain forest at 1000–1850 m. It has been collected equally frequently in both areas, which, in fact, are no more than 40 km apart (straight line distance between Murri, Frontino, and La Encarnación, Urrao), but in the Frontino region, where, according to collectors, it is rare (sub *Callejas et al.* 6826, 9928; *Luteyn et al.* 12006), the premontane forests are not protected and face deforestation pressure (Myers et al., 2000). These forests are described in Luteyn and Sylva S. (1999).

Phenology: *Podandrogynone nutibarana* has been collected in flower in February, April, and July and in fruit in April and July.

Etymology: The epithet *nutibarana* is taken from the

name of the Corregimiento of Nutibara, where about half of the specimens, including the type, were collected.

Additional specimens examined: COLOMBIA. Dept. Antioquia: Mpio. Frontino, Correg. La Blanquita, región de Murri, Alto de Cuevas, 14.5 km O [WSW] de Nutibara en la vía a La Blanquita, 06°45'N, 76°25'W, 1850 m, 14 July 1988 (bud), *R. Callejas et al.* 6826 (Topotypes: HUA [WIS photo], MO [WIS photo]); Mpio. Frontino, Correg. Nutibara, zona de Murri, vía Nutibara-La Blanquita, 5–8 km S de Alto de Cuevas, 06°39'N, 76°25'W, 1000–1850 m, 15 February 1995 (bud), *R. Callejas et al.* 9928 (Topotype: HUA [WIS digital images]); Parque Nacional Natural Las Orquídeas, Sector Venados arriba, margen izquierda del Río Venados, 06°34'N, 76°19'W, 1090–1215 m, 28 July 1988 (fr), *A. Cogollo et al.* 3572b (JAUM [WIS photo]); Parque Nacional Natural Las Orquídeas, camino de Venados arriba hacia Carauta, margen derecho del Río Venados, 06°33'N, 76°17'W, 1680 m, 15 February 1989 (bud), *A. Cogollo et al.* 4018 (COL, MO); Mpio. Urrao, Correg. La Encarnación, Parque Nacional Natural Las Orquídeas, entre el Río Polo y el Páramo del Almorzadero, without alt., 4 February 2011 (fl), *P. Pedraza-P. et al.* 2191 (NY [WIS digital image]); Mpio. Frontino, Correg. Nutibara, cuenca alta del Río Cuevas, 1790 m, 15 April 1987 (fl), *D. Sánchez et al.* 1208 (Topotype: MEDEL [WIS photo]).

Podandrogynone nutibarana is characterized by its nearly always unifoliolate leaves, elongate slender inflorescences, and bright orange or red-orange flowers as well as by the green rachis, short pedicels, cream-colored pollen, and green to dark-reddish-green (yellowish-green when young) fruits. In contrast, *P. laplanadae* has dark red to purple rachises, flowers, and fruits as well as green or violet anthers with golden-brown pollen (one dried flower seen). Study of herbarium specimens has not turned up any dramatic quantitative differences between the two species, but comparison of the shapes and dimensions of the leaves, flower parts, and fruits, as well as the pedicels and the dried nectar glands, has yielded differences, albeit small, in pedicel length and staminate flower size that may show valid discrimination between the two species (see notes under *P. laplanadae*, above). A level of uncertainty is associated with these distinctions, based as they are on such a small number of flowers. However, no deliberation was required before deciding to recognize each as a new species, because the color differences between the two as shown in photographs (i.e., <http://www.tropicos.org/31315>; María F. González MG8520, MG8521, MG8523, unpubl.) are emphatic.

The androgynophores of *Podandrogynone nutibarana* are long for such small flowers. Unlike the predominant condition in the genus, in which the stamens are quite uniform in length and orientation, there is relatively strong differentiation within the compact androecium of *P. nutibarana* as revealed in the photographs by González. The filaments of the proximal pair of stamens diverge from the androgynophore at right angles (70–90°) and in a plane perpendicular to the vertical orientation of the flower as a whole. They are straight and up to twice as long as those of the four verticillate terminal stamens, which spread (in

top view) much less widely (45–70° or 15–30°, median or distal pairs, respectively) and are sharply upcurved, orienting themselves (in side view) in parallel in a plane (in front view) more nearly vertical (Fig. 2C). Whether this arrangement occurs in *P. laplanadae* is unknown. Although the distances separating the stamen pairs and the relative lengths of the filaments are the same as in *P. nutibarana*, any distinctive pattern is ruined in pressing.

IUCN Conservation Status

Occurrences of presumably healthy populations of *Podandroyne laplanadae* within the Reserva Natural La

Planada and *P. nutibarana* within the Parque Nacional Natural Las Orquídeas offer the best hope for survival of these species, assuming slash-and-burn agriculture, illegal lumbering, mining, or cropping, or other habitat perturbation can be controlled. Their conservation status must be considered Data Deficient (DD) according to IUCN Red List criteria (IUCN, 2001). Although both are known from fewer than 10 collections, which in each case represent only three localities, no information is available about population sizes or trends or plausible threats to the plants, which are needed to assess them against the Red List criteria.

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