
Two New Species of *Monopyle* (Gesneriaceae) from Panama

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ABSTRACT. Two new species of *Monopyle* Moritz ex Benth. (Gesneriaceae) are described from central Panama near the Caribbean coast in the Panama Copper Concession (Consección Minera Panamá S. A.). The new species are endemic to Panama, are poorly represented in herbaria, and are differentiated from other *Monopyle* by a suite of characters. *Monopyle aurea* Keene & J. L. Clark has yellow flowers with a distinct maroon osmophore and red fleshy fruits. *Monopyle longicarpa* J. L. Clark & Keene has a villous golden indument on all vegetative surfaces and elongate linear fruits. Both species are differentiated from other congeners by the presence of small glandular trichomes along the margins of the corolla lobes.

RESUMEN. Se describen dos especies nuevas de *Monopyle* Moritz ex Benth. (Gesneriaceae) de la Región Central de Panamá, cerca a la costa Caribe, en la Concesión Minera Panamá S. A. Las especies nuevas son endémicas de Panamá, son escasamente representadas en colecciones de herbario, y se diferencian de otras especies de *Monopyle* por una serie de características. *Monopyle aurea* Keene & J. L. Clark tiene flores amarillas con un osmóforo marrón distintivo y frutos carnosos rojos. *Monopyle longicarpa* J. L. Clark & Keene tiene indumento viloso dorado y frutos elongados lineares. Ambas especies se diferencian de sus congéneres por la presencia de tricomas pequeños glandulares a lo largo de las márgenes de los lóbulos de la corola.

Key words: Gesneriaceae, IUCN Red List, *Monopyle*, Panama.

Monopyle Moritz ex Benth. (Gesneriaceae, Gloxiniaceae) is a genus of terrestrial understory or epiphytic herbs distributed from Guatemala southward to northern South America. The genus currently comprises 19 recognized species (Roalson et al., 2005; Keene et al., 2011), including at least three species known from Panama (Skog, 1979). The actual number is much higher because preliminary mono-

graphic work suggests that some broadly circumscribed taxa should be more narrowly defined (Keene, in prep.). Additionally, recent exploratory expeditions by the second author have yielded numerous new species not represented in herbaria and collections that have facilitated the recognition of new species poorly represented in herbaria. Here we describe two sympatric species that were collected in 2011 during a research expedition facilitated by Minera Panamá S.A. in the copper mine concession in Colón Province of central Panama.

Monopyle is morphologically complex and has had little attention since Morton's monographic revision (1945). The genus is traditionally characterized by strongly anisophyllous opposite leaves, campanulate white or white with purple flowers, and the presence of uncinat trichomes (Weber, 2004; Roalson et al., 2005). Additional diagnostic characters that define *Monopyle* that were discovered during revisionary work by the first author include variably swollen internodes, a nodal ridge, and the presence of an osmophore (floral fragrance gland) at the base of the corolla. Many *Monopyle* species are presumably locally endemic and appear to be restricted to a specific watershed. It is likely that narrow distributions are the result of the minute seeds limited by a splash-cup dispersal mechanism.

1. *Monopyle aurea* Keene & J. L. Clark, sp. nov.
Type: PANAMA. **Colón:** Distr. Donoso, Concesión de Minera Panamá S. A. Helipad ZP-P9, 8°51'5"N, 80°40'19"W, 391 m, 20 July 2011, J. L. Clark & L. Martínez 12564 (holotype, US; isotypes, K, MO, NY, PMA, SEL). Figure 1.

Diagnosis. Differs from all other *Monopyle* species by the combination of white corollas suffused with yellow, a dark maroon osmophore, and dark red fleshy fruits.

Terrestrial suffrutescent herb; roots fibrous, shoots erect, red to brown, 0.5–1.5 m tall, to 5 mm diam., pilose to densely pilose with uncinat trichomes intermixed occasionally with long, septate, eglandular

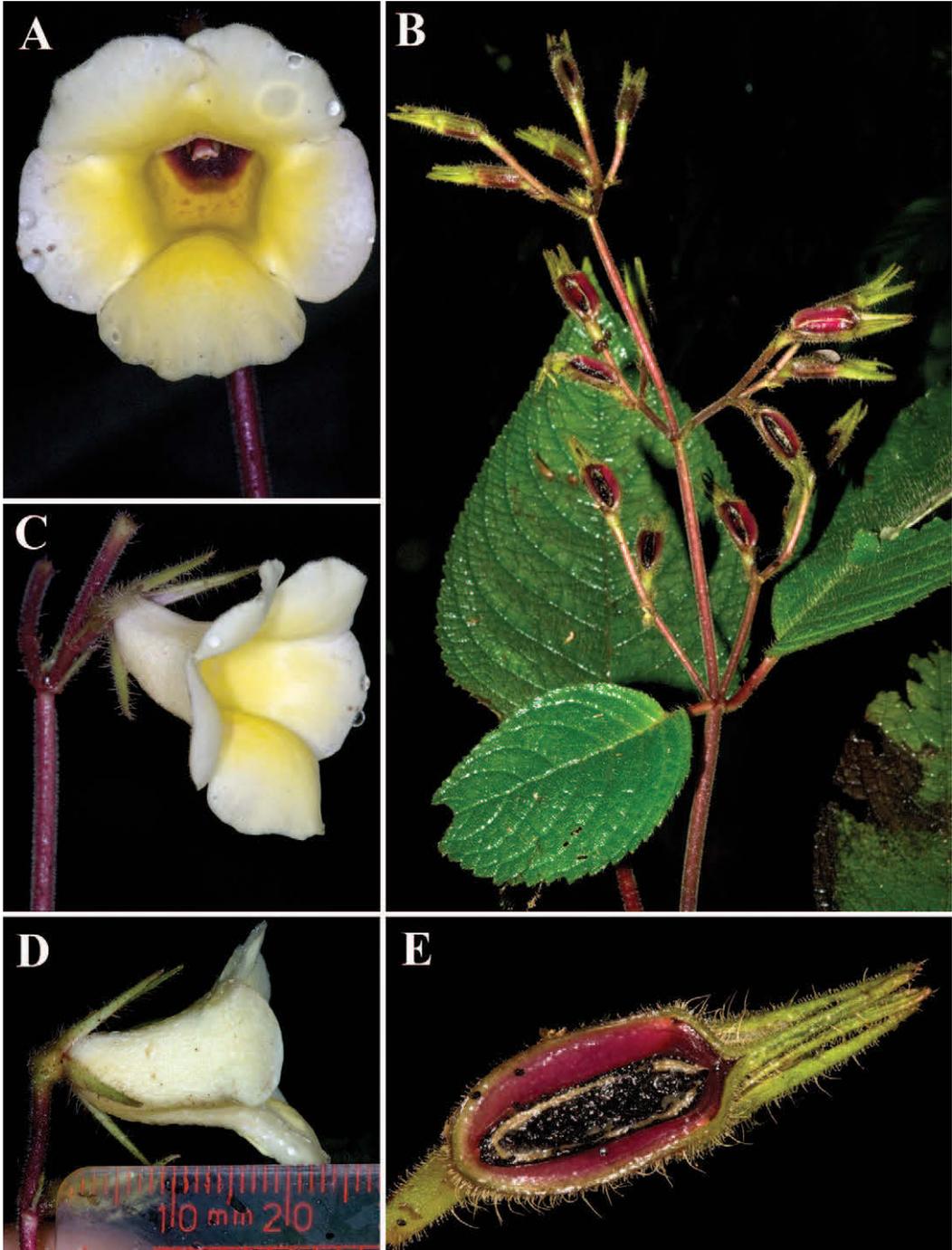


Figure 1. *Monopyle aurea* Keene & J. L. Clark. —A. Face view of flower showing maroon-colored osmophore. —B. Inflorescence. —C, D. Lateral views of flower. —E. Mature fruit showing dorsal dehiscence. Photos by J. L. Clark of voucher from the holotype J. L. Clark & Martínez 12564 (US).

trichomes; lateral shoots present in the axils of leaves. Leaves opposite, strongly anisophyllous, interstipular scar present; the larger leaf of pair with petioles (1.4–) 2.9–7.9 cm, villous with eglandular trichomes intermixed with uncinata trichomes on the abaxial surface, lamina asymmetrical ovate to elliptic, base oblique, to 8 mm between bases, apex attenuate to acuminate, (10.3–)13.1–19.9 × (5.6–)7.1–10.8 cm, serrate with a gland at each tooth; adaxially green to red, densely villous at leaf base with eglandular trichomes becoming villous and intermixed with uncinata trichomes toward the apex, abaxially red to maroon, sparsely villous along veins with eglandular trichomes; the smaller leaf of a pair with petioles (0.7–)1.7–4.5 cm, pubescence same as large leaf; lamina ovate to elliptic, base oblique (occasionally cuneate), apex acute to attenuate, (2.5–)5.3–11.2(–13.9) × (1.9–)3.2–6.9(–9.1) cm, serrate; adaxially and abaxially same as large leaf. Inflorescence a terminal, erect, compound cyme; peduncle 34–50 mm, densely pilose with uncinata trichomes intermixed with longer eglandular trichomes, bracts 6–8 × 0.4–1.1 mm, persistent, opposite, adaxially nearly glabrous, abaxially villous with eglandular trichomes; rachis (8.9–)15.7–25.3 cm, 2 to 4 nodes, with 6 to 8 cymules per node; secondary peduncle 15–39 mm, bracteoles 2–4 × 0.5–1 mm; tertiary peduncle 8–13 mm, bracteoles 1–2 × 0.4–0.6 mm; pedicel of terminal flower (12–)22–33 mm, front flower (second flower in a pair) 2–7 mm. Calyx green to maroon, lobes five, linear to lanceolate, 8–13 × 1–2.5 mm, connate 2–6 mm from base, apex acute, abaxially pilose with uncinata trichomes intermixed with long, septate, eglandular trichomes, adaxially nearly glabrous; corolla mostly white suffused with yellow in the throat, 18–24 × 12–15 mm, villous with thin eglandular trichomes, minute gland-tipped trichomes on the inner dorsal surface of the tube (above androecium), osmophore at base of corolla dark maroon; corolla lobes with minute glandular trichomes along the margins, dorsal lobes 6–9 × 4–8 mm, ventral lobe 7–13 × 5–11 mm; androecium of four stamens, 3–7 mm, didynamous, included, filaments 2–6 mm, adnate to corolla, anthers to 1 × 0.6 mm, connivent for ≤ 0.7 mm; nectary usually absent, some flowers with small amounts of raised tissue at the base of the ovary; gynoecium with ovary subinferior, to 1.5 mm wide, densely pilose with uncinata intermixed with eglandular trichomes (mainly at the apex near the base of the style), style to 4.5 mm, glabrous, stigma stomatomorphic. Fruits 8–12 × 2.5–4 mm, accrescent, dehiscent along dorsal surface, interior dark red, calyx persistent in fruit; seeds numerous, ovoid to ellipsoid, with many tube-shaped protuberances, 0.3–0.4 × 0.2–0.3 mm, dark brown to black.

Phenology. *Monopyle aurea* was collected in flower in February, June, July, and November and in fruit during February and July.

Distribution and habitat. *Monopyle aurea* is endemic to Panama and is only known from six collections from the adjacent provinces of Colón and Coclé. The lowland forest (i.e., below 500 m) of the Caribbean slope where *M. aurea* is abundant is classified as Tropical Wet Forest (Holdridge 1967). The habitat for the type locality was the understory of shaded mature forest along small streams where there were at least two populations of 15+ individuals.

Conservation and IUCN Red List category. According to the IUCN Red List criteria (IUCN, 2001) for limited geographic range (B2a, severely fragmented or known to exist at no more than five locations), and considering the uncertain future of habitat conservation in the area, *Monopyle aurea* should be listed as EN (Endangered).

Etymology. The specific epithet, *aurea*, refers to the white suffused with yellow color in the corolla throat. In contrast, most species of *Monopyle* have blue corollas. The only other known species of *Monopyle* with yellow flowers is *M. flava* L. E. Skog.

Paratypes. PANAMA. **Coclé:** area between Caño Blanco del Norte, Caño Sucio and Chorro del Río Tife, 3 Feb. 1983, *G. Davidge & C. Hamilton 23544* (MO); rd. from La Pintada to Coclesito, 7 Feb. 1983, *C. Hamilton & G. Davidge 2816* (MO); trail from Río San Juan to Río Tife Falls, 10 June 1978, *B. Hammel 3378* (MO); Caribbean side of the divide at El Copé, 4 Feb. 1983, *C. Hamilton & G. Davidge 2710* (L, MO). **Colón:** Teck Cominco Petaquilla Mining Concession, 30 Nov. 2007, *G. McPherson 19902* (MO).

2. *Monopyle longicarpa* J. L. Clark & Keene, sp. nov. TYPE: Panama. **Colón:** Distr. Donoso, Conseción de Minera Panamá S. A. Helipad ZP-P9, 8°51'5"N, 80°40'19"W, 391 m, 20 July 2011, *J. L. Clark & L. Martínez 12563* (holotype, US; isotypes, K, MO, NY, PMA, SEL). Figure 2.

Diagnosis. Differs from all other *Monopyle* species by the combination of villous golden indument on all vegetative surfaces and elongate linear cream to greenish fruit.

Terrestrial herb; roots fibrous, shoots dorsiventral, golden to dark red at the base, 20–40 cm tall, 2.5–5 mm diam., villous with long, septate eglandular (occasionally glandular) golden trichomes (indument on all vegetative surfaces); lateral shoots absent in the axils of leaves. Leaves opposite, strongly anisophyllous, interstipular scar present; the larger leaf of pair with petioles (4–)7–17 mm, densely villous, lamina asymmetrical ovate to elliptic, base oblique, to 13

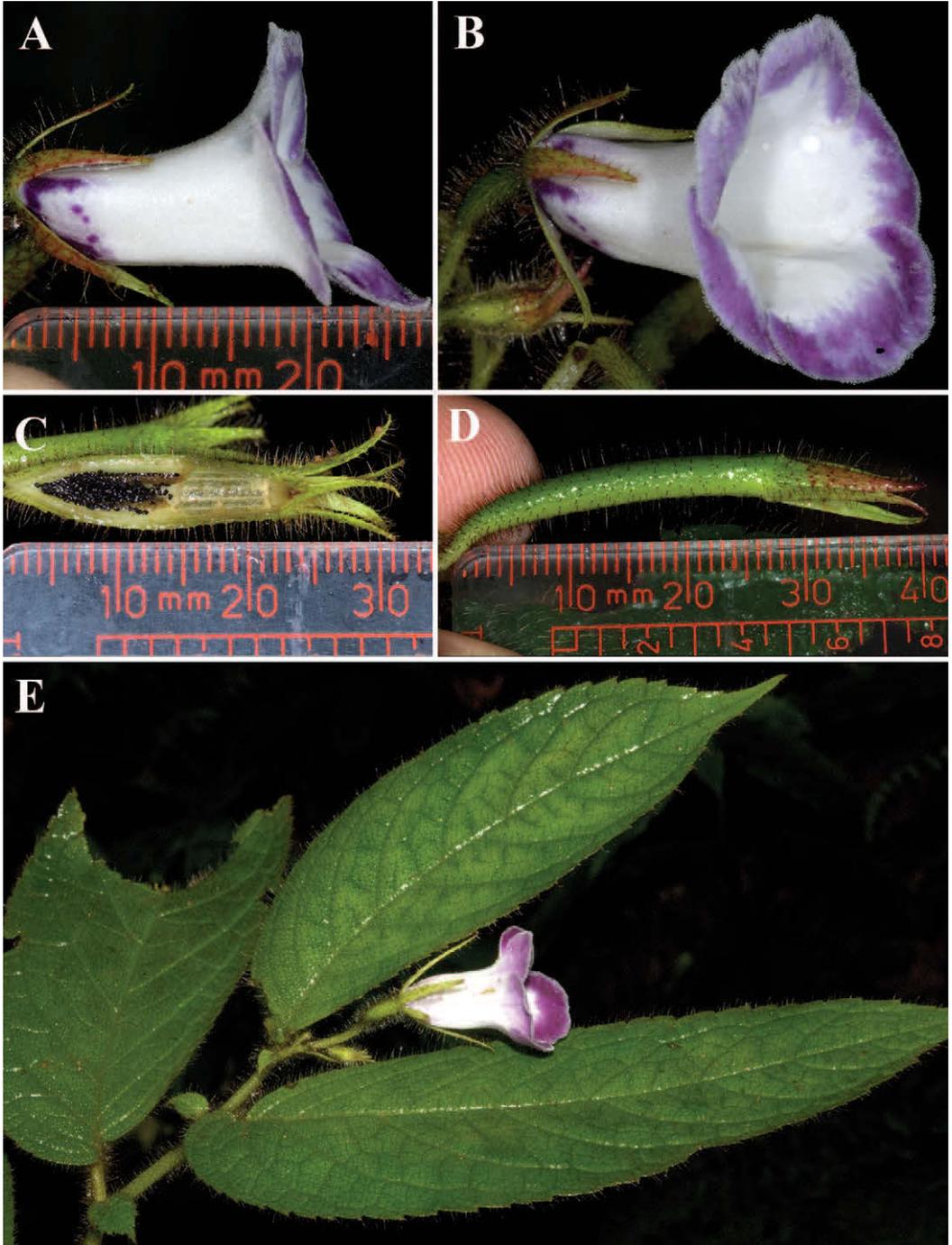


Figure 2. *Monopyle longicarpa* J. L. Clark & Keene. —A, B. Lateral views of flower. —C. Mature fruit showing dorsal dehiscence. —D. Immature fruit. —E. Dorsiventral shoot with anisophyllous leaves. Photos by J. L. Clark of voucher from the holotype J. L. Clark & L. Martínez 12563 (US).

mm between bases, apex acuminate, (5.1)–8.6–23.3 × 3.0–5.8(–8.1) cm, subentire to serrate; adaxially dark green (occasionally suffused red), villous, abaxially dark green to maroon, villous (more so on veins); the smaller leaf of a pair with petioles to 5 mm (some appearing sessile), villous; lamina ovate to orbicular, base oblique (appearing equilateral), apex acuminate to cuspidate, 0.9–2.4 × 0.5–1.2 cm, entire to serrate toward the apex; adaxially and abaxially similar to larger leaf. Inflorescence a terminal, erect, compound cyme; peduncle 41.6–50.3 mm, densely villous, bracts 3–5 × 0.5–1 mm, persistent, opposite, adaxially nearly glabrous, abaxially villous; rachis 35.4–41.6 cm, 2 or 3 nodes, with 2 cymes per node; secondary peduncle 5–9 mm, bracteoles 1–2 × 0.2–0.4 mm; pedicel 6–9 mm. Calyx green to maroon, lobes five, linear, 11–15 × 1–2 mm, connate 4–8 mm from base, apex acute, reflexing, abaxially villous, adaxially nearly glabrous; corolla white with varying amounts of violet, 18–24 × 10–13 mm, pilose with thin eglandular trichomes, minute gland-tipped trichomes on the inner dorsal surface of the tube (inserted above androecium), osmophore present (likely yellow to orange); corolla lobes with minute glandular trichomes along margin of the lobes, dorsal lobes 7–9 × 4–6 mm, ventral lobe 9–11 × 6–7 mm; androecium with four stamens, 4–5 mm, didynamous, included, filaments 3–5 mm, adnate to corolla, anthers 0.8–1.1 × 0.5–0.7 mm, connivent for ≤ 1 mm; nectary usually absent, some flowers with small amounts of raised tissue at the base of the ovary; gynoecium with ovary subinferior, to 1.6 mm wide, densely pilose with glandular trichomes (mainly at the apex near the base of the style), style to 5.6 mm, glabrous, stigma stomatomorphic with a flap of tissue surrounding the dorsal surface. Fruits 13–25 × 2–2.5 mm, accrescent, dehiscent along dorsal surface, interior cream to greenish, calyx persistent in fruit; seeds numerous, ovoid to ellipsoid, with many tube-shaped protuberances, 0.3–0.5 × 0.2–0.5 mm, dark brown to black.

Phenology. *Monopyle longicarpa* was collected in flower and fruit in June and July.

Distribution and habitat. *Monopyle longicarpa* is endemic to Panama and is known from only two collections near the type locality in Colón Province. The lowland forest (i.e., below 500 m) of the Caribbean slope where *M. longicarpa* is abundant is classified as Tropical Wet Forest (Holdridge 1967). The habitat for the type locality was the understory of shaded mature forest along small streams where there were at least two populations of 15+ individuals

Conservation and IUCN Red List category. The only known populations of *Monopyle longicarpa* are located inside a region that will be developed for a copper mine by the Conseción Minera Panamá S. A. There are no known populations outside the copper mine concession, and therefore significant efforts are being implemented by the Conseción Minera Panamá S. A. to cultivate and transplant *M. longicarpa*. These conservation efforts are ongoing for *M. longicarpa* and other species as a way to mitigate the impact on biodiversity when the mine is implemented. According to the IUCN Red List criteria (IUCN, 2001) for limited geographic range (B2a, less than 10 km² and known to exist at only a single location), and considering the uncertain future of the region, *M. longicarpa* should be listed as CR (Critically Endangered).

Etymology. The specific epithet, *longicarpa*, refers to the elongate linear fruits (Fig. 2C).

Discussion. *Monopyle longicarpa* is easily differentiated from all other congeners by its elongate fruits, which reach 2.5 cm in length (Fig. 2C). Most fruits of *Monopyle* are less than 1.5 cm in length. *Monopyle longicarpa* is vegetatively distinct by the villous golden indument on all vegetative surfaces, in contrast to the pilose dark brown to black indument in other species of *Monopyle*.

Paratypes. PANAMA. **Colón:** Distr. Donoso. Área del proyecto minero Petaquilla, Valle Grande, Río Petaquilla, 7 June 2009, B. Araúz, P. Moreno & J. I. González 1870 (MO).

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