

*DE MACROCARPAEAE GRISEBACH (EX GENTIANACEIS) SPECIEBUS
NOVIS III: SIX NEW SPECIES OF MOON-GENTIAN
(MACROCARPAEA, GENTIANACEAE: HELIEAE)
FROM PARQUE NACIONAL PODOCARPUS, ECUADOR*

JASON R. GRANT¹ AND LENA STRUWE²

Abstract. In preparation for the *Flora Neotropica* monograph of *Macrocarpaea* (Gentianaceae: Helieae) and recent fieldwork in Ecuador, six new species have been identified and are here described from Parque Nacional Podocarpus and its surrounding areas in Loja and Zamora-Chinchipec provinces. These are *Macrocarpaea apparatusata*, *M. bubops*, *M. jensii*, *M. lenae*, *M. luna-gentiana*, and *M. noctiluca*. For each new species, descriptions, illustrations, and ecological information are provided. The neotropical montane genus *Macrocarpaea* has among the highest biodiversity in Ecuador with over 30 species present. The name “moon-gentian” or “genciana de luna” is coined as the common name for the genus *Macrocarpaea*.

Keywords: Ecuador, Gentianaceae, Helieae, *Macrocarpaea*, morphology, Neotropics.

The treatment of *Macrocarpaea* in the *Flora of Ecuador* (Pringle 1995) is exceedingly conservative at the species rank, likely due to the limited number of herbarium specimens observed. Where Pringle only recognized 8 species, over 30 species for Ecuador will be recognized in the *Flora Neotropica* monograph of *Macrocarpaea* (Grant, in prep.) The genus has a high and previously unexpected amount of species endemism in Colombia, Ecuador and Peru, notably on eastern Andean slopes between 1000–3500 m. *Macrocarpaea* itself belongs to the ‘*Macrocarpaea* clade’ of the tribe Helieae, comprising at least *Chorisepalum*, *Macrocarpaea*, and *Tachia*, and possibly *Zonanthus* (Struwe et al. 2002). This paper results from plant collections made during a collecting expedition to southern Ecuador in

February 2001. We collected and made observations on numerous species in the field. Examination of these living plants as well as herbarium specimens has led us to identify six new species. These are *Macrocarpaea apparatusata*, *M. bubops*, *M. jensii*, *M. lenae*, *M. luna-gentiana*, and *M. noctiluca*.

Southern Ecuador and notably the provinces of Loja and Zamora-Chinchipec with the large and species-rich Parque Nacional Podocarpus represents one of the areas of highest species diversity in *Macrocarpaea*. Some 16 species occur in the region, an increase of seven species from the nine recorded to occur in the region by Grant & Struwe (2001). Many are common throughout the area (e.g., *M. arborescens* Gilg and *M. noctiluca*), while others are only known from basically a single locality (e.g., *M. apparatusata*), Fig. 1.

This work was supported by a Swiss National Science Foundation grant, No. 3100-052885 to the Université de Neuchâtel, Switzerland, The Lewis B. and Dorothy Cullman Program for Molecular Systematics Studies at The New York Botanical Garden, and Rutgers University–Cook College. We thank Zhofre Huberto Aguirre Mendoza, Lorena Endara, John Janovec, Jens Madsen, Wilson Rodrigo Quizhpe Coronel, Katya Romoleroux, Carlos Efrén Rosales Granda, Santos Benigno Calderon Sanmartín, and Joseph Torres who each helped to facilitate our fieldwork and herbarium visits in Ecuador. We also thank Ernest Fortis, Philippe Küpfer, James S. Pringle, and Richard E. Weaver for additional support and advice. Bobbi Angell skillfully prepared the illustrations. Library research by J. R. G. was largely carried out at the Conservatoire et Jardins botaniques de la Ville de Genève, Switzerland. We thank the following herbaria either for the loan of material, photocopies of specimens, data on their collections, or for hospitality extended during visits* by J. R. G. to examine material of *Macrocarpaea*: AAU, ALA*, B, BM, BR, BRIT, BSB, C, CAS, CHR*, COL*, CR, CUVC, CUZ*, DAV, DUKE, E, F, FI, FLAS, G*, GB, GH, GOET, HAC, HAL HAM, HAO*, HUT*, IAC, INB, JBSD, JE, K, L, LD, LOJA*, LPB, LS, M, MA*, MANCH, MBM*, MICH, MIN, MO, MOL*, MSB, MY, NA, NO, NY*, NSW*, OXF, P*, PH, Q*, QAP*, QCA*, QCNE*, QPLS*, QUSF*, R*, RB*, S*, SBG*, SEL*, SP, TEX, U, UC, UCWI, UPCB, US*, USM*, VEN*, W*, WIS, WU*, YU, and Z*.

¹Laboratoire de Botanique Évolutive, Institut de Botanique, Faculté des Sciences, Université de Neuchâtel, rue Émile-Argand 11, Case Postale 2, 2007 Neuchâtel, Switzerland. E-mail: jason.grant@unine.ch; author for correspondence.

²Department of Ecology, Evolution and Natural Resources, Rutgers University–Cook College, 237 Foran Hall, 59 Dudley Road, New Brunswick, New Jersey 08901, U. S. A. E-mail: struwe@aesop.rutgers.edu

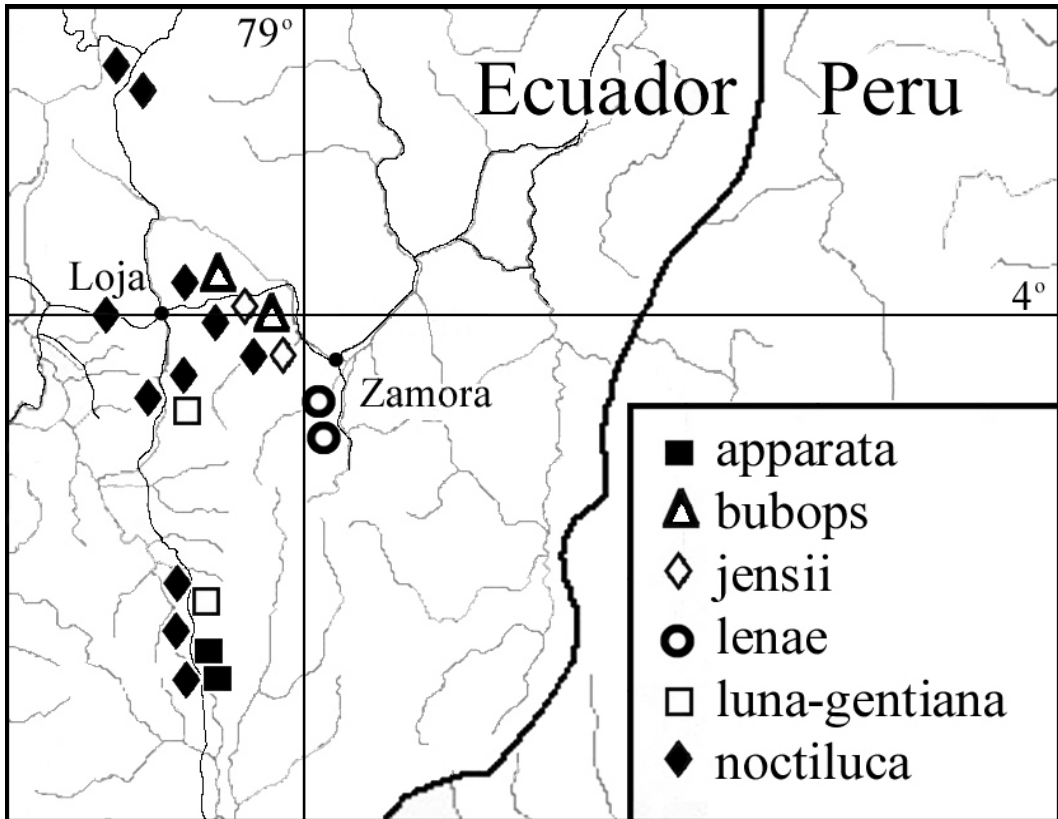


FIGURE 1. Distribution of *Macrocarpaea apparata*, *M. bubops*, *M. jensii*, *M. lenae*, *M. luna-gentiana*, and *M. noctiluca* in Loja and Zamora provinces, southern Ecuador.

The descriptions of the six species below are based on field observations, pickled material from the field, photographs, and herbarium specimens. In order to maintain continuity between written descriptions of other authors (as well as other descriptions of our own made without the benefit of fresh material), all measurements and descriptions here are based on dried pressed specimens since floral material has been known to shrink by up to 50% in drying.

The total length of an inflorescence will generally not be reported since a number of species have large inflorescences that do not fit on a single herbarium sheet (e.g., *M. apparata*). Therefore, measuring and comparing inflorescence fragments on a single herbarium sheet of such a species, to another one where the entire inflorescence will always fit on an entire sheet (e.g., *M. angelliae* J.R. Grant & Struwe), do not lead to parallel descriptions. Therefore, measurements of branch length alone (lateral and terminal branches) will be given for all species, and both such branch length and total inflores-

cence length for species with comparatively small inflorescences when possible. While the entire inflorescence is a thyrse composed of cymes in a racemose branching pattern, the term “branch” will be used as a general term since any branch may comprise 1–3 or more cymes.

The term “bract” is defined as all leaves in the inflorescence, except the 1–2 “bracteoles” that subtend each flower. The pair of leaves that subtend the entire inflorescence are recognized as true leaves since their size and shape is more consistent with the leaves below than the bracts above. The width of the corolla is measured at the level of the corolla lobe sinuses.

Every plant needs a common name that connects a sense of recognition in a vernacular language. And therefore, after careful consideration, we herald “moon-gentian” or “genciana de luna” for *Macrocarpaea*. The name is fitting since all species known to date are night-blooming, bathed in the glow of the moon, and have pale yellow, light-greenish or

white colored corollas, often with half-moon-shaped corolla lobes. The Latin name *Macrocarpaea* reflects the presence of an unusually large fruit for a gentian. However, this character would not be suitable for translation into a common name in English or Spanish since many other plants have larger capsules within the gentians (e.g., *Fagraea* and *Symbolanthus*).

1. *Macrocarpaea apparata* J.R. Grant & Struwe, *sp. nov.* TYPE: ECUADOR. Loja: 28.8 km S of Yangana, 04° 27' 59" S, 079° 08' 44" W, 2450 m, roadside secondary vegetation, tree 4–5 m tall, 5 cm in diameter at the base of the trunk, corolla rugose on the outside, calyx medium green, 11 February 2001, *J.R. Grant & Struwe 01-4002* (Holotype: US; isotypes: G [2 sheets], LOJA, NEU [2 sheets], NY, MO, QCA, QCNE, S, SBG). Fig. 2–3A.

A Macrocarpaea sodiroanae cui affinis, sed arbores excelsis, foliis multo grandibus, et caulibus, petiolis, foliis, inflorescentiis, calycibus et lobis corollae pubescens hyalinis differt.

Dichotomously branched tree, overall branching pattern triangular in outline, 4–5 m tall, hyaline hispid with short simple hairs on stems, petioles, leaves, inflorescences, calyces, and corolla lobes. Trunk to 6.5 cm in diameter, wood hollow (pith 3–19 mm, narrower in trunk, and wider in younger branches), growth rings detectable but not prominent; bark papery thin to scarcely measurable (to 0.05 mm), outer surface smooth to rugose, tan-brown. Stems terete to slightly quadrangular, hollow, 8–16 mm in diameter just below inflorescence. Leaves broadly to narrowly ovate to elliptic, petiolate, 27–60 cm; blades 24–50 × 14–31 cm, base aequilateral to slightly oblique, apex acute, entire, not revolute, papery thin in texture, dark green, with slightly impressed veins above and slightly raised veins below, glabrous above, hyaline to tan pubescent on lower surfaces and especially veins; interpetiolar ridge 3–10 mm high; petioles robust with strong open vagination nearly equaling the length of the petiole, (30–)60–100 mm. Branches of the inflorescence 23–40 cm, 14–30 flowered per branch; bracts ovate to lanceolate to linear, 20–165 × 4–100 mm, base aequilateral to oblique, apex acute to acuminate, petiolate; bract petioles 1–20 mm. Flowers pedicellate, erect to horizontal to oriented in all directions in the inflo-

rescence; pedicels 2–26 mm; bracteoles linear to lanceolate to ovate, 3–25 × 1–8 mm. Calyx narrowly campanulate, 7–10 × 6–8 mm, hyaline puberulent, smooth, medium to dark green, ecarinate, no ridges extend down from calyx lobes; calyx lobes dividing calyx to one third, rounded to obtuse, 2–3 × 3–4 mm. Corolla funnel-shaped, 39–53 mm, 18–22 mm wide at corolla lobe sinuses, whitish-green, rugose to smooth; corolla lobes ovate, apex obtuse to rounded to retuse, 7–14 × 8–12 mm. Stamens 27–33 mm; filaments 20–26 mm, filiform, terete; anthers linear to linear-elliptic, 5.5–7.0 × 2.0–2.5 mm, sagittate, versatile. Pistil 35–39 mm; ovary 7–8 × 3.0–3.5 mm; style 22–26 × 1.0–1.5 mm; stigma 2-lobed, lobes 4–5 × 2.0–2.5 mm, rounded to spatulate. Capsules and seeds unknown.

Macrocarpaea apparata is a large sturdy tree to 4–5 m tall with the largest leaves known to date within the genus (27–60 cm long × 14–31 cm wide). The tobacco-like leaves are broadly ovate to narrowly ovate to elliptic, and sterile plants typically look rather like members of the Rubiaceae or Asteraceae. Even as sterile it is easy to recognize by its winged, vaginated petioles (Fig. 2), a feature that is rare among gentians, and known only in species of *Anthocleista*, *Fagraea*, and *Macrocarpaea*. These winged, vaginated petioles are pronounced in *M. apparata*, *M. bubops*, and several other undescribed species. The wings are essentially elevated ridges along the vagination that extend from the base on either side of the petiole. In smaller leaved species these “wings” between paired opposite leaves may appear as a ring around the stem. However, in larger leaved species as here in *M. apparata*, these wings extend well along the length of the petiole to form this unique morphology.

It is somewhat surprising that this species has never been collected prior to our collections since mature individuals are conspicuous along the roadside. *Macrocarpaea apparata* has affinities to several other undescribed species from southern Ecuador. However, for the purpose of the establishment of the name, comparison to *M. sodiroana* is made even though the two species are not closely related. It differs from *M. sodiroana* in its tall habit, large leaves, and distinct hyaline pubescence of short simple hairs on stems, petioles, leaves, inflorescences, calyces, and corolla lobes.

Etymology. The name *apparata* derives from the English verb “to apparate”, made popular in

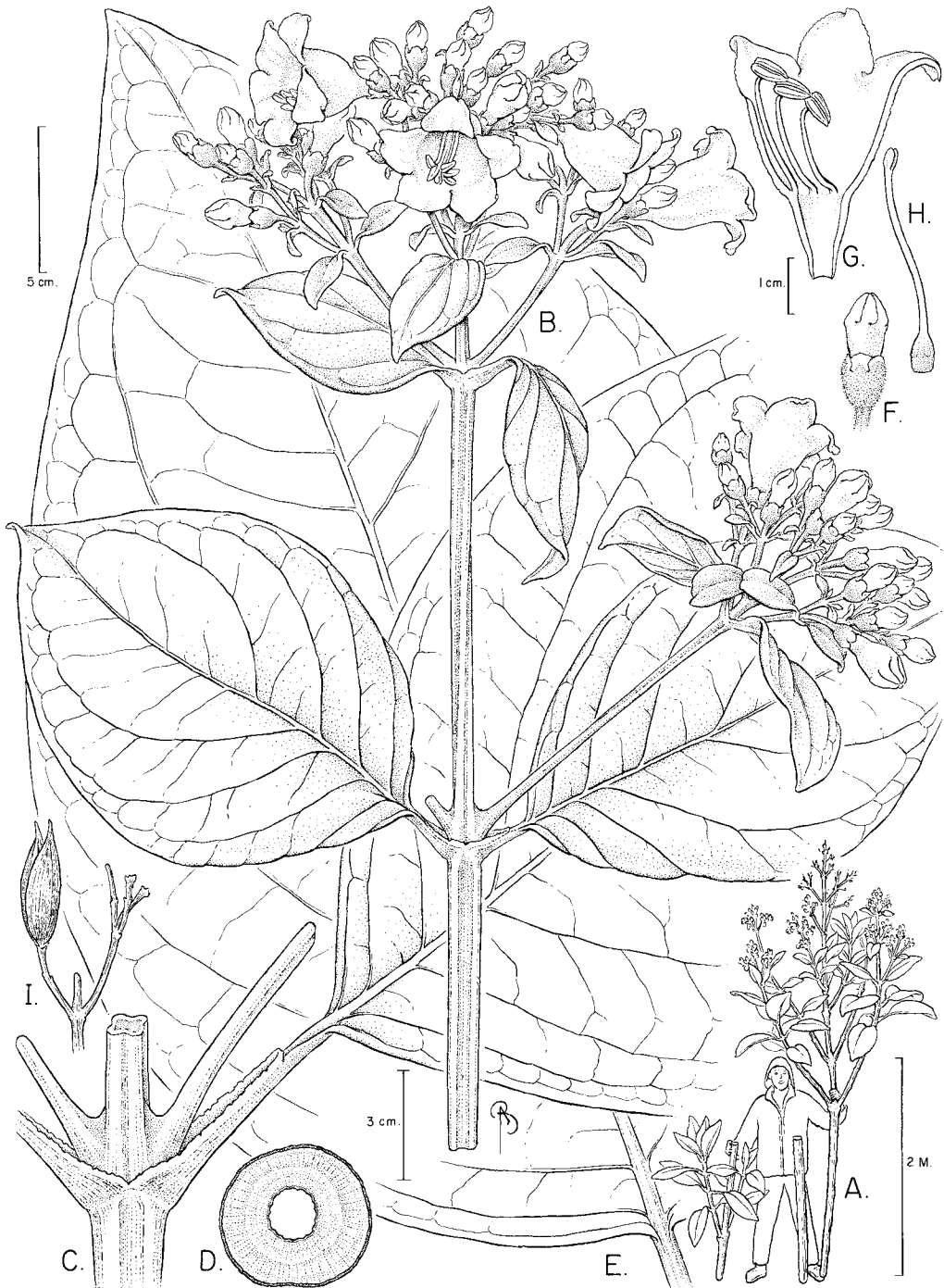


FIGURE 2. *Macrocarpaea apparata*. A, habit of tree in the field, trunk cut into three segments from the base; B, habit of flowering stem; C, interpetiolar ridge; D, wood anatomy of cross-section of main trunk; E, leaf; F, floral bud; G, cross-section of corolla; H, pistil; I, mature dehiscent capsule. A, D, F, H from pickles, photos and pressed specimens of *J.R. Grant & Struwe 01-4002*; B, C from *J.R. Grant & Struwe 01-3999* and photos of *J.R. Grant & Struwe 01-4002*; E from *J.R. Grant & Struwe 3998*; I from *J.R. Grant & Struwe 4001*.



FIGURE 3. A–C. *Macrocarpaea* species. A, *Macrocarpaea apparata*: flowering stem with large white campanulate flowers. Photo by Jason R. Grant, 28.8 km S of Yangana, Loja, Ecuador, 11 February 2001, *J.R. Grant & Struwe 01-4002* (type); B, *Macrocarpaea jensii*. Flowering stem with large yellowish-white campanulate flowers. Photo by Jason R. Grant, Parque Nacional Podocarpus (San Francisco entrance), Zamora-Chinchipe, Ecuador, 16 February 2001, *J.R. Grant & Struwe 01-4047* (type); C, *Macrocarpaea lenae*. Lena Struwe holding type material of *M. lenae*. Photo by Jason R. Grant, Parque Nacional Podocarpus (Bombuscaro entrance), Zamora-Chinchipe, Ecuador, 13 February 2001, *J.R. Grant & Struwe 01-4013* (type).

the book 'Harry Potter and the Chamber of Secrets' by J.K. Rowling (1998). The term describes the magical ability to vanish and reappear at your destination (i.e. apparating). When we first found this new species, we could only find sterile individuals. After looking all afternoon, and only just before dusk, we finally found several flowering plants that seem to have 'apparated' in front of us, appearing out of nowhere. Therefore, we present the name the "apparating moon-gentian".

Paratypes: ECUADOR. Loja: Nudo de Sabanilla, ca. 24 km S of Yangana, at border of P.N. Podocarpus, roadside right after stream that crosses the road, roadside secondary vegetation, plant sterile, 2550 m, 11 February 2001, *J.R. Grant & Struwe 01-3995* (LOJA, QCNE, NEU, NY, US [2 sheets]); 29.6 km S of Yangana, 04° 27' 59" S, 079° 08' 44" W, 2450 m, roadside secondary vegetation, plant sterile, 11 February 2001, *J.R. Grant & Struwe 01-3998* (LOJA, QCNE, NEU, NY, US [2 sheets]); 29.6 km S of Yangana, 04° 27' 59" S, 079° 08' 44" W, 2450 m, roadside secondary vegetation, pickled flowers, stem, petioles, and leaves available, calyx dark green, corolla whitish green, filaments light green, stamens cream-colored, corolla bud rugose on outside, calyx with short, stiff hairs, 11 February 2001, *J.R. Grant & Struwe 01-3999* (LOJA, QCNE, NEU, NY, US [2 sheets]); 30.9 km S of Yangana, 04° 27' 59" S, 079° 08' 44" W, 2450 m, roadside secondary vegetation, tree 10 m tall, with flowers and fruits, 11 February 2001, *J.R. Grant & Struwe 01-4001* (LOJA, QCNE, NEU [4 sheets], NY, US [4 sheets]); 30.1 km past Yangana towards Valladolid, 5 November 2002, *J.R. Grant et al 02-4292* (NEU, NY, US).

2. *Macrocarpaea bubops* J.R. Grant & Struwe, *sp. nov.* TYPE: ECUADOR. Zamora-Chinchipe: Along new road Loja-Zamora, moist cloud forest on peaty soil with *Sphagnum* and terrestrial lichens, 2500 m, tree 5 m, flowers greenish yellow, 25 April 1987, *van der Werff & Palacios 8986* (Holotype: NY; isotypes: AAU, G, GB, QCNE). Fig. 4.

A Macrocarpaea calophylla cui affinis, sed foliis coriaceis, ellipticis vel anguste ovatis (vs. ellipticis), paginae superiore laevibus, inflorescentiis multiifloribus, et lobis calycis margine hyalinis differt.

Dichotomously branched tree, much branched from about 2 m above the ground; overall

branching pattern conical in outline, 1–10 m tall, glabrous throughout except lower leaf surfaces with short papillae. Trunk to 9.5 cm diameter wood always solid without any hollow cavities, growth rings prominent; bark thick, pithy to 4 mm thick, outer surface rugose, brown. Stems terete, solid, 5–12 mm in diameter just below inflorescence. Leaves narrowly ovate to elliptic, petiolate, 8.5–22.0 cm; blades 7.5–19.5 × 4.0–11.5, cuneate to rounded, margin entire, slightly revolute, base aequilateral to slightly oblique, apex acute, thick, leathery-coriaceous, dark green, with no or few impressed veins above, and slightly raised veins below, glabrous above and typically below, yet often with short tuberculate hairs on lower veins, and on most herbarium specimens (and especially visible on living material) on the underside of most leaves, at the base, on either side of the midrib just above the petiole, there are two orange dots (Fig. 4C); interpetiolar ridge 1–5 mm high; petioles robust with strong open vagination nearly equaling the length of the petiole, 10–35 mm. Branches of the inflorescence 14–36 cm, 5–20 flowered per branch. Bracts narrowly ovate to elliptic to obovate to rounded, 22–60(–170) × 6–32(–80) mm, base aequilateral, apex acute, petiolate; bract petioles 2–14(–30) mm. Flowers pedicellate, erect to horizontal to oriented in all directions in the inflorescence; pedicels 4–20 mm; bracteoles linear to ovate to obovate, 2–20 × 2–9 mm. Calyx narrowly to broadly campanulate, 7–11 × 7–10 mm, glabrous, smooth, green, ecarinate, often with pronounced ridges between calyx lobes extending to the base of the calyx; calyx lobes dividing calyx one third to one half, rounded to obtuse, 3–4 × 3–5 mm, often with a slightly raised orange keel. Corolla funnel-shaped, 32–51 mm, 13–22 mm wide at corolla lobe sinuses, white to greenish yellow, smooth; corolla lobes ovate to elliptic, apex obtuse to rounded to retuse, 5–10 × 7–11 mm. Stamens 17–23 mm; filaments 12–19 mm, filiform, terete; anthers elliptic to oblong, 4–5 × 2.0–2.5 mm, sagittate, versatile. Pistil 22–29 mm; ovary 5–6 × 2.5–4.0 mm; style 14–19 × 0.5–1.0 mm; stigma 2-lobed, lobes 3–4 × 1–2 mm. Capsules and seeds unknown.

Macrocarpaea bubops belongs to a group of species previously circumscribed under a broad interpretation of *M. revoluta* (e.g., Pringle 1995: 95–97). However, *M. bubops* has no morphological affinity to *M. revoluta* and is also



FIGURE 4. *Macrocarpaea bubops*. A, habit of flowering stem and leaves; B, interpetiolar ridge; C, lower surface of leaf showing two orange dots; D, wood anatomy of cross-section of main trunk; E, flowering stem; F, floral bud; G, cross-section of corolla and pistil. A–D, F from pickles, photos and specimens of *J.R. Grant & Struwe 01-4046*; E, G from *Madsen 74050* (AAU).

geographically distinct from its Huánuco and Junín distribution (Grant 2002). *Macrocarpaea bubops* has affinities to *M. calophylla* of Magdalena, Colombia, which may be extinct since it has not been recollected since its original collections made in 1843. These two species are similar in the general shape of the leaves and architecture of the inflorescence. *Macrocarpaea bubops* differs in its thicker, more leathery, elliptic to narrowly ovate (vs. broadly elliptic) leaves with a smooth upper surface, a many-flowered inflorescence, and rounded calyx lobes with a hyaline margin. Interestingly, on the underside of most leaves, at the base, on either side of the midrib just above the petiole, are two, so far as yet unexplained orange dots that become translucent when preserved in alcohol. These dots are part of the plant, and not a fungus, lichen or insect damage. Similar yet yellow-colored dots were also observed on some leaves of *M. noctiluca* in Loja (J.R. Grant & Struwe 01-4074).

The Estación Científica San Francisco in Parque Nacional Podocarpus is unique in Ecuador in that four species of the genus *Macrocarpaea* occur sympatrically. Individuals of *M. bubops* (J.R. Grant & Struwe 01-4046), *M. harlingii* (J.R. Grant & Struwe 01-4048; J.R. Grant & Struwe 01-4049), and *M. jensii* (J.R. Grant & Struwe 01-4047) were collected within 20 m of each other, and *M. noctiluca* (J.R. Grant & Struwe 01-4062) within 100 m from them. Each species is a clearly different morphological type, and none appears to be closely related to the other. *Macrocarpaea bubops*, *M. harlingii*, and *M. jensii* are rarely-collected plants that generally occur in primary forest and known best from the San Francisco site, whereas *M. noctiluca* is a commonly collected species that occurs throughout Loja and Zamora-Chinchipe provinces, seen most commonly in disturbed sites along roadsides. *Macrocarpaea bubops* is a tall stately tree to 10 m, perhaps the tallest in the genus. *Macrocarpaea harlingii* is a slender unbranched beanpole-like treelet with its leaves and inflorescence clustered at the apex. *Macrocarpaea jensii* is more slender and stouter than *M. harlingii*, rather shrubby in appearance and 1–5 m tall. *Macrocarpaea noctiluca* is a 1–6 m tree often simply appearing as a large inflorescence. No hybrids were observed.

Etymology. The name *bubops* derives from the Latin “*Bubo*”, owl, and the Greek “*ops*”, eye. This species is named for the orange dots

on the underside of most leaves that are reminiscent of a pair of owl eyes, and hence the name “owl-eyed moon-gentian”.

Paratypes: ECUADOR. Loja: En una pista que sale de la carretera de Loja a Zamora, 2600 m, 28 September 1995, Garmendia & Paredes 311 (QCNE); Loja-Zamora rd, km 11, 79° 11'W, 03° 59'S, 2630 m, shrub 3 m, floral buds greenish yellow, 23 February 1988, Jørgensen 65084 (AAU, QCA); Loja-Zamora rd., approx. km 15, disturbed primary and secondary montane forest, 79° 08'W, 03° 58'S, 2400–2700 m, shrub 1 m, flowers white, 23–24 April 1988, Madsen 74050 (AAU, LOJA, QCA). Zamora-Chinchipe: Canton Zamora, sector el Tambo, Estación Científica “San Francisco”, 2170 m, 17 April 2000, Cerna 109 (QCNE); Carretera Loja-Zamora, Cuenca del río San Francisco, Fundación Arco Iris, 2100 m, 03° 59'S, 79° 05'W, bosque de neblina montano, transectos de 50 × 4 m. × 5 (0.1 Ha.), especies de 2.5 cm. de DAP en adelante (modelo radial), árbol de 7 m × 10 cm. de DAP, flor limon. T. 26, 27 February 2000, Cerón et al. 40136 (QAP); Parque Nacional Podocarpus (San Francisco entrance), trail leading west from San Francisco, 03° 59'24" S, 079° 05'48" W, 2100 m, 16 February 2001, J.R. Grant & Struwe 01-4046 (G [2 sheets], LOJA, MO, NEU [3 sheets], NY, QCA, QCNE, S, SBG, US [3 sheets]).

3. *Macrocarpaea jensii* J.R. Grant & Struwe, *sp. nov.* TYPE. ECUADOR. Zamora-Chinchipe: Parque Nacional Podocarpus (San Francisco entrance), trail leading west from San Francisco, 03° 59'24" S, 079° 05'48" W, 2100 m, slender tree to 4 m tall, corolla light green, tube yellowish-green, outside of corolla thick and spongy, the corolla lobes warty and uneven, leaves membranaceous, dark green, 16 February 2001, J.R. Grant & Struwe 01-4047 (Holotype: US [3 sheets]; isotypes: G [2 sheets], LOJA, QCNE, NEU, NY, SBG). Fig. 5, 3B.

A Macrocarpaea sodiroanae cui affinis, sed foliis longe-petiolatis gracilis, ellipticis-rhombiformibus, et corollae crassis spongiosis differt.

Unbranched tree, overall inflorescence triangular in outline, 1–5 m tall, glabrous throughout; trunk to 1.5 cm diameter wood solid to hollow (pith to 3 mm), growth rings scarcely visible; bark papery thin to scarcely measurable, 0.05 mm thick, outer surface smooth to rugose, tan. Stems terete, solid to hollow, 4–6



FIGURE 5. *Macrocarpaea jensii*. A, habit of flowering stem; B, leaf; C, floral bud; D, corolla viewed from front; E, side-view of flower at anthesis; F, cross-section of corolla; G, anthers; H, pistil; I, pistil with sepals removed to show the ovary; J, wood anatomy of cross-section of main trunk; K, mature dehiscent capsules. A-K from pickles, photos and specimens of J.R. Grant & Struwe 01-4047.

mm in diameter just below inflorescence. Leaves elliptic-rhomboid to oval, slightly asymmetric, petiolate, 12–32 cm; blades 14–23 × 4.5–11.5 cm, long attenuate and decurrent on the petiole, entire, not revolute, base aequilateral, apex acute to acuminate, membranaceous, thin, flexible, dark green, with slightly impressed veins above, and slightly raised veins below, glabrous above and typically below, yet often with short tuberculate hairs on lower veins; interpetiolar ridge 1–5 mm high; petioles slender with very slight vagination, 30–90 mm. Branches of the inflorescence 6–23 cm, 3–12 flowered per branch. Bracts elliptic-rhomboid to oval, slightly asymmetric, 18–80(–140) × 9–35(–50) mm, base aequilateral to attenuate, apex acute to acuminate, sessile to petiolate; bract petioles 0–10 mm. Flowers pedicellate, erect to horizontal to oriented in all directions in the inflorescence; pedicels 6–17 mm; bracteoles lanceolate to ovate, 1–12 × 1–9 mm, urceolate to campanulate, 7–9 × 7–9 mm, glabrous, smooth, green, ecarinate, no ridges extend down from calyx lobes; calyx lobes dividing calyx one third to one half, apex rounded, obtuse to acute, 2–4 × 3–4 mm. Corolla funnel-shaped, 29–41 mm, 17–25 mm wide at corolla lobe sinuses, yellowish-green, smooth to spongy, fleshy, warty and uneven; corolla lobes ovate, apex obtuse to rounded, 7–14 × 6–13 mm. Stamens 19–21 mm; filaments 16–18 mm, filiform, terete; anthers elliptic to oblong, 3–4 × 2–3 mm, sagittate, versatile. Pistil 26–32 mm; ovary 7–10 × 2.5–3.0 mm; style 17–18 × 0.5–1.0 mm, 2-lobed; stigma 2-lobed, lobes 2–4 × 1–2 mm, spatulate. Capsules dry, bilocular, medially dehiscent, ellipsoidal, 20–26 × 6–11 mm, smooth to very faintly ribbed, faint-orangish tan, erect to slightly nodding, style remnant 2–6 mm. Seeds flattened, angular, roughly triangular in outline, winged, 0.3–1.0 × 0.2–0.5 mm, faint orangish-tan, rugose-reticulate.

Macrocarpaea jensii belongs to a large group of species previously circumscribed under a broad interpretation of *M. sodiroana* (e.g., Pringle 1995: 93–95). However, *M. jensii* is a distinct species with several unique features in the genus. It has the thinnest leaves of any known species (when pressed and dried), contrasting with the thickest and spongiest corolla. It does not appear to have any clear affinities to any other Ecuadorian species, but has been confused with *M. sodiroana*. It is similar to *M. harlingii*, *M. lenae*, and *M. sodiroana* in its

habit as a small slender treelet, and to *M. lenae* with its long slender petioles. Its leaves are long-petiolate, elliptic-rhomboid and often slightly asymmetric. It is known best from the 'Estación Científica San Francisco' within Parque Nacional Podocarpus.

Etymology. This species is named for Danish botanist Jens Madsen, 1959–, of the University of Aarhus, prolific collector of southern Ecuadorian plants, at whose home in Loja we stayed during our plant-collecting expedition to Parque Nacional Podocarpus. We are grateful for his hospitality, the logistics he provided, and introducing us to the bar "El Viejo Minero" in Loja where they serve the deadly cocktail "El Vikingo", also named for Jens. Therefore, we dedicate this species as "Jens' moon-gentian".

Paratypes: ECUADOR. Zamora-Chinchipe: Loja-Zamora rd., E of the pass, disturbed forest, 2600 m, slender treelet, 4–5 m, corolla yellowish-green, 15 February 1985, *Harling & Andersson 22118* (GB, QCA); At 25 km from Loja (road to Zamora), in the forest of the 'Estación Científica San Francisco', south of the river San Francisco, beside the path connecting the hydroelectric station and the entrance of the water channel, 1850 m, January 1998, *Matt 16* (ER); At 25 km from Loja (road to Zamora), in the forest of the 'Estación Científica San Francisco', south of the river San Francisco, beside the path connecting the hydroelectric station and the entrance of the water channel, 1850 m, January 1998, *Matt 17* (ER); P.N. Podocarpus, La Esmeralda (Cooperativa San Francisco de Numbala Alto), bosque primario alto, 04° 22' S, 79° 03' W, 2250 m, arbusto de 1 m de altura, cáliz verde oscuro, corolla verde claro, January 1995, *Palacios & Tirado 13033* (MO, U).

4. *Macrocarpaea lenae* J.R. Grant, *sp. nov.* TYPE: ECUADOR. Zamora-Chinchipe: 5 km S of Zamora towards P.N. Podocarpus (Bombuscaro entrance), 04° 06' 31" S, 078° 57' 49" W, 1030 m, open area in primary forest, small 4 m tree, sparsely branched, calyx and corolla buds the same glaucous green color, corolla light green, old fruits brown and nodding, 13 February 2001, *J.R. Grant & Struwe 01-4013* (Holotype: US; isotypes: G, LOJA, QCA, QCNE, NEU [2 sheets], NY, MO, S, SBG). Fig. 3C, 6.

A Macrocarpaeae sodiroanae cui affinis, sed calycibus urceolatis glaucis, et foliis longe-

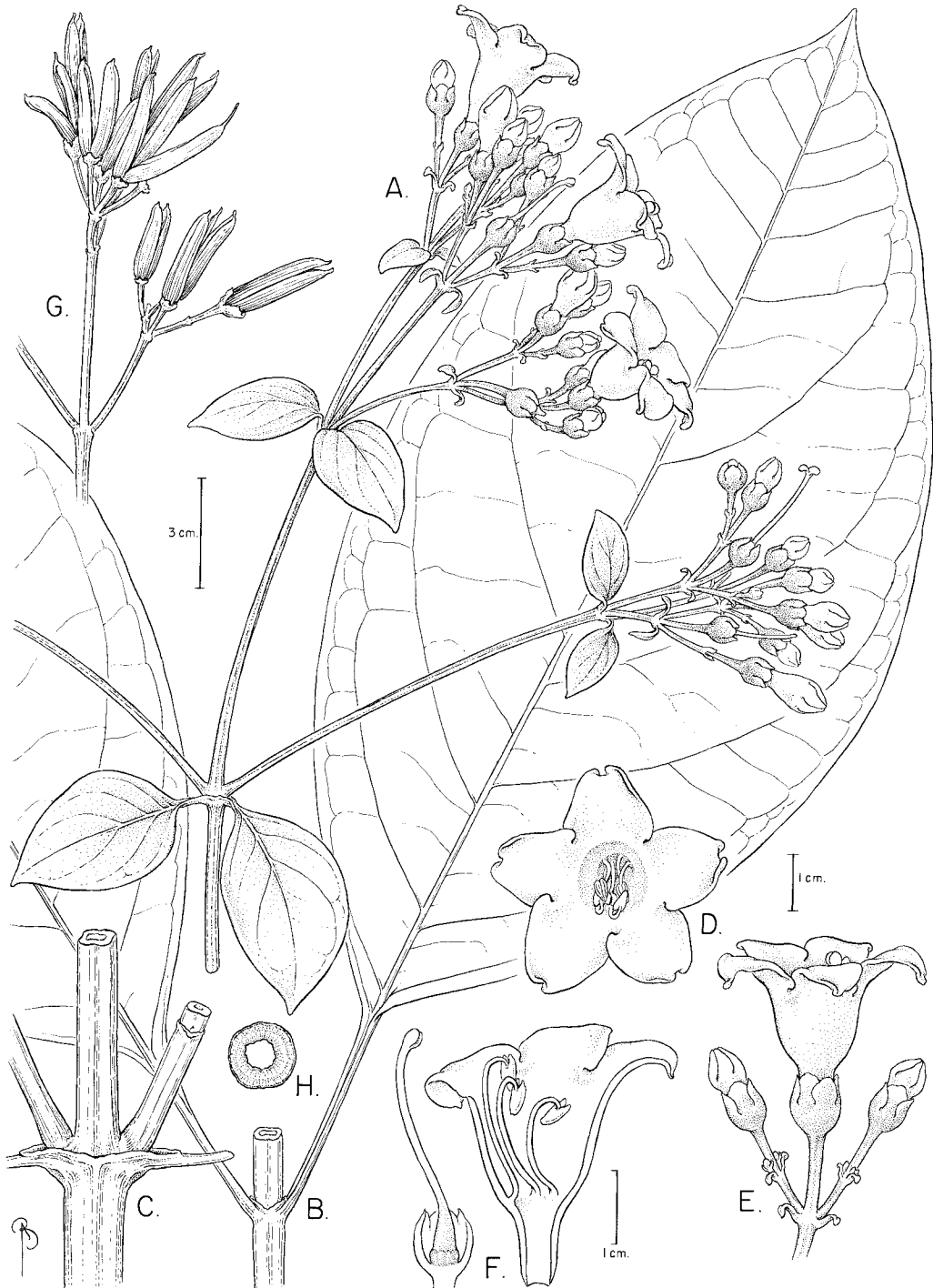


FIGURE 6. *Macrocarpaea lenae*. A, habit of flowering stem; B, leaves; C, interpetiolar ridge; D, corolla viewed from front; E, flower and floral buds; F, cross-section of corolla; G, mature dehiscent capsules; H, wood anatomy of cross-section of main trunk. A–H from pickles, photos and specimens of J.R. Grant & Struwe 01-4013.

petiolatis differt, et cui petioli tenues homonymiae talis similis.

Unbranched tree, overall inflorescence triangular in outline, 2–3 m tall, glabrous throughout; trunk to 2.7 cm diameter wood always hollow (pith 5–9 mm), growth rings scarcely visible, bark papery thin to scarcely measurable (to 0.05 mm), outer surface smooth to rugose, tan. Stems terete to slightly quadrangular, hollow, 4–6 mm in diameter just below inflorescence. Leaves elliptic, oblong to oval, petiolate, 12–45 cm; blades 10.5–37 × (4.5–) 11.5–19 cm, cuneate to rounded, entire, not revolute, base aequilateral to oblique, apex acute to acuminate, papery thin, dark green, with slightly impressed veins above, and slightly raised veins below, glabrous above and below; interpetiolar ridge 2–8 mm high; petioles slender with very slight vagination, 15–70 mm. Branches of the inflorescence 11–26 cm, 6–20 flowered per branch. Bracts ovate to elliptic, 9–70 × 5–32 mm, base aequilateral, apex acute to acuminate, short-petiolate; bract petioles 1–5 mm. Flowers pedicellate, erect to horizontal to oriented in all directions in the inflorescence; pedicels 7–25 mm; bracteoles linear to ovate, 1–15 × 1–9 mm. Calyx urceolate to campanulate, 8–10 × 6–8 mm, glabrous, smooth, glaucous green, ecarinate; no ridges extend down from calyx lobes; calyx lobes dividing calyx one third to one half, rounded to obtuse, 3–4 × 3.0–4.5 mm. Corolla funnel-shaped, 30–37 mm, 12–21 mm wide at corolla lobe sinuses, light green, smooth; corolla lobes ovate, apex obtuse to retuse, 9–12 × 4–9 mm. Stamens 24–28 mm; filaments 20–24 mm, filiform, terete; anthers elliptic to oblong, 3–4 × 2–3 mm, sagittate, versatile. Pistil 25–31 mm; ovary 5–7 × 2.5–3.5 mm; style 17–20 × 0.5–1.5 mm; stigma 2-lobed, lobes 3–4 × 2.0–2.5 mm, rounded to spatulate. Capsules dry, bilocular, medially dehiscent, ellipsoidal, 24–29 × 8–11 mm, smooth, faint orangish-tan, erect to slightly nodding, style remnant 1–2 mm. Seeds flattened, angular, roughly triangular in outline, winged, 0.3–1.1 × 0.4–0.6, faint orangish-tan, rugose-reticulate.

Macrocarpaea lenae belongs to a large group of species previously circumscribed under a broad interpretation of *M. sodiroana* (e.g., Pringle 1995: 93–95). The two species resemble one another in their open spreading to bending inflorescences, and habit as small lanky 1–3 m tall shrubs to treelets often found in disturbed areas. It differs notably from

M. sodiroana in its urceolate to campanulate, glaucous calyx, and leaves with long slender petioles (vs. sessile to short-petiolate leaves). As presently known, *Macrocarpaea lenae* is restricted to a small area south of the town of Zamora, Zamora-Chinchipec while *Macrocarpaea sodiroana* is confined to the province of Pichincha in northern Ecuador.

Etymology. This species is named for the co-author of this paper, Swedish botanist Karin Lena Elisabet Struwe, 1967–, of Rutgers University- New Brunswick, NJ. This species is called “Lena’s moon-gentian”.

Paratypes. ECUADOR. Zamora-Chinchipec: 5 km S of Zamora towards P.N. Podocarpus (Bombuscaro entrance), 04° 06' 31" S, 078° 57' 49" W, 1030 m, 1 November 2002, *J.R. Grant et al. 02-4250* (MO, NEU, NY, SEL, US); P.N. Podocarpus, Romerillo, trail at limit of P.N. Podocarpus, mountain rainforest, 78° 56' W, 04° 13' S, 1650–1700 m, flowers green, 14 February 1990, *Madsen & Knudsen 86854* (AAU, LOJA); hills and pasture and disturbed forest immediately S and SE of Zamora, 78° 57' W, 04° 04' S, 1000–1250 m, shrub to 3 m, 14 June 1988, *Øllgaard et al. 74846* (AAU, LOJA, QCA); P.N. Podocarpus, Guardería Río Bombuscaro, Sendero al Mirador, bosque primario alto, 1100 m, arbusto de 2 m de altura, flores verdes, January 1995, *Palacios & Tirado 13301* (MO, QCNE, U).

5. *Macrocarpaea luna-gentiana* J.R. Grant & Struwe, *sp. nov.* TYPE: ECUADOR. Loja: Km 21 on road from Yangana to Cerro Toledo, then trail from Cerro Toledo (ca. 300 m below antennas) towards Numbala, (to 1 km down the trail), cool, very rainy, windy páramo, 04° 24' 01" S, 079° 06' 42" W, 3350 m, small tree, 6 cm in diameter at the base, leaves coriaceous, glossy green, bullate, revolute edge, corolla buds green, corollas light green, fruits green, 14 February 2001, *J.R. Grant & Struwe 01-4028* (Holotype: US; isotypes: G, LOJA, NEU, NY, QCA, QCNE). Fig. 7, 8.

A Macrocarpaeae pachyphylla cui affinis, sed arbores robustis, inflorescentiis paucifloribus, calycibus longioribus (9–18 vs. 7–12 mm), lobis calycis latis, et floribus magni differt.

Dichotomously branched to unbranched tree, overall branching pattern obtriangular and flat-topped in outline, 2–3 m tall, glabrous to hyaline puberulent with short simple hairs on

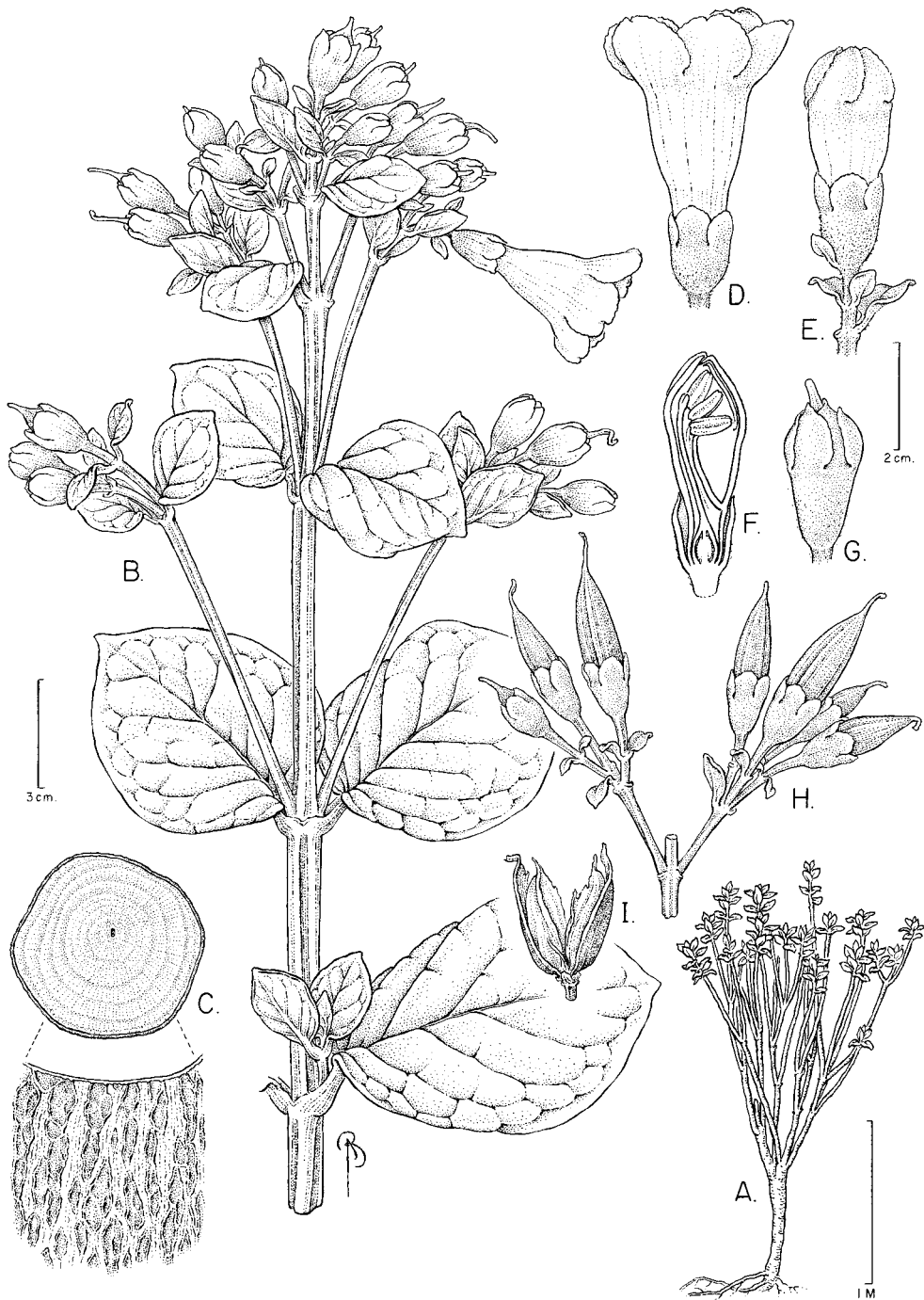


FIGURE 7. *Macroparpaea luna-gentiana*. A, habit of tree in the field; B, habit of flowering stem; C, wood anatomy of cross-section of main trunk, and bark; D, flower; E, floral bud; F, cross-section of floral bud; G, flower just after anthesis; H, immature capsules; I, mature dehiscent capsule. A from a photo of J.R. Grant & Struwe 01-4027; B from Matt 1 (ER); C from J.R. Grant & Struwe 01-4027; D-I from J.R. Grant & Struwe 01-4028.

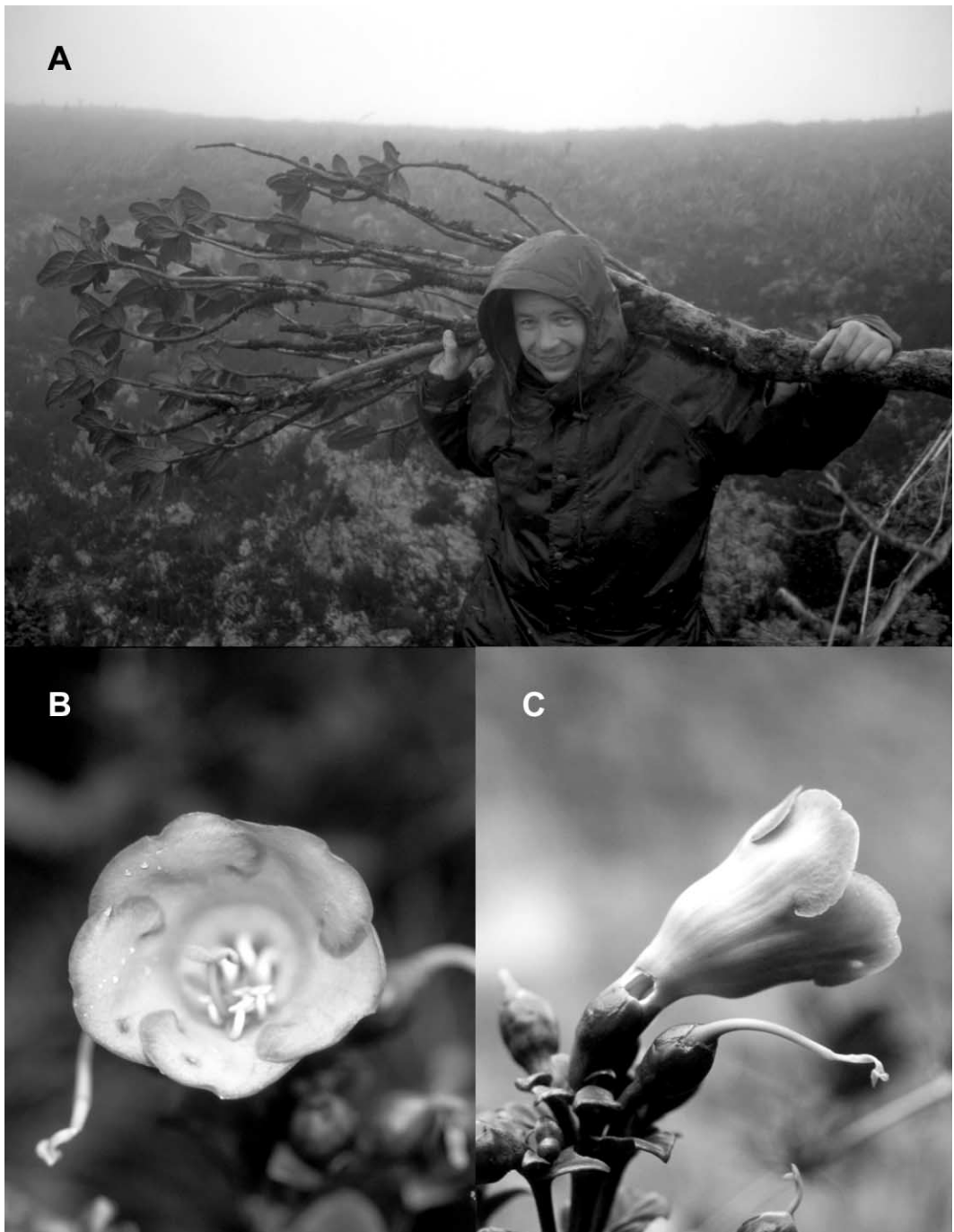


FIGURE 8. A–C. *Macrocarpaea luna-gentiana*. A, Jason R. Grant at type locality carrying a large plant. Photo by Lena Struwe, Cerro Toledo Loja, Ecuador, 14 February 2001, *J.R. Grant & Struwe 01-4028* (type); B, Corolla viewed from front, distinct overlapping corolla lobes. Photo by Jason Grant, Cerro Toledo Loja, Ecuador, 2 November 2002, *J.R. Grant et al. 02-4272*; C, Corolla viewed from side, hole at base of corolla made by nectar robbers. Photo by Jason Grant, Cerro Toledo Loja, Ecuador, 2 November 2002, *J.R. Grant et al. 02-4272*.

stems, petioles, leaves, inflorescences, calyces, and corolla lobes; trunk to 7.7 cm diameter wood solid in trunk, hollow in younger branches (to 0.5), growth rings prominent; bark thin to thick, (to 0.5–4.0 mm), brown background, mottled with distinctive tan rippling and furrowing patterns. Stems terete to slightly quadrangular, solid to hollow, 5–10 mm in diameter just below inflorescence. Leaves broadly ovate, sessile to short-petiolate, 3–12 cm; blades 10–11.5 × 2.5–8.0 cm, entire, slightly revolute, base aequilateral to slightly oblique to cuneate, apex acute, thick, leathery-coriaceous, light to dark glossy green, bullate, with few to strongly impressed veins above, and strongly raised veins below, glabrous above and typically below yet often with long pubescent hairs on the veins of young leaves; interpetiolar ridge 1–5 mm high; petioles flattened to concave, 3–5 mm. Branches of the inflorescence 5–23 cm, 1–10 flowered per branch. Bracts ovate to lanceolate, 33–82 × 10–42 mm, base aequilateral to slightly oblique or rounded, apex acute, sessile to short-petiolate; bract petioles 0–3 mm. Flowers pedicellate, erect to horizontal to oriented in all directions in the inflorescence; pedicels 3–30 mm; bracteoles ovate, 5–18 × 3–7 mm. Calyx broadly campanulate, 9–18 × 13–14 mm, hyaline puberulent to glabrous, rugose, green, ecarinate, no ridges extend down from calyx lobes; calyx lobes dividing calyx one third to one half, rounded, 7–9 × 6–12 mm. Corolla funnel-shaped, 341–62 mm, 15–40 mm wide at corolla lobe sinuses, light green, smooth; corolla lobes half moon-shaped to broadly ovate, apex rounded, 5–21 × 9–24 mm. Stamens 23–35 mm; filaments 18–29 mm, filiform, flattened; anthers elliptic to oblong, 5–6 × 2.5–3.5 mm, sagittate, versatile. Pistil 41–42 mm; ovary 7–8 × 3–4 mm; style 29–30 × 1.0–1.5 mm; stigma 2-lobed, lobes 4–5 × 2.0–2.5 mm, spatulate. Capsules dry, bilocular, medially dehiscent, ellipsoidal to ovoid, 30–49 × 13–19 mm, wrinkled to ribbed, dark brown, erect to slightly nodding; style remnant 4–15 mm. Seeds unknown.

Macrocarpaea luna-gentiana has been previously recognized as *M. pachyphylla* (e.g., Ewan 1948: 232; Pringle 1995: 97). The two species have a similar gestalt especially in the morphology of the leaves, yet the details of the inflorescence are quite different. *Macrocarpaea luna-gentiana* has a generally robust, stout appearance, a few-flowered inflorescence,

broad campanulate calyx, rounded calyx lobes, and a broad funnel-shaped corolla with broad rounded to half-moon-shaped corolla lobes. *Macrocarpaea pachyphylla* has a more slender appearance overall, a many-flowered inflorescence, smaller calyx, obtuse to acute to rounded calyx lobes, a narrower corolla, and obtuse to acute corolla lobes.

Macrocarpaea luna-gentiana is a distinct narrow endemic of Loja province, Ecuador, between 2500–3500 m. Its probable sister species *M. pachyphylla* is restricted to Nariño and Putumayo provinces of Colombia at similar elevations of 3000–3400 m. These two species occur in true páramo conditions at some of the highest elevations of any known species in the genus. Other species of the genus occurring at or above 3000 m include *M. arborescens* Gilg, *M. bracteata* Ewan, *M. densiflora* (Benth.) Ewan, *M. duquei* Gilg-Benedict, *M. glabra* (L.f.) Gilg, *M. noctiluca* J.R. Grant & Struwe, and *M. stenophylla* Gilg. It is interesting to note that this species was first collected by Édouard André in 1876, and then not again for more than 100 years until 1985, a similar situation to that of the Peruvian *M. viscosa* (Grant 2002).

Etymology: *Macrocarpaea luna-gentiana* is the seminal name for the common name of the genus, “moon-gentian”, derived from the Latin “*luna*”, moon, and “*gentiana*”, gentian.

Paratypes: ECUADOR. Loja: Loja-Zamora, 3800 m, fleur verte épaisse, arbuste à feuillage jolie, alt 2–3 m., fleur verte épaisse, arbuste à feuillage jolie, alt. 2–3 m, fl. eau de vies, 1 December 1876, *André 4513* (F, K, NY); Loja-Zamora, 3500 m, fleur verte, arbuste alt. de 2–3 m, 1 December 1876, *André 4536* (K, NY); Parque Nacional Podocarpus, Sendero a Cajanuma-Laguna del Compadre-Mirador-Cajanuma, 2750–3200 m, 04°04'S, 79°09'W, Bosque siempreverde montano alto, arbusto de 2 m., botones color verde, fruto capsular color verde, 25 February 2000, *Cerón & Curso de Dendrologia 40077* (QAP); Km 21 on road from Yangana to Cerro Toledo, then trail from Cerro Toledo (ca. 300 m below antennas) towards Numbala, (to 1 km down the trail), cool, very rainy, windy páramo, 04°24'01"S, 079°06'42"W, 3350 m, small tree, 6 cm in diameter at the base, leaves coriaceous, glossy green, bullate, revolute edge, corolla buds green, corollas light green, fruits green, 14 February 2001, *J.R. Grant & Struwe 01-4027* (LOJA, NEU, QCNE, US); Km 21 on road

from Yangana to Cerro Toledo, 2 November 2002, *J.R. Grant et al. 02-4272* (NEU, NY, US); P.N. Podocarpus, Cerro Toledo, montane forest and páramo, 79°07'W, 04°23'W, 2500–3400 m, 30 October 1989, *Madsen 86290* (AAU [2 sheets], LOJA); P.N. Podocarpus, above the refuge of Cajanuma, beside the trail from 'Mirador' on the ridge eastward to the cordillera, 3200 m, November 1997, *Matt 1* (ER); P.N. Podocarpus, S of Loja, above "Centro de información", E of Nudo de Cajanuma, mountain crest with low scrub and páramo, 79°10'W, 04°05'S, 3050–3420 m, 3 m tall shrub, flowers green, 24 February 1985, *Øllgaard et al. 58114* (AAU); P.N. Podocarpus, Yangana-Cerro Toledo, at entrance to crest, subpáramo scrub and bogs in the pass, 70°06'W, 04°23'S, 3100 m, 2 m tall sparsely branched shrub, 26 February 1985, *Øllgaard et al. 58258* (AAU, LOJA, QCA).

6. *Macrocarpaea noctiluca* J.R. Grant & Struwe, *sp. nov.* TYPE: ECUADOR. Loja: Nudo de Sabanilla, 15 km S of Yangana, 04°25'22"S, 079°09'04"W, 2486 m, common, small tree along roadside, flowers yellow, 10 February 2001, *J.R. Grant & Struwe 01-3977* (Holotype: US; isotypes: LOJA, QCA, QCNE, NY). Fig. 9, 10.

A Macrocarpaeae revoluta cui affinis, sed inflorescentiis compactis, foliis late-ovalis oblongis vel ellipticis, costae robustis, apicibus obtusis vel acutis (vs. foliis lanceolatis vel ovatis, costae gracilis, et apicibus acutis) differt.

Dichotomously branched to unbranched tree, overall branching pattern triangular in outline, 1–6 m tall, glabrous throughout; trunk to 4.0 cm diameter wood solid to hollow (pith to 5 mm), growth rings prominent, bark thin 0.005–0.1, outer surface rugose, brown. Stems terete, solid to hollow, 6–12 mm in diameter just below inflorescence. Leaves broadly ovate, oblong to elliptic, sessile to short-petiolate, 8–43 cm; blades 7–35 × 4.5–16.0 cm, entire, slightly revolute, base aequilateral to slightly oblique or rounded, apex acute, papery thin, shiny to opaque, light green to dark green, with slightly impressed veins above, and slightly raised veins below, glabrous above and below; interpetiolar ridge 3–6 mm high; petioles slender with very slight vagination, 10–90 mm. Branches of the inflorescence 17–34 cm, 3–18 flowered per branch. Bracts ovate to lanceolate

to oblong to elliptic, 9–135 × 5–75 mm, base aequilateral to attenuate, apex acute to obtuse, sessile to short-petiolate; bract petioles 1–7 mm. Flowers pedicellate, erect to horizontal to oriented in all directions in the inflorescence; pedicels 3–31 mm; bracteoles linear to lanceolate to obovate, 1–13 × 1–8 mm. Calyx narrowly to broadly campanulate, 7–10 × 5–9 mm, glabrous, smooth, green, ecarinate, to sometimes a small keel on the back of calyx lobe, often with pronounced ridges between calyx lobes extending to the base of the calyx; calyx lobes dividing calyx to one third, obtuse, rounded to acute, 2–4 × 2.5–3.0. Corolla funnel-shaped, 30–50 mm, 11–24 mm wide at corolla lobe sinuses, creamy white to yellow to yellowish green, smooth; corolla lobes ovate to elliptic, apex obtuse to rounded, 7–15 × 4–13 mm. Stamens 22–34 mm; filaments 18–28 mm, filiform, terete; anthers linear to linear elliptic, 4–6 × 2.0–2.5 mm, sagittate, versatile. Pistil 25–43 mm; ovary 4–7 × 2.5–3.0 mm; style 18–31 × 1.0–1.5 mm; stigma 2-lobed, lobes 3–5 × 2–3 mm, rounded to spatulate. Capsules dry, bilocular, medially dehiscent, ellipsoidal to ovoid, 29–34 × 10–14 mm, smooth to rugose, dark brown, erect to slightly nodding; style remnant 3–6 mm. Seeds unknown.

Macrocarpaea noctiluca was previously included within a broad interpretation of *M. revoluta* (e.g., Pringle 1995: 95–97) which has since been shown to be restricted to Peru (Grant 2002). It can be distinguished from *M. revoluta* in its more compact inflorescence, and broadly ovate to oblong to elliptic leaves with stout midrib and obtuse to acute apex (vs. lanceolate to ovate leaves with a slender midrib and acute apex).

Macrocarpaea noctiluca is the most common species of the genus in Ecuador, occurring in Azuay, Loja, Morona-Santiago, and Zamora-Chinchipe, and subsequently, the mostly frequently collected. It is mostly commonly observed as a primary colonizer in roadside secondary vegetation. It occurs at different sites with *M. angelliae*, *M. apparata*, *M. arborescens*, *M. bubops*, *M. harlingii*, and *M. jensii*. Often its presence may indicate the occurrence of other more rare species of *Macrocarpaea*.

Vernacular names: zimora del cerro (*Ellemann 66529*), simora del cerro (*Ellemann 75387*), cascarilla (*Ellemann 91665*).

Medicinal uses: medicine for headache: crush the leaves and place or tie it at the forehead

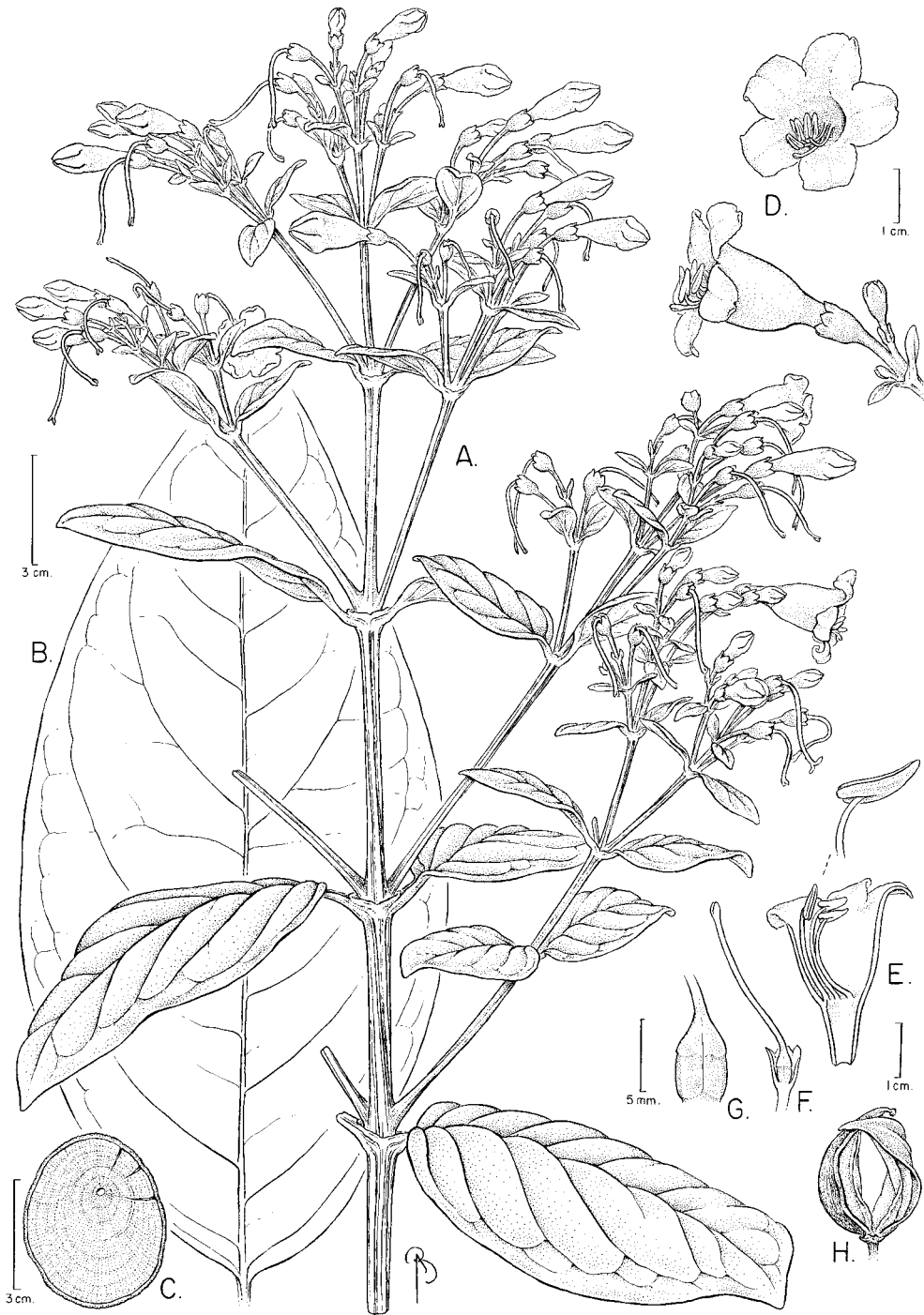


FIGURE 9. *Macrocarpaea noctiluca*. A, habit of flowering stem; B, leaf; C, wood anatomy of cross-section of main trunk; D, corolla viewed from front, and side-view of flower; E, cross-section of corolla, and anther; F, pistil; G, ovary; H, mature dehiscent capsule. A from field photo *J.R. Grant & Struwe 01-4021*; B, G from *J.R. Grant & Struwe 01-4074*; C from *J.R. Grant & Struwe 01-3994*; D-F from pickles of *J.R. Grant & Struwe 01-3979*.



FIGURE 10. *Macrocarpaea noctiluca*. Locally common species occurring frequently in roadside secondary vegetation in Loja and Zamora-Chinchipe. Photo by Jason R. Grant, Loja, Ecuador, February 2001.

(*Ellemann 66529, Ellemann 75387*; information of vernacular name and use given by Daniel Chalán Cartuche, Saraguro-Indian); a decoction is used as a medicine for malaria (*Ellemann 91665*; information given by Honorio Gonzales).

Etymology. The name *noctiluca* derives from the Latin “*noctis*”, night, and “*lucis*”, light, or glowing. The yellowish-white campanulate flowers remind us of small glowing lights. Therefore, we describe the “night-glowing moon-gentian”.

Paratypes: ECUADOR. Azuay: Km 74 de Cuenca, carretera Zigzig-Molón-Gualaquiza, 2790 m, 6 August 1986, *Jaramillo et al. 8866* (AAU, GB, QCA); Road Sigsig-Gualaquiza, km 25.6, at the pass on military post road, wet páramo vegetation with large patches of *Neurolepis*, km 3.3 from pass to military post, shrub 3 m, corolla greenish white/cream, stem hollow, 3200-3330 m, 11 January 2000, *Jørgensen et al. 1832* (CHRB, QCNE). Loja: 15 km S of Yangana on the road Loja-Zumba (under construction), slightly disturbed mountain cloud forest, 04° 30' S, 79° 8' W, 2500 m, shrub 2.5 m, flowers pale yellow, 24 September 1983, *Brandbyge 42299* (AAU, Q); Nudo de Guagrauma, slopes of the Lora de Oro (about 6 km south of Saraguro), 3000 m, tree 5 m, trunk 6 cm diameter, flowers creamy white, leaves subcoriaceous, dark green and shining above, with dark green veins a shiny below, in the sotobosque, 2 August 1944, *Camp 275* (NY); P.N. Podocarpus, Sendero a Cajanuma, 2550-2700 m, 04° 04' S, 79° 09' W, bosque de neblina montano, arbusto de 2 m., corola amarillo, fruto capsular color verde 23 February 2000, *Cerón & Curso de Dendrologia 40065* (QAP); Saraguro Canton, along road between Cuenca and Loja, 58.6 km N of Loja (first roundabout after entering the main entrance road), ca. 5 km S of Saraguro), 03° 39' S, 79° 15' W, 2875 m, 1 m tall, flowers greenish-yellow, 4 March 1992, *Croat 72660* (MO, QCNE); Loja-Zamora, 12 km from Loja, on the finca of Dr. David Espinosa, 03° 55' S, 79° 09' W, 2600 m, shrub 1 m high, flowers light green, bark light gray, slash green, 1 October 1988, *Ellemann 66529* (AAU, LOJA, QCA); Loja-Zamora, 12 km from Loja, on the finca of Dr. David Espinosa, 03° 55' S, 79° 09' W, 2400–2600 m, shrub, flowers yellow, 17–18 November 1988, *Ellemann 75387* (AAU, LOJA); 12 km NW of Saraguro on Loma Paredones, 03° 36' S, 79° 10' W, 2800 m, shrub 2 m high, 9 March 1989, *Ellemann*

91665 (AAU, LOJA, QCA); Namandu, S. Loja, 2400–2500 m, flores de color amarillo-verdoso, de bello aspecto, en corimbos terminales y axilares, 18 April 1946, *Espinosa, R. 198* (LOJA, US); Quebrada Honda, en la carretera Yangana-Valladolid, 2470 m, 9 October 1995, *Garmendia & Paredes 639* (QCNE); De la carretera Yangana-Valladolid, antes del refugio de Quebrada Honda, sale un camino de herradura que va a unos potreros, a 10 km de la carretera, cerca del camino, bosque secundario de cresta, arbustivo, 04° 28' 59" S, 79° 9' 20" W, 2720 m, 9 October 1995, *Garmendia & Paredes 688* (QCNE); 8 km E of Loja on Loja-Zamora road, 31 October 2002, *J.R. Grant 02-4245* (NEU, NY, US); Nudo de Sabanilla, 20 km S of Yangana, 04° 27' 12" S, 079° 09' 11" W, 2485 m, common, small tree along roadside, flowers yellow, 10 February 2001, *J.R. Grant & Struwe 01-3979* (LOJA, QCA, QCNE, NEU, NY, S, US); Nudo de Sabanilla, between 20-28.8 km S of Yangana, 04° 27' 59" S, 079° 08' 44" W, 2550 m, roadside secondary vegetation, 1.5 m tall small, single-stemmed tree, calyx dark green, glabrous, 11 February 2001, *J.R. Grant & Struwe 01-3992* (LOJA, QCA, QCNE, NEU, NY, MO, S, US); Nudo de Sabanilla, between 20-28.8 km S of Yangana, 04° 27' 59" S, 079° 08' 44" W, 2550 m, roadside secondary vegetation, 1.5 m tall small, single-stemmed tree, calyx dark green, glabrous, 11 February 2001, *J.R. Grant & Struwe 01-3993* (LOJA, NEU, QCNE); Nudo de Sabanilla, between 20-28.8 km S of Yangana, 04° 27' 59" S, 079° 08' 44" W, 2550 m, roadside secondary vegetation, 1.5 m tall small, single-stemmed tree, calyx dark green, glabrous, 11 February 2001, *J.R. Grant & Struwe 01-3994* (LOJA, NEU, QCNE, US [2 sheets]); 28.8 km S of Yangana, 04° 27' 59" S, 079° 08' 44" W, 2560 m, roadside secondary vegetation, plants 3 m tall, 11 February 2001, *J.R. Grant & Struwe 01-3996* (LOJA, QCNE, US); 28.8 km S of Yangana, 04° 27' 59" S, 079° 08' 44" W, 2560 m, roadside secondary vegetation, plants 3 m tall, 11 February 2001, *J.R. Grant & Struwe 01-3997* (LOJA, QCNE, US [2 sheets]); 10 km from Loja on road to Zamora, 03° 59' 28" S, 079° 09' 57" W, 2550 m, disturbed forest, flowers the same color as the common local Proteaceae, many seedlings present, 13 February 2001, *J.R. Grant & Struwe 01-4003* (LOJA, NEU, NY, QCA, QCNE); Km 8.9 on road from Yangana to Cerro Toledo, 04° 23' 08" S, 079° 09' 03" W, 2450 m, roadside

secondary vegetation, common, single-stemmed, sparsely branched shrub to 3 m, corollas light green, 14 February 2001, *J.R. Grant & Struwe 01-4021* (LOJA, NEU, NY, QCA, QCNE); From Loja-Saraguro road, then 200 m on road towards Fierro Urco, 03°40'58"S, 079°16'22"W, 2900 m, roadside shrub to 2 m tall with flower buds and old fruits, corollas light greenish-yellow, leaves with two yellow dots at the base of the leaf, growing alongside *Macrocarpaea arborescens* (*Grant & Struwe 01-4075*), 17 February 2001, *J.R. Grant & Struwe 01-4074* (G, LOJA, NEU [3 sheets], NY, QCA, QCNE, US [2 sheets]); Km 8.9 on road from Yangana- Cerro Toledo, 2 November 2002, *J.R. Grant et al. 02-4269* (NEU); Km 10 on road from Yangana- Cerro Toledo, 2 November 2002, *J.R. Grant et al. 02-4275* (MO, NEU, NY, SEL, US); Km 10 on road from Yangana- Cerro Toledo, 2 November 2002, *J.R. Grant et al. 02-4276* (MO, NEU, NY, SEL, US); 30.1 km past Yangana towards Valladolid, 5 November 2002, *J.R. Grant et al. 02-4295* (NEU, NY, US); Road between Loja and Zamora, 2600–2700 m, shrub ca. 2 m high, corolla pale yellow, 20 March 1972, *Harling 11322* (GB); Loma de Loro, 6 km S of Saraguro on road to Loja, 3200 m, treelet 4–5 m tall, corolla greenish-yellow, 11 February 1985, *Harling & Andersson 21910* (GB, QCA); W slope of Nudo de Sabanilla, ca. 10 km above Yangana on road to Valladolid, rainforest with open bog-like areas, 2500 m, shrub 2.0–2.5 m tall, corolla pale greenish-yellow, 3 April 1985, *Harling & Andersson 23594* (GB, QCA); Loja-Zamora rd, 2700–2900 m, shrub 4–5 m, corolla yellow, 8 February 1982, *Harling et al. 20386* (GB); Nudo de Sabanilla, N part, 2400–2600 m, tree ca. 4 m high, corolla pale yellow, 10 February 1982, *Harling et al. 20558* (GB); Carretera Loja-La Palma, bosque húmedo, suelo cascajosa, 2850 m, arbusto de 5 m, cáliz verde, corolla amarilla, 27 December 1988, *Jaramillo 10514* (QCA); Km 10-15 Yangana-Toledo road, subpáramo, 04°24'S, 79°6'W, 3000–3300 m, tree 3 m, fruits green, 1 August 1986 *Jørgensen 61374B* (AAU, QCA, QCNE); Loja-Saraguro, km 58, turnoff towards Fierro Urco, km 1-2, 03°41'49"S, 79°16'22"W, 3000 m, shrub 1.5 m, flowers yellow, fruits brownish-green, 21 April 1994, *Jørgensen et al. 499* (HAM, LOJA, MO, QCA, QCNE); Cerro Uritusinga, Loja-La Palma, km 18-20, montane forest, primary and secondary forest, 04°05'03"S, 79°13'40"W, 2910–3000 m, tree 4 m, calyx green, corolla light yellow, 30 November 1994, *Jørgensen et al. 1050* (HAM, LOJA, MO, QCA, QCNE); Slopes of Cerro Villonaco, ca. 10 km west of Loja, 03°11'80"S, 79°3'10"W, 2850 m, small tree 4 m tall, with yellow flowers, 6 March 1966, *Knight 517* (WIS); 4 km S of Loja, 04°0'40"S, 79°2'15"W, 2600 m, 17 April 1966, *Knight 494* (WIS); Road Loja-Zamora, km 10, vegetación bosque húmedo andino, and secondary roadside scrub mixed with ericaceous scrub forest, 03°58'S, 79°08'W, 2600 m, erect shrub, 2.5 × 5 cm diameter, bark pale brown, leaves dark bottle-green, slightly paler below, calyces dark green, corollas yellowish green, style and stigma green, filaments pale green, anthers creamish white, open areas of bosque margin with crown in open sunlight, 24 October 1996, *Lewis 2709* (LOJA, QCNE); Road Loja-Saraguro, km 26, bosque Cofragia, 03°49'437"S, 79°17'592"W, 2750 m, shrub 3–5 m × 3–6 cm diameter, bark smooth, gray, mottled, stems brittle, wood orange, yellow outer slash, leaves fleshy-rubbery, dark bottle-green above, paler below, calyces green, corollas cream, style pale green, stigma green, filaments creamish green, anthers cream, 17 January 1997, *Lewis et al. 2930* (LOJA, QCNE); Road between Loja and Zamora ca. Km 9, ecotone between cloud forest & páramo, 2500–2750 m, shrub to 3 m tall, calyx green, corolla pale yellowish-green, common, 31 December 1978, *Luteyn et al. 6542* (AAU, CAS, GH, NY, QCA); Cordillera de Sabanilla, ca. 15 km S of Yangana, 2480 m, wet montane forest, sparingly branched shrub 2.2 m tall, calyx green, corolla cream, 30 December 1980, *Madison & Besse 7498* (QCA, SEL); P.N. Podocarpus, about 6.5 km from the park entrance to the refuge Cajanuma, 2500 m, November 1998, *Matt 4* (ER); P.N. Podocarpus, about 6.5 km from the park entrance to the refuge Cajanuma, 2500 m, November 1998, *Matt 5* (ER); P.N. Podocarpus, about 6.5 km from the park entrance to the refuge Cajanuma, 2500 m, November 1998, *Matt 6* (ER); Beside the road from Loja to Zamora, still on the eastern slope of the cordillera, 2 km before the former rubbish dump of Loja, 2550 m, January 1998, *Matt 7* (ER); Beside the road from Loja to Zamora, still on the eastern slope of the cordillera, 2 km before the former rubbish dump of Loja, 2550 m, January 1998, *Matt 8* (ER); Beside the road from Loja to Zamora, still on the eastern slope of the cordillera, 2 km before the former rub-

bish dump of Loja, 2550 m, January 1998, *Matt 9* (ER); Beside the road from Loja to Zamora, still on the eastern slope of the cordillera, 2 km before the former rubbish dump of Loja, 2550 m, January 1998, *Matt 10* (ER); Beside the road from Loja to Zamora, still on the eastern slope of the cordillera, 2 km before the former rubbish dump of Loja, 2550 m, January 1998, *Matt 11* (ER); Amaluza, 5-10 km ENE of the village (Pasaje del Romerillo), montane forest with 4-10 m high trees along river, 2400-2700 m, tree 3 m high, 79°23'W, 04°34'S, 23 September 1976, *Øllgaard & Balslev 9740* (AAU, NY); Carretera Valladolid-Loja, km 4-21, 04°20'S, 79°15'W, 1900-2700 m, arbusto de 2 m, 18 February 1993, *Romoleroux et al. 1536* (QCA, QCNE); western slopes of Cordillera de Condor and northwest slopes of Nudo de Sabanillas, around Tambo Cachiyacu, along Río Cachiyacu, about 2 leagues southeast of Yangana, 2000-3000 m, shrub 1 m tall, corolla creamy-yellow, leaves dull above, paler dull green below, calyx dull green, 19 October 1943, *Steyermark 54812* (F). Morona-Santiago: Path Campamento San Miguel (on road in construction Sigsig-Gualaquiza)-Gualaquiza, shrub ca. 3 m high, corolla yellowish green, 9 April 1968, *Harling et al. 8115* (GB). Zamora-

Chinchipe: Quebrada Honda, cuesta carrizal, 2520 m, 26 September 1996, *Garmedia & Igual 1464* (QCNE); Parque Nacional Podocarpus (San Francisco entrance), trail leading west from San Francisco, 03°59'24"S, 079°05'48"W, 2100 m, common shrub in disturbed areas, corolla lemon yellow, 16 February 2001, *J.R. Grant & Struwe 01-4062* (LOJA, QCNE); Above Valladolid on rd to Yangana, montane rain forest, 2700 m, suberect shrub, corolla greenish-white, 2 February 1985, *Harling & Andersson 21462* (GB); Nudo de Sabanilla-Valladolid, horse trail to Caserío Quebrada Honda, montane rainforest, 2400-2600 m, ca. 2.0-2.5 m, corolla sulphur, slightly greenish, 12 February 1993, *Harling & Ståhl 26325* (GB, S); P.N. Podocarpus, road Yangana-Valladolid, km 26, montane forest along ravine, 04°29'S, 79°09'W, 2550 m, shrub 3 m high, flowers cream, 2 December 1988, *Madsen et al. 75753* (AAU, LOJA, QCA, QCNE); P.N. Podocarpus, road Yangana-Valladolid, just S of the pass (Nudo de Sabanilla), quebrada with wet montane forest, and low dense scrub on ridgetop, 04°27'S, 78°08'W, 2640-2770 m, 4 m tall, flowers yellowish green, 16 February 1989, *Øllgaard et al. 90616* (AAU, LOJA, QCA).

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