

Reldia longipedunculata (Gesneriaceae), a new species from the Mache-Chindul Mountains of Northwestern Ecuador and an updated checklist of *Reldia* for the Neotropics

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Abstract. A new species, *Reldia longipedunculata* (Gesneriaceae, tribe Beslerieae), is described from the Mache-Chindul Mountains near the border of the Bilsa Biological Research Station in northwestern Ecuador (province of Esmeraldas). The new species differs from all other species of *Reldia* by the presence of erect peduncles to 10 cm long and narrowly obovate leaves. An updated checklist and key are provided for the seven currently recognized species of *Reldia*. A previous infraspecific variety is recognized at the species rank as *Reldia veraguensis*. The presence of pedunculate inflorescences is discussed as a common character in five of the seven species of *Reldia*.

Key Words: Gesneriaceae, *Reldia*, taxonomy, Bilsa Biological Station, peduncles, Cordillera Mache Chindul.

Resumen. Se describe una nueva especie, *Reldia longipedunculata* (Gesneriaceae, tribo Beslerieae), de las montañas de Mache-Chindul en cercanías a la Estación de Investigación Biológica Bilsa, noroccidente de Ecuador (provincia de Esmeraldas). La nueva especie se diferencia de las otras especies de *Reldia* por la presencia de pedúnculos erectos de hasta 10 cm de largo y hojas estrechamente obovadas. Se presenta un listado de especies actualizado y una clave para la identificación de las siete especies actualmente reconocidas en *Reldia*. *Reldia veraguensis*, considerada previamente como variedad, se reconoce como especie. Se discute la presencia de inflorescencias pedunculadas como un carácter común en cinco de las siete especies de *Reldia*.

The flowering plant family Gesneriaceae is a member of the order Lamiales (APG III 2009) and is primarily pantropical with extensions into the subtropics and temperate regions (Weber, 2004; Weber et al., 2013). The family contains ca. 150 genera and ca. 3500 species (Weber, 2004; Weber et al., 2013). *Reldia* Wiehler is strongly supported as a member of the tribe Beslerieae (Smith, 2000; Zimmer et al., 2002; Roalson & Clark, 2005; Clark et al., 2010; Möller & Clark, 2013), but its sister clade is not strongly supported based on current molecular phylogenies of the Beslerieae.

Reldia is readily differentiated from most other genera of Gesneriaceae by the presence of alternate leaves. Most New World Members of the Gesneriaceae have opposite leaves or appear alternate when one of the paired leaves is highly reduced as found in many of the epiphytic species of *Columnea* L. and

Creemosperma Benth. The only other New World genera with alternate leaves are *Gesneria* (65+ spp.) and *Rhytidophyllum* (25+ spp.) in the tribe Gesnerieae, which is nearly endemic to the Caribbean with two species located in northern Venezuela and Colombia (Skog 1976). *Shuaria* D. A. Neill & J. L. Clark can also have alternate leaves, but its phyllo-taxy is noteworthy for having both alternate and opposite leaves on the same stems (Clark et al. 2010). The monograph of *Reldia* by Kvist and Skog (1989) described epedunculate inflorescences as a diagnostic character for *Reldia*. Recent fieldwork suggests that most species of *Reldia* have peduncles and their presence in the genus is evaluated and discussed based on recent observations and collections.

Wiehler (1977) described *Reldia* and at that time it was considered endemic to Panama with

only two species represented by five collections (Wiehler, 1977; Skog, 1979). The presence of *Reldia* in South and Central America is documented by more than a hundred recent collections (including 25 by the author from Panama, Colombia, Ecuador, and northern Peru). *Reldia* was monographed by Kvist and Skog (1989) and included five species, but *Reldia veraguensis* Wiehler was recognized at the infraspecific rank of variety (*R. minutiflora* var. *veraguensis* (Wiehler) L. P. Kvist & L. E. Skog). Recent research discussed below strongly supports that *Reldia veraguensis* and *Reldia minutiflora* (L. E. Skog) L. P. Kvist & L. E. Skog should be recognized as separate species. The discovery of *Reldia longipedunculata* and the recognition of *Reldia veraguensis* increase the total diversity in the genus to seven species (Table I).

***Reldia longipedunculata* J. L. Clark, sp. nov.**

Type: Ecuador. Esmeraldas: Cantón Quinindé, Reserva Ecológica Mache-Chindul, 35+ km W of Quinindé, trail from SW border of reserve to Don Bolivar's home (trail connecting the road towards Piedrita and the road towards Mono), 00°21'N, 79°44'W, 400–600 m, 21 Aug 2003 (fl), *J. L. Clark, R. Fleiss & F. Gurumendi* 8835 (holotype: US; isotypes: BRIT, CAS, E, F, K, MO, NY, QCA, QCNE, SEL). (Figs. 1, 2)

Differs from all other *Reldia* by the presence of elongate erect peduncles to 10 cm long and narrowly obovate leaf blades.

Terrestrial herb; stems unbranched and erect, to 35 cm tall, herbaceous, quadrangular, glabrescent below, sparsely pubescent above. *Leaves* alternate; petioles terete, 3–12 mm long, densely pubescent, blade papyraceous when dry, obovate to narrowly obovate, 9–13 × 3–4.5 cm,

base rounded, apex acute, margin serrate, adaxially light green, sparsely pilose, abaxially green, sparingly pilose (more so along secondary veins). *Inflorescence* erect, in the upper leaf axils, usually one per shoot (occasionally two), with 4–11 flowers in apical cluster or spread along forked inflorescence, each inflorescence with only one mature flower, peduncle pilose, each peduncle reaching 10 cm long and subtending two clustered apical cymes. *Flowers* with 5 equal calyx lobes, appearing free, 5–6 × 1.5–2.5 mm, lobes triangular, persistent in fruit; corolla tubular, throat tightly constricted, 5 × 1.5 mm; tube greenish-yellow with white lobes; densely pilose inside and glabrous outside; stamens 4, didynamous, included; staminode not observed; ovary superior, 0.2 × 0.2 mm, style 2–3 mm long, glabrous, stigma included and stomatomorphic. *Fruit* a bivalved globose capsule; seeds ca. 0.3 × 0.2 mm, elliptic.

Distribution and ecology.—*Reldia longipedunculata* is only known from a single population near the southwestern border of the Bilsa Biological Station in the Mache-Chindul mountain range of northwestern Ecuador (Esmeraldas province). It was initially collected in 1995 by Walter Palacios (*W. Palacios & J. L. Clark* 13628) and then again by the author in 1996 (*J. L. Clark et al.* 2992) and more recently in 2003 (*J. L. Clark et al.* 8835). The type locality is not accessible by road and each collection required extensive walking. It should be noted that the longitude and latitude coordinates for the *J. L. Clark* collections were estimated to minutes and the *W. Palacios* collection is recorded with minutes and seconds. All collections are from the same population, but different routes were explored to search for other populations. The specimen from 1995 was collected during a multi-day expedition that followed a temporary

TABLE I.
Checklist of currently accepted species of *Reldia* and their known distribution by country.

Species	Country
<i>Reldia alternifolia</i> Wiehler	Panama
<i>Reldia calcarata</i> L. P. Kvist & L. E. Skog	Ecuador
<i>Reldia grandiflora</i> L. P. Kvist & L. E. Skog	Colombia
<i>Reldia longipedunculata</i> J. L. Clark	Ecuador
<i>Reldia multiflora</i> L. P. Kvist & L. E. Skog	Ecuador
<i>Reldia minutiflora</i> (L. E. Skog) L. P. Kvist & L. E. Skog	Costa Rica, Panama, Colombia, Ecuador, Peru
<i>Reldia veraguensis</i> Wiehler	Panama, Colombia

logging road via Luz de America. The collection in 1996 was planned as a day-hike and ended up being a two-day excursion with an unplanned bivouac near the type locality. Numerous expeditions throughout the Mache-Chindul mountain range of northwestern Ecuador between 1994 and 1998 did not locate additional populations. The relative rarity of *Reldia longipedunculata* inspired the 2003 expedition that resulted in the type collection.

The population from the type locality had 30+ individuals and is located along a ridge in primary forest. The ridgelines of the Cordillera Mache-Chindul that exemplify the type locality receive extensive precipitation in the form of mist. Terrestrial herbs that grow with *Reldia longipedunculata* are usually restricted to wet habitats such as the sides of waterfalls or rivers. Sympatric species include *Gasteranthus crispus* (Mansf.) Wiehler and *Nomophyle dodsonii* (Wiehler) E. H. Roalson & Boggan. It is interesting to note that all three of these species share a similar fruit structure and seed dispersal mechanism that has been referred to as a splash-cup or rain-wash-fruit (Weber, 2004; Ertelt, 2013). This type of capsular fruit dehisces loculicidally on the dorsal surface and forms a boat- or bowl-shaped open structure (Fig. 2B, 3D) that faces upwards and parallel to the ground. The exposed seeds are relatively small and supposedly dispersed by the force of dripping water or rain.

Phenology.—Flowering in August, October, and November. Fruiting in August and November.

Etymology.—The specific epithet, *longipedunculata*, reflects the presence of erect and elongate peduncles that characterize this species.

Conservation and IUCN Red List category.—*Reldia longipedunculata* is known from one population in northwestern Ecuador and is located inside the Mache-Chindul Ecological Reserve (70,000 hectares), which is part of the National System of Protected Areas of Ecuador (SNAP). Significant forest continues to be cleared despite the area being formally protected. As a result, many of the remnant tracts of forest are highly fragmented. One of the most intact and actively studied areas inside the Mache-Chindul Ecological Reserve is the Bilsa Biological Station (Jatun Sacha Foundation). The type locality of *Reldia*

longipedunculata is near the border of the Bilsa Biological Station, but there are no known populations located within the boundaries. 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 habitat conservation, *Reldia longipedunculata* should be listed in the category CR (Critically Endangered).

Additional specimens examined: ECUADOR. Esmeraldas: Cantón Quinindé, two-day trek from Bilsa Biological Station towards Luz de America, 00°21'N, 79°44'W, 500 m, 2 Oct 1996 (fl), *J. L. Clark et al. 2992* (AAU, COL, E, MO, QCA, QCNE, SRP, US); The Mache-Chindul Ecological Reserve, Bilsa Biological Station, Mache Mountains, 35 km W of Quinindé, 5 km W of Santa Isabel, W of station to confluence of Río Aguacatal and Río Dogala, 00°21'N, 79°44'W, 500 m, 18 Nov 1996 (fl), *J. L. Clark et al. 3442* (AAU, COL, E, MO, QCNE, US); Esmeraldas Quinindé, Carretera vecinal Herrera-Los Monos, cabecera del Río Aguacatal, finca de Francisco Cantos, 00°19'30"N, 79°46'6"W, 550 m, 24 Feb 1995, *W. Palacios & J. L. Clark 13628* (MO, QCNE).

The inflorescences of *Reldia* are usually pedunculate with much reduced cymes (Figs. 1–3). The monograph of *Reldia* by Kvist and Skog (1989) discussed epedunculate inflorescences as one of the diagnostic characters that differentiated it from *Cremosperma* and *Gasteranthus*. Kvist and Skog (1989) discussed the inflorescence of *Reldia* as having primary and secondary pedicels, but lacking peduncles. Kvist and Skog (1989) stated that inflorescences with peduncles on the same plant with primary and secondary pedicels had never been observed. The images presented in Figs. 1–3 (esp. Fig. 3C, F) and the discussion below strongly support that peduncles are present regardless of the interpretation of primary or secondary pedicels. The number of specimens cited in the monograph by Kvist and Skog (1989) was less than 50 and many of the specimens did not have mature inflorescences. Recent herbarium research and field-based research has added more than 100 collections and access to these specimens provides a more adequate overview of inflorescence diversity in *Reldia*. In addition, recent fieldwork in Panama, Colombia, Ecuador, and Peru by the author has provided information that strongly supports the presence of peduncles in five of the seven species of *Reldia*. The only species of *Reldia* that are epedunculate are *R. alternifolia* Wiehler and *R. grandiflora* L. P. Kvist & L. E. Skog.

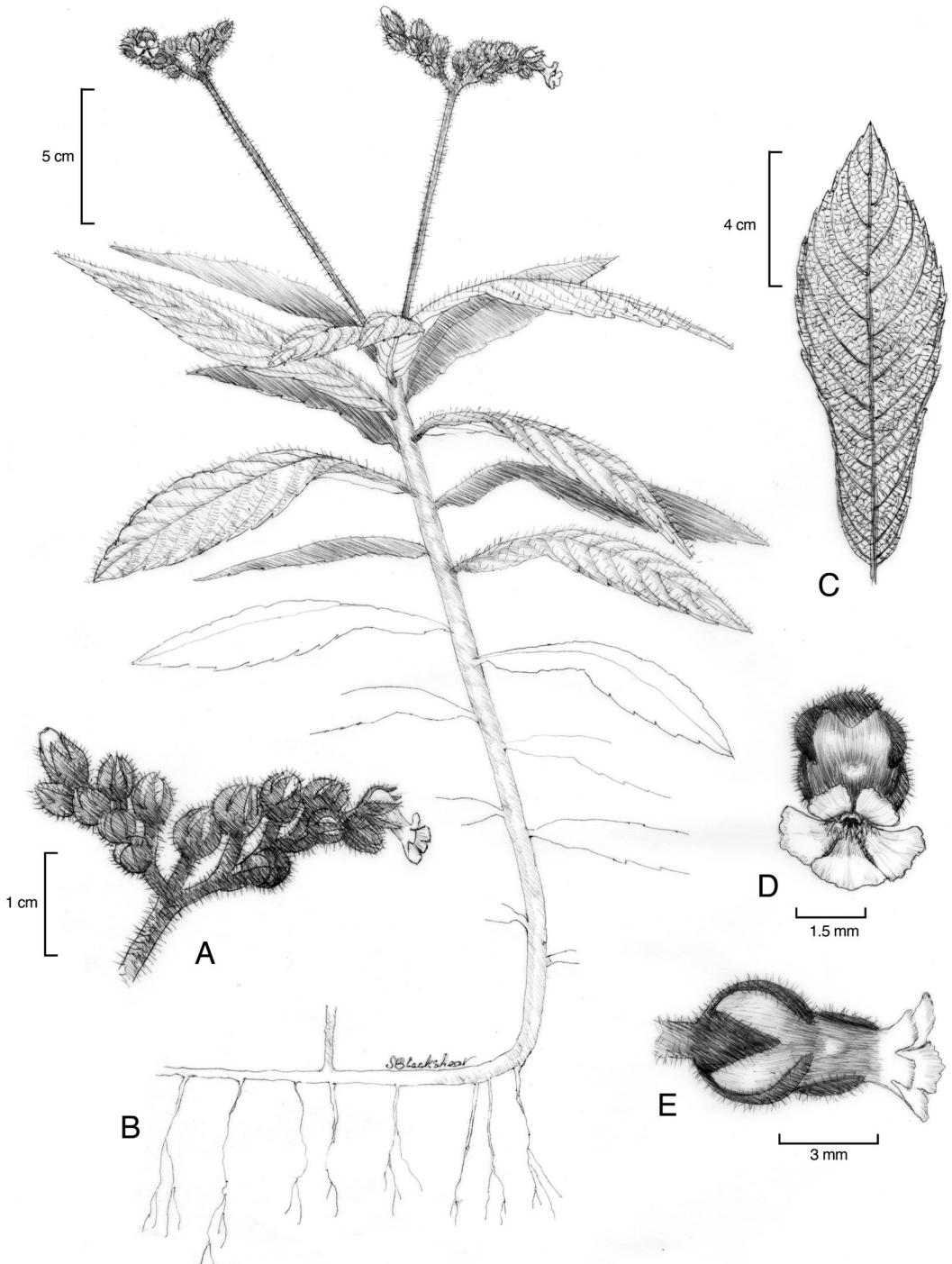


FIG. 1. *Reldia longipedunculata*. A. Forked inflorescence. B. Habit showing erect elongate peduncle. C. Abaxial surface of leaf. D. Front view of flower. E. Dorsal view of flower (Drawn from the type).

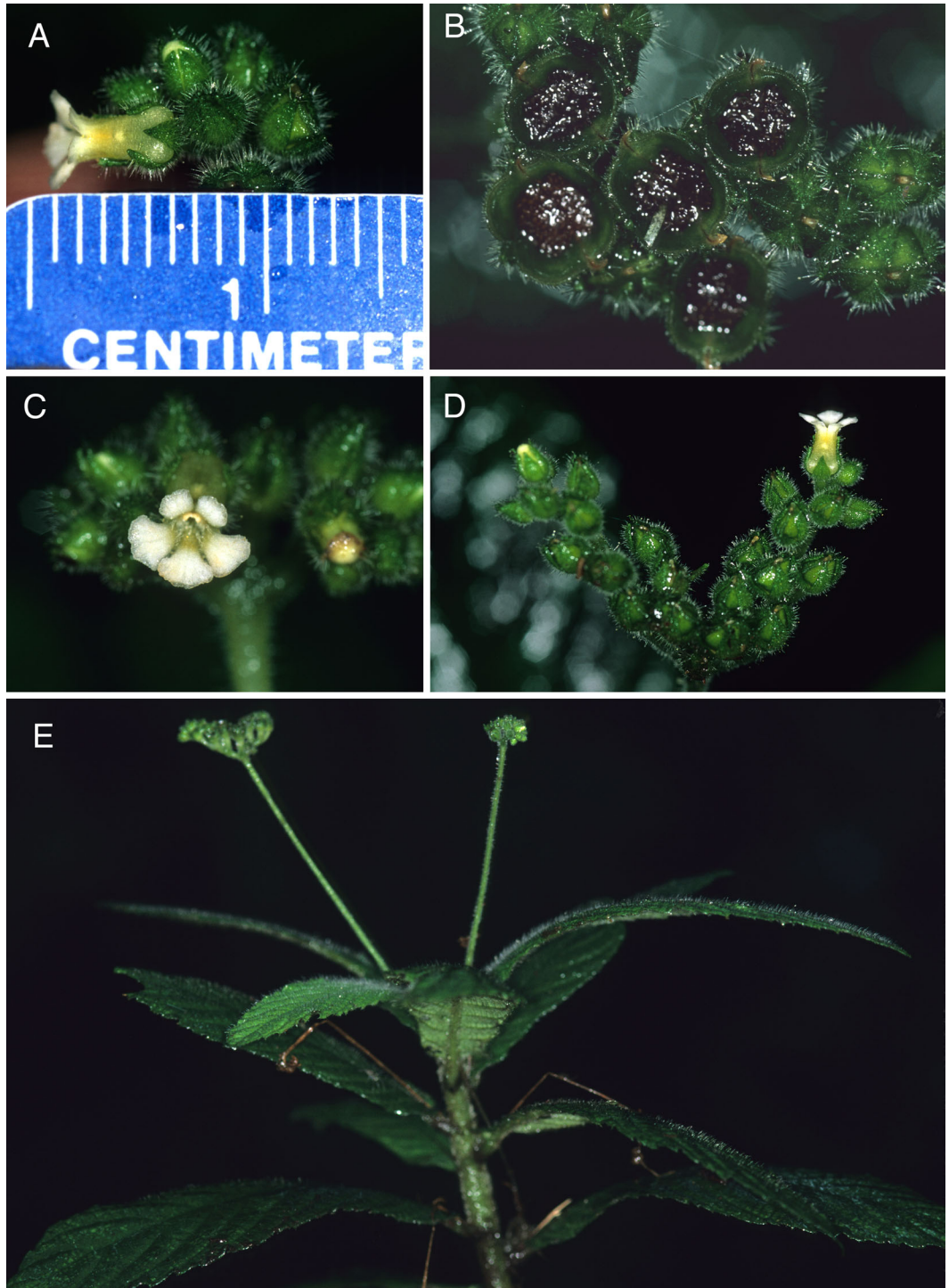


FIG. 2.. *Reldia longipedunculata*. A. Dorsal view of flower. B. Dorsal view of infructescence showing splash-cup or rain-wash-fruit. C. Front view of flower. D. Forked inflorescence. E. Habit. (From the type).

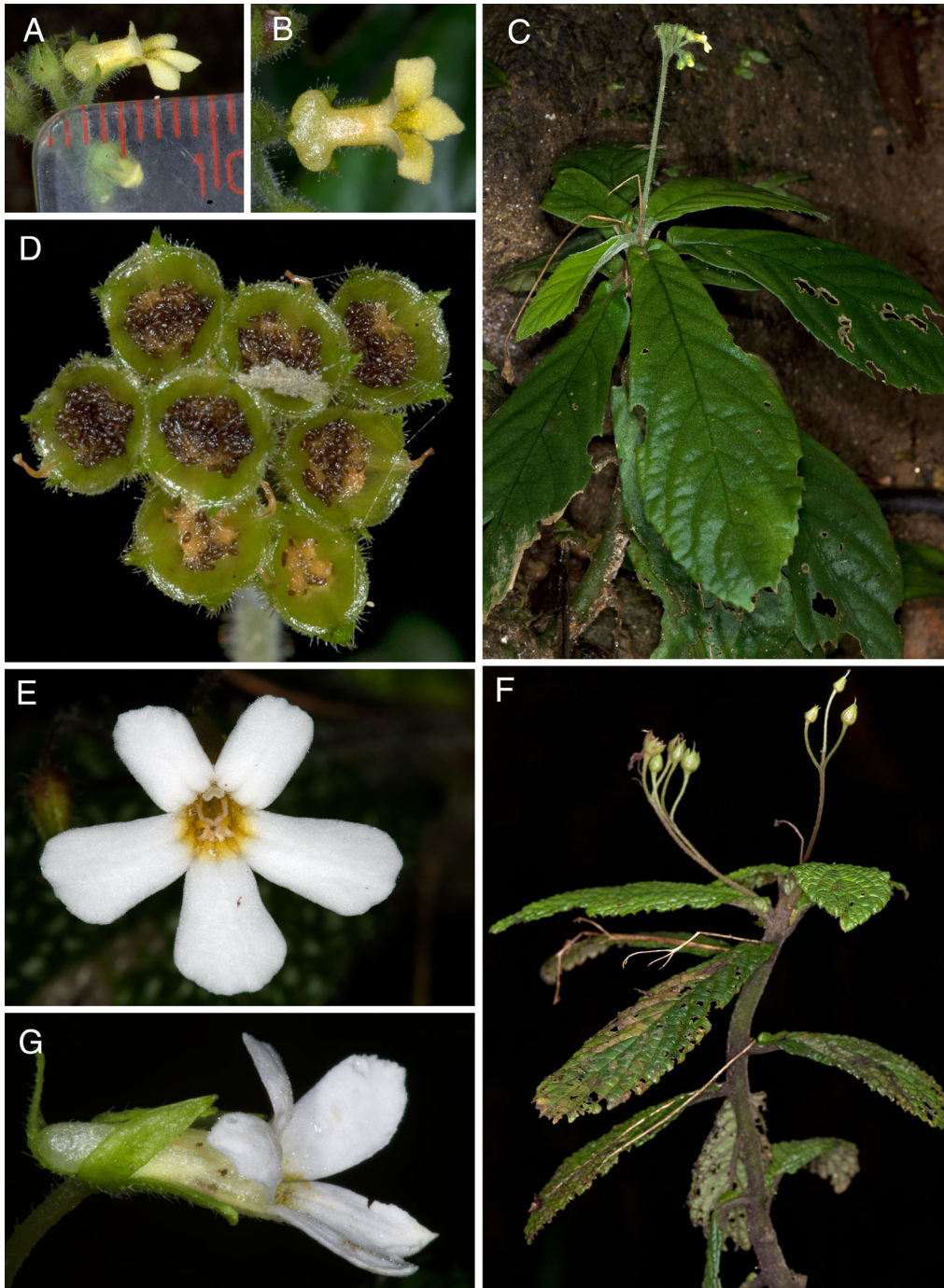


FIG. 3.. *Reldia veraguensis* (A–D) and *R. calcarata* (E–G). A. Lateral view of flower of *R. veraguensis* with scale (in mm) showing corolla length < 10 mm. B. Dorsal view of corolla tube of *R. veraguensis*. C. Habit showing basal rosette and peduncle of *R. veraguensis*. D. Dorsal view of infructescence of *R. veraguensis* showing splash-cup or rain-wash fruit. E. Front view of corolla of *R. calcarata*. F. Habit showing alternate leaves and evenly spaced (non-rosette) leaves of *R. calcarata*. G. Lateral view of flower of *R. calcarata*. (A–C from J. L. Clark et al. 12474; D from J. L. Clark et al. 12400; E, F from J. L. Clark et al. 9876; G from J. L. Clark et al. 12872).

Species rank of *Reldia veraguensis*

The monograph by Kvist and Skog (1989) included *Reldia veraguensis* as a variety of *Reldia minutiflora* (*Reldia minutiflora* var. *veraguensis*). Recent fieldwork and studies of herbarium material reveal numerous qualitative characters that support the recognition of *Reldia veraguensis* as a distinct species. Characters that support the recognition at the specific rank include differences in inflorescence architecture, pubescence, and flow-

er color. Both species contain inflorescences with peduncles, but they differ by the presence of a congested cyme with short pedicels in *R. veraguensis* (Fig. 3C) and spreading cyme with elongate pedicels in *R. minutiflora*. The stems and leaves of *Reldia minutiflora* are pubescent in contrast to the nearly glabrous stems and leaves of *R. veraguensis*. The flowers of *Reldia veraguensis* are yellow (Fig. 3A, B) and the flowers of *R. minutiflora* are white.

Updated checklist and key for currently recognized species of *Reldia*

An updated list of all currently recognized species of *Reldia* is provided in Table I. Geographic distribution by country is also provided.

1. Peduncles > 5 cm long, flowers appearing clustered at apex of peduncle (e.g., Figs. 1A, 2E, 3C).
 2. Leaves in a basal rosette on a short stem. *R. veraguensis*
 2. Leaves evenly distributed on an elongate stem *R. longipedunculata*
1. Peduncles < 5 cm long or absent, flowers appearing in axillary clusters or in several-flowered cymes (appearing racemose; Fig. 3F).
 3. Upper leaf surface smooth.
 4. Corolla tube 6–8 mm long; throat 1.5–3 mm wide; distributed in South America *R. multiflora*
 4. Corolla tube 13–19 mm long; throat 3.5–6 mm wide; distributed in Central America *R. alternifolia*
 3. Upper leaf surface rugose.
 5. Peduncles absent, inflorescence reduced to a single axillary flower. *R. grandiflora*
 5. Peduncles present, inflorescence appearing as a cluster of axillary flowers or racemose.
 6. Leaf blades obovate, 10–40 cm long. *R. calcarata*
 6. Leaf blades ovate, 15–20 cm long. *R. minutiflora*

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Literature cited

- APG (Angiosperm Phylogeny Group) III. 2009. An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG III. Botanical Journal of the Linnean Society 161: 105–121.
- Clark, J. L., D. A. Neill, J. A. Gruhn, A. Weber & T. Katan. 2010. *Shuaria* (Gesneriaceae), an arborescent new genus from the Cordillera del Cóndor and Amazonian Ecuador. Systematic Botany 35: 662–674.
- Ertelt, J. 2013. Observation on splash seed dispersal among neotropical Gesneriaceae. Selbyana 31: 234–239.
- IUCN. 2001. IUCN Red List Categories and Criteria, Version 3.1. Prepared by the IUCN Species Survival Commission. Gland, Switzerland and Cambridge: International Union for Conservation of Nature and Natural Resources.
- Kvist, L. P. & L. E. Skog. 1989. Revision of *Reldia* (Gesneriaceae). Nordic Journal of Botany 8: 601–611.
- Möller, M. & J. L. Clark. 2013. The state of molecular studies in the family Gesneriaceae. Selbyana 31: 95–125.
- Roalson, E. H. & J. L. Clark. 2005. Phylogenetic patterns of diversification in the Beslerieae (Gesneriaceae). Pp. 251–268. In: A.K. Sharma and A. Sharma (eds.), *Plant Genome: Biodiversity and Evolution, Phanerogams 1C*. Science Publishers, Inc., Enfield, New Hampshire.
- Skog, L. E. 1976. A study of the tribe Gesnerieae with a revision of *Gesneria* (Gesneriaceae: Gesnerioideae). Smithsonian Contributions to Botany 29: 1–182.

- . 1979. Flora of Panama. Part IX. Family 175. Gesneriaceae. *Annals of the Missouri Botanical Garden*. 65 [“1978”]: 783–996.
- Smith, J. F.** 2000. A phylogenetic analysis of tribes Beslerieae and Napeantheae (Gesneriaceae) and evolution of fruit types: parsimony and maximum likelihood analysis of *ndhF* sequences. *Systematic Botany* 25: 72–81.
- Weber, A.** 2004. Gesneriaceae. Pp. 63–158 In: Kubitzki, L. and J.W. Kadereit, (eds.), *The families and genera of vascular plants. Vol. 7. Flowering plants, dicotyledons: Lamiales (except Acanthaceae including Avicenniaceae)*. Springer-Verlag, Berlin & Heidelberg, Germany.
- Weber, A., J. L. Clark & M. Möller.** 2013. A new formal classification of Gesneriaceae. *Selbyana* 31: 68–94.
- Wiehler, H.** 1977. New genera and species of Gesneriaceae from the Neotropics. *Selbyana* 2: 67–132.
- Zimmer E. A., E. H. Roalson, L. E. Skog, J. K. Boggan & A. Idnurm.** 2002. Phylogenetic relationships in the Gesnerioideae (Gesneriaceae) based on nrDNA ITS and cpDNA *trnL-F* and *trnE-T* spacer region sequences. *American Journal of Botany* 89: 296–311.