
A New Species of *Burmeistera*
(Campanulaceae: Lobelioideae) from Ecuador

Nathan Muchhala

Department of Biology, University of Miami, P.O. Box 249118, Miami, Florida 33124, U.S.A.
n.muchhala@umiami.edu

Thomas G. Lammers

Department of Biology and Microbiology, University of Wisconsin Oshkosh, Oshkosh,
Wisconsin 54901, U.S.A. lammers@uwosh.edu

ABSTRACT. *Burmeistera auriculata* is described from a cloud forest remnant in Pichincha, Ecuador. Although allied to *B. borjensis*, this new species is distinguished from all known congeners by its auriculate calyx.

RESUMEN. Se describe *Burmeistera auriculata* de un remanente de bosque nublado en Pichincha, Ecuador. Aunque aliado a *B. borjensis*, esta especie nueva se distingue de las demás *Burmeisteras* conocidas por su cáliz auriculado.

Key words: *Burmeistera*, Campanulaceae, Ecuador, Lobelioideae, South America.

Burmeistera Triana (Campanulaceae: Lobelioideae) comprises 102 species of robust plants (herbaceous or suffruticose perennials, shrubs, and lianas) distributed from Guatemala to Peru (Lammers, 1998, 2002). The genus is distinguished by a combination of moderate-size flowers (corollas averaging 25–35 mm long) usually borne singly in the axils of the upper leaves on ebracteolate pedicels; green or yellow corolla often suffused with maroon or purple; corolla tube neither fenestrate nor cleft dorsally; dorsal corolla lobes larger than the ventral lobes and falcate or reflexed; anther tube wide open at the orifice; baccate, often inflated fruit; and oblong to fusiform seeds much longer than broad. With this circumscription, the genus is most likely monophyletic (Luteyn, 1986; Stein, 1987a, 1987b, 1987c), a hypothesis supported by preliminary molecular data (Pepper et al., 1997; E. Knox, pers. comm.).

The last comprehensive account of *Burmeistera* was the monograph by Wimmer (1943), who recognized 77 species. More recent treatments are available for the species of Costa Rica (Wilbur, 1975), Ecuador (Jeppesen, 1981), Guatemala (Nash, 1976), Honduras (Lammers & Maas, 1998), Panama (Wilbur, 1977, 1981), and Peru (Stein,

1987c). Here and in other publications (McVaugh, 1943, 1949a, 1949b, 1957, 1965; Wimmer, 1955, 1968; Gómez & Gómez-Laurito, 1986; Lozano & Galeano, 1986; Luteyn, 1986; Stein, 1987b; Lammers, 1998, 2002), 44 new species were described, while some taxa recognized by Wimmer (1943) were reduced to synonymy.

Wimmer (1932, 1943, 1968) divided the genus into two sections: *Burmeistera* (Imberbes, nom. invalid), with all five anthers sparsely soft-pubescent or glabrous at apex; and *Barbatae* E. Wimmer, with the two ventral anthers barbate at apex. Though Wimmer further divided section *Burmeistera* into two subsections, Stein (1987b) transferred all members of subsection *Aequilatae* E. Wimmer to the genus *Siphocampylus* Pohl. This sectional classification is unsatisfactory, if only for the lack of structure afforded so large a genus. It also is not supported by preliminary molecular data (E. Knox, pers. comm.).

The senior author is currently studying the pollination biology of the genus (Muchhala & Jarrin-V., 2002). This research has revealed that, while the closely related genera *Centropogon* C. Presl and *Siphocampylus* are primarily hummingbird-pollinated, *Burmeistera* has shifted to bat pollination (Muchhala 2003, unpublished data). Although hummingbirds visit *Burmeistera* flowers in the early morning and at dusk (Feinsinger et al., 1987; Muchhala, 2003), they rarely transport pollen and only in small quantities. Meanwhile, a single visit by a bat will deposit thousands of grains on a receptive stigma.

In the course of this research, a new species was discovered in the Otonga reserve in northern Ecuador. This species, here described and named, demonstrates a number of the floral adaptations to bat pollination that are common to the genus, including nocturnal anthesis, dull coloration, rela-

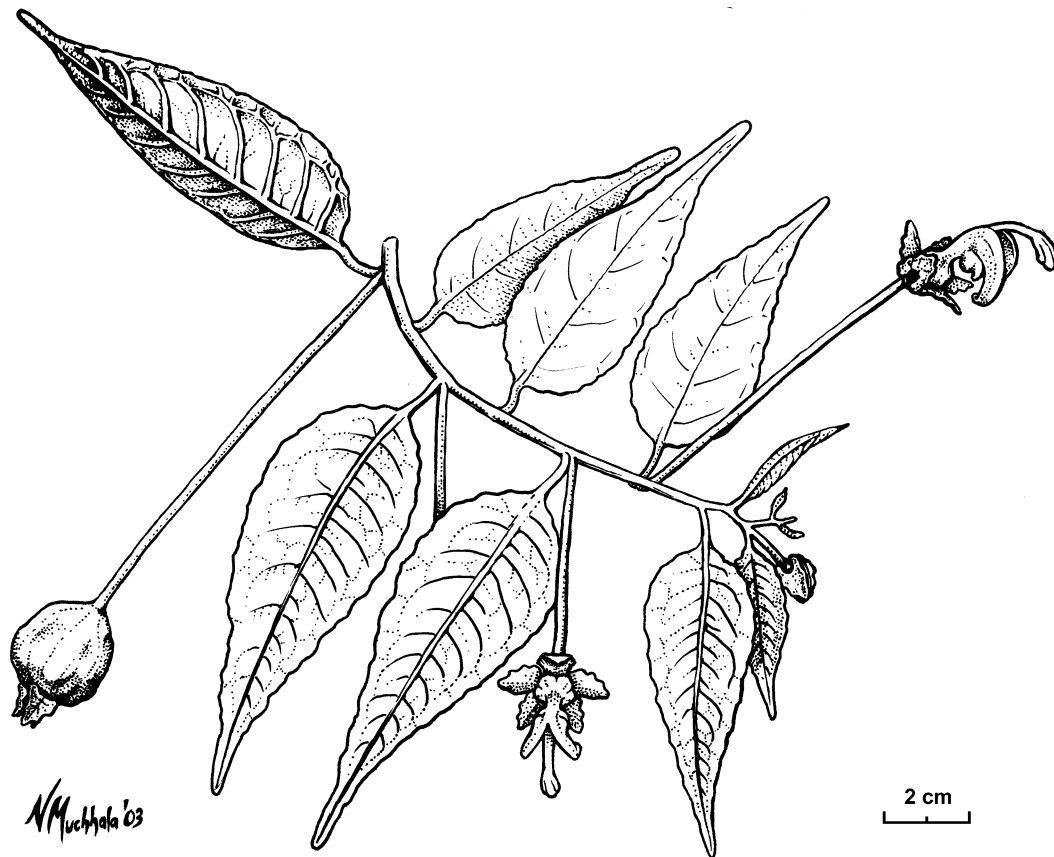


Figure 1. *Burmeistera auriculata* Muchhala & Lammers. Drawn from the holotype, Muchhala 120, and photos of live material.

tively wide corollas, a distinctive odor, and well-exposed flowers.

Burmeistera auriculata Muchhala & Lammers, sp. nov. TYPE: Ecuador. Pichincha: Bosque Integral Otonga, 00°25.264'S, 79°00.779'W, cloud forest, 2233 m, 7 July 2002, N. Muchhala 120 (holotype, QCA; isotype, MO). Figure 1.

Ab omnibus caeteris speciebus *Burmeisterae* calycis lobis auriculatis differt; species sect. *Burmeisterae* affinis *B. borjensi*, sed ab hac specie lamina lanceolata parviore 7.5–14 cm longa 2.8–4.4 cm lata, pedicellis pubescentibus, hypanthio breviore 5.5–6 mm longo, calycis lobis brevioribus 9–11 mm longis, antheris dorsalibus longioribus 9.5–10.5 mm longis, et baccis globosis brevioribus 18–20 mm longis facile distinguenda.

Scandent hemi-epiphytic subshrub, 3 m tall; stems 2.0–3.8 mm diam., glabrous, occasionally branching; latex white. Leaves strictly distichous, patent; lamina lanceolate, 7.5–14 × 2.5–4.4 cm; adaxial surface minutely scabrous, dull green; ab-

axial surface minutely and more densely pubescent, dull light green; margin subentire; apex acuminate to almost caudate; base rounded, occasionally asymmetric; petiole 1.4–2.0 cm long, 1.0–1.5 mm diam., minutely pubescent, 1/12–1/6 as long as the lamina. Flowers solitary in upper leaf axils; pedicels 70–100 mm long, straight and ascending at anthesis, 100–150 mm long, curved and declined in fruit, 1–1.8 mm diam., minutely pubescent. Hypanthium broadly obconic, 5.5–6 mm long, 5–6.5 mm diam., minutely pubescent; calyx lobes broadly triangular, 9–11 × 7–9 mm, with reflexed auricles 4–7 mm long in the sinuses, ascending, overlapping at base, finely reticulate, minutely scabrous; margin sinuate; apex obtuse, almost emarginated; corolla light green, 18–20 mm long, sparsely and minutely pubescent or almost glabrous; tube slightly decurved, 8–9 mm long, distended at base to 8.5–9.5 mm diam., dorsiventrally compressed at middle, 3.0–3.5 mm tall, 4.0–4.5 mm wide, abruptly expanding to 7.5–8.0 mm at mouth; dorsal lobes lanceolate, strongly falcate, 23–25 × 5 mm, acuminate

at apex; ventral lobes narrowly triangular, falcate, 11–12 × 4 mm, acuminate at apex; staminal column long-exserted; filament tube 26–28 mm long, ca. 1.8 mm diam., sparsely puberulent; anther tube curved-cylindrical, long-exserted, 5 mm diam., glabrous; dorsal anthers 9.5–10.5 mm long; ventral anthers 5.5–6.5 mm long; pollen grains tricolpate, prolate, 72 μ m diam. (equatorial) × 63 μ m diam. (polar), the surface reticulate. Berries inflated, globose, light green, 18–20 mm long, 17–24 mm diam., crowned by the persistent calyx lobes; seeds ellipsoid, 0.9 mm long, 0.3 mm diam.

Additional illustration. Muchhala and Jarrín-V. (2002), fig. 2A.

Distribution and ecology. *Burmeistera auriculata* is endemic to the Andes of northwestern Ecuador and known only from the type locality, where it grows in cloud forest at elevations of 1990 to 2250 m. It flowers throughout the year, with individual flowers opening nocturnally between 1715 and 1800 hr. and senescing after 5 to 6 days. It is pollinated by glossophagine bats of the genus *Anoura* (Muchhala & Jarrín-V., 2002, as “*Burmeistera* sp.”).

Etymology. The name derives from the Latin adjective *auriculatus*, “with little ears,” given in reference to the unique calyx appendages.

Relationships. The most distinctive feature of this species is the large reflexed auricle associated with each sinus of the calyx. These appear to represent basal lobules of adjacent calyx lobes that have become connate. Though otherwise unknown in *Burmeistera*, similar auricles are found elsewhere in the Campanulaceae, characterizing some species of North American *Lobelia* L. sect. *Lobelia* (e.g., *L. siphilitica* L., *L. appendiculata* A. DC., *L. brevifolia* Nuttall ex A. DC.; McVaugh, 1943), as well as certain Eurasian genera of Campanuloideae (e.g., *Favratia* Feer, *Cryptocodon* Fedorov, *Michauxia* L'Héritier).

In Jeppesen's (1981) treatment of Ecuadorian *Burmeistera*, the new species keys readily to *B. borjensis* Jeppesen, known from Napo and adjacent Colombia. The two species shared the following characters: (1) glabrous scandent stems; (2) abaxially pubescent lamina with subentire margins; (3) the length of petioles and pedicels; (4) broad overlapping reticulately veined calyx lobes with sinuate margins; (5) the overall length and color of the corolla; and (6) the inflated berries. *Burmeistera borjensis*, however, differs in its larger (15–20 vs. 7.5–14 cm long, 5–8 vs. 2.8–4.4 cm wide) elliptic (vs. lanceolate) lamina, cuneate (vs. rounded) at base; glabrous (vs. pubescent) pedicels; longer hypanthi-

um (6–8 vs. 5.5–6 mm) and calyx lobes (14–16 vs. 9–11 mm); longer corolla tube (15–18 vs. 8–9 mm); shorter dorsal corolla lobes (ca. 16 vs. 23–25 mm); shorter anthers (dorsal pair 8–9 vs. 9.5–10.5 mm); larger (30–35 vs. 18–20 mm long) ovoid (vs. globose) berry; and of course the exauriculate calyx.

In their combination of large inflated berries, curved-cylindrical anther tube, and overall floral morphology, *Burmeistera auriculata* and *B. borjensis* would appear to belong to a group of species comprising *B. refracta* E. Wimmer, *B. ignimontis* E. Wimmer, *B. cuyujensis* Jeppesen, *B. truncata* Zahlbruckner, *B. glabrata* (Kunth) Benth & Hooker f. ex B. D. Jackson, and *B. oyacachensis* Jeppesen. Among these, only *B. cuyujensis* and *B. ignimontis* share the abaxially pubescent lamina of *B. auriculata* and *B. borjensis*, an unusual trait in the genus. Both differ from the new species in their elliptic or obovate (vs. lanceolate) lamina cuneate (vs. rounded) at base, glabrous pedicels, longer hypanthium (8–12 vs. 5.5–6 mm) with narrowly triangular or lanceolate (vs. broadly triangular) calyx lobes, longer corolla (24–35 vs. 18–20 mm) with longer tube (14–22 vs. 8–9 mm) and shorter dorsal lobes (18–22 vs. 23–25 mm).

Paratypes. ECUADOR. **Cotopaxi:** Bosque Integral Otonga, entre Quito y Sto. Domingo, cerca de San Francisco de las Pampas, C. Nowicki & J. Mutke 1213 (QCA); Bosque Integral Otonga, N. Muchhala 24 (QCA).

Acknowledgments. The senior author thanks Hugo Navarrete and the Pontificia Universidad Católica de Ecuador for logistical help and access to the QCA herbarium, and Giovanni Onore for access to the study site (Bosque Integral Otonga). He also thanks Paulina Moreno for help in identifying collections; it was she who first suggested that this specimen from Otonga might represent an undescribed species.

Literature Cited

- Feinsinger, P., J. H. Beach, Y. B. Linhart, W. H. Busby & K. G. Murray. 1987. Disturbance, pollinator predictability, and pollination success among Costa Rican cloud forest plants. *Ecology* 68: 1294–1305.
- Gómez, L. D. & J. Gómez-Laurito. 1986. *Plantae mesoamericanae novae* XIV. *Brenesia* 25–26: 311–312.
- Jeppesen, S. 1981. *Lobeliaceae*. Pp. 9–170 in G. Harling & B. Sparre (editors), *Flora of Ecuador*, no. 14. Swedish Natural Science Research Council, Stockholm.
- Lammers, T. G. 1998. Review of the Neotropical endemics *Burmeistera*, *Centropogon*, and *Siphocampylus* (Campanulaceae: Lobelioideae), with description of 18 new species and a new section. *Brittonia* 50: 233–262.
- . 2002. Seventeen new species of Lobelioideae (Campanulaceae) from South America. *Novon* 12: 206–233.
- & P. J. M. Maas. 1998. First report of the genus

- Burmeistera* (Campanulaceae) from Honduras. Sida 18: 363–364.
- Lozano C., G. & G. Galeano G. 1986. Una nueva especie de *Burmeistera* (Campanulaceae) de Colombia. *Caldasia* 15: 53–56.
- Luteyn, J. L. 1986. A new *Burmeistera* (Campanulaceae: Lobelioideae) from western Colombia. *Syst. Bot.* 11: 474–476.
- McVaugh, R. 1943. Campanulaceae (Lobelioideae). *N. Amer. Fl.* 32A: 1–134.
- . 1949a. Studies in South American Lobelioideae (Campanulaceae) with special reference to Colombian species. *Brittonia* 6: 450–493.
- . 1949b. Seven new species of Lobelioideae (Campanulaceae). *J. Washington Acad. Sci.* 39: 157–162.
- . 1957. Two new species of Lobeliaceae from Costa Rica. *Brittonia* 9: 30–32.
- . 1965. South American Lobelioideae new to science. *Ann. Missouri Bot. Gard.* 52: 399–409.
- Muchhala, N. C. 2003. Exploring the boundary between pollination syndromes: Bats and hummingbirds as pollinators of *Burmeistera cyclostigmata* and *B. tenuiflora*. *Oecologia* 134: 373–380.
- & P. Jarrín-V. 2002. Flower visitation by bats in cloud forests of western Ecuador. *Biotropica* 34: 387–395.
- Nash, D. L. 1976. Flora of Guatemala, Campanulaceae. *Field Mus. Nat. Hist., Bot. Ser.* 24: 396–431.
- Pepper, A. S.-R., M. H. G. Gustafsson & V. A. Albert. 1997. Molecular systematics of Neotropical Lobelioideae (Campanulaceae), with emphasis on *Burmeistera*, *Centropogon*, and *Siphocampylus*, and the utility of fruit and floral characters in lobelioid classification. *Amer. J. Bot.* 84 (6, Suppl.): 222 (Abstract).
- Stein, B. A. 1987a. Systematics and Evolution of *Centropogon* subg. *Centropogon* (Campanulaceae: Lobelioideae). Ph.D. Dissertation, Washington University, St. Louis.
- . 1987b. *Siphocampylus oscitans* (Campanulaceae: Lobelioideae), a new name for *Burmeistera weberbaueri* from Peru. *Ann. Missouri Bot. Gard.* 74: 491–493.
- . 1987c. Synopsis of the genus *Burmeistera* (Campanulaceae: Lobelioideae) in Peru. *Ann. Missouri Bot. Gard.* 74: 494–496.
- Wilbur, R. L. 1975. A synopsis of the Costa Rican species of *Burmeistera* (Campanulaceae: Lobelioideae). *Bull. Torrey Bot. Club* 102: 225–231.
- . 1977. Flora of Panama, Campanulaceae. *Ann. Missouri Bot. Gard.* 63: 593–655.
- . 1981. Additional Panamanian species of *Burmeistera* (Campanulaceae: Lobelioideae). *Ann. Missouri Bot. Gard.* 68: 161–171.
- Wimmer, F. E. 1932. *Burmeistera*, eine umstrittene Pflanzengattung und ihre Arten. *Repert. Spec. Nov. Regni Veg.* 30: 1–52 + pl. cxxiii–cxxvi.
- . 1943. Campanulaceae–Lobelioideae, I. Teil. Pp. i–vi, 1–260 in R. Mansfeld (editor), *Das Pflanzenreich*, IV. Teil, Abteilung 276b. Wilhelm Engelmann, Leipzig.
- . 1955. Lobeliacearum species novae austro-americanae. *Brittonia* 8: 107–111.
- . 1968. Campanulaceae–Lobelioideae supplementum et Campanulaceae–Cyphioideae. Pp. i–x, 815–1024 in S. Danert (editor), *Das Pflanzenreich*, IV. Teil, Abteilung 276c. Akademie-Verlag, Berlin.