

Novae Gesneriaceae Neotropicarum XI. New genera and species from the Guianas.

Brittonia 54: 344-351. ["2002"]

REFNO: 3256

KEYWORDS:

Cremersia, Episcieae, French Guiana, Guianas, Guyana, Lampadaria, Lembocarpus



THE NEW YORK BOTANICAL GARDEN



Springer

Novae Gesneriaceae Neotropicarum XI. New Genera and Species from the Guianas

Author(s): Christian Feuillet and Laurence E. Skog

Source: *Brittonia*, Vol. 54, No. 4 (Oct. - Dec., 2002), pp. 344-351

Published by: Springer on behalf of the New York Botanical Garden Press

Stable URL: <http://www.jstor.org/stable/3218509>

Accessed: 11/02/2010 18:02

Your use of the JSTOR archive indicates your acceptance of JSTOR's Terms and Conditions of Use, available at <http://www.jstor.org/page/info/about/policies/terms.jsp>. JSTOR's Terms and Conditions of Use provides, in part, that unless you have obtained prior permission, you may not download an entire issue of a journal or multiple copies of articles, and you may use content in the JSTOR archive only for your personal, non-commercial use.

Please contact the publisher regarding any further use of this work. Publisher contact information may be obtained at <http://www.jstor.org/action/showPublisher?publisherCode=springer>.

Each copy of any part of a JSTOR transmission must contain the same copyright notice that appears on the screen or printed page of such transmission.

JSTOR is a not-for-profit service that helps scholars, researchers, and students discover, use, and build upon a wide range of content in a trusted digital archive. We use information technology and tools to increase productivity and facilitate new forms of scholarship. For more information about JSTOR, please contact support@jstor.org.



New York Botanical Garden Press and Springer are collaborating with JSTOR to digitize, preserve and extend access to *Brittonia*.

<http://www.jstor.org>

Novae Gesneriaceae Neotropicarum XI. New genera and species from the Guianas

CHRISTIAN FEUILLET AND LAURENCE E. SKOG

Feuillet, C. & L. E. Skog. (Department of Systematic Biology-Botany, MRC-166, Smithsonian Institution, P.O. Box 37012, Washington, DC 20013-7012, U.S.A.; emails: bihorel@concentric.net; skog.larry@nmnh.si.edu). Novae Gesneriaceae Neotropicarum XI. New genera and species from the Guianas. *Brittonia* 54: 344–351. 2002.—Two new genera of Gesneriaceae are described, **Lampadaria** and **Cremersia**, each with one new species: **Lampadaria rupestris** from Guyana and **Cremersia platula** from French Guiana, both belonging to the tribe Episcieae. The placement of *Lembocarpus* in the Episcieae near **Cremersia** and *Rhoogeton* is proposed.

Key words: *Cremersia*, Episcieae, French Guiana, Gesneriaceae, Guyana, *Lampadaria*, *Lembocarpus*.

In the last twenty years, there has been an intensification of botanical collecting in the Guianas and in Venezuelan Guayana mainly for floristic projects. The new collections revealed several new species (Skog & Steyermark, 1991; Feuillet & Skog, 2003) and the two new genera described here.

Compared to other regions that are especially rich in species of Gesneriaceae such as Colombia, this area, combined with a narrow part of northern Brazil, has a surprisingly large number of endemic genera (Leeuwenberg, 1958, 1960). Already described from this region are *Lembocarpus* Leeuwenb. originally placed in the tribe Gloxinieae, *Rhoogeton* Leeuwenb. in the Episcieae, and *Tylopsacas* Leeuwenb. in the Beslerieae (for tribal delimitation, see Wiehler, 1983 and Burt & Wiehler, 1995). We describe here two new genera, *Lampadaria* and *Cremersia*, which we believe belong in the Episcieae.

New Genera

Lampadaria Feuillet & L. E. Skog, gen. nov.

TYPE: **Lampadaria rupestris** Feuillet & L. E. Skog, sp. nov.

Folia opposita; cymae bracteatae, longipedunculatae, brevipedicellatae; duae nectarii glandes: una dorsalis et una ventralis; ovarium superum; capsula succulenta.

Terrestrial, caulescent *herbs*, with short internodes. *Leaves* opposite decussate; venation pinnate; stomata scattered; petiolate. *Inflorescences* axillary, long-pedunculate, bracteate, short-pedicellate. *Flowers* with 5 sepals; corolla campanulate, 5-lobed; stamens 4, included, adnate to the corolla base, the thecae dehiscent by a longitudinal slit; nectary ring reduced to 2 large glands, one ventral and one dorsal; ovary superior. *Fruit* a somewhat fleshy capsule, bivalved, dehiscent loculicidally, opening fully.

Etymology.—The name of this new genus is a derivation of *lampadarius*, Latin for torchbearer, referring to the long peduncle holding the compact inflorescence above the foliage.

Affinities.—The genus *Lampadaria* can be separated from other related genera by the combination of the long-pedunculate and subcapitate inflorescences, the presence of bracts, and the nectary reduced to one dorsal and one ventral gland. The inflorescence of *Lampadaria* is reminiscent of *Re-*

sia H. E. Moore, a genus that had been placed in the non-bracteate tribe Beslerieae until specimens were found that had inflorescent bracts, more like the tribe Napeantheae (Skog & de Jesus, 1997). At the beginning of dehiscence, the laterally compressed fruits of *Lampadaria* resemble those of some species of *Gasteranthus* Benth. in the Beslerieae although they are much more flattened. *Lampadaria rupestris* has opposite leaves, bracteate inflorescences, a nectary reduced to two glands, a superior ovary, a somewhat fleshy capsule, and seeds with long funicles. To us these critical characters place *Lampadaria* in the tribe Episcieae, but with reservation, because there its affinities are somewhat unclear. The inflorescences look like a many-flowered *Rhoogeton* Leeuwenb., but the leaves, corolla, nectary, and fruit are different. The leaves and fruit are reminiscent of some species of *Nautilocalyx* Hanst. and a few *Paradrymonia* Hanst. The nectary reduced to two glands is found in some species of *Columnea* L. (Kvist & Skog, 1993) and *Corytoplectus* Oerst. (Wiehler, 1995). The corolla is unlike any other found in this tribe.

Molecular phylogenetic evidence (cp-DNA *trnL* intron and *trnL-F* intergenic spacer sequence data; Eric H. Roalson, unpubl. data) suggests that *Lampadaria* is definitely not a member of the Beslerieae, Gesnerieae, Gloxinieae, Sinningieae, or Napeantheae. Whether the genus is a member of the Episcieae, or a lineage outside of this tribe as currently circumscribed, is not yet clear.

Lampadaria rupestris Feuillet & L. E. Skog, sp. nov. (Fig. 1)

TYPE: GUYANA. Potaro-Siparuni Region: near North Fork River, 5°11'N, 59°09'W, 274–335 m, 22 May 1991 (fl, fr), T. McDowell 4872 (HOLOTYPE: BRG; ISOTYPES: K, NY, U, US).

Folia bullata, variegata; inflorescentia longipedunculata, subcapitata; sepala 3–5-dentata, dentibus glandulosis; corolla candida, ecalcarata, tubo campanulato, limbo dentato-fimbriato.

Low saxicolous herbs, rosette-like, with fibrous roots, hairy except on corolla lobes

and nectary. *Stem* sappy, ca. 3 cm long on type collection, decumbent, tomentose, unbranched, with adventitious roots. *Leaves* opposite, petiolate, equal to unequal in a pair; lamina ovate-elliptic, 5.5–8 × 2.4–6 cm, apex barely acute to blunt; base round to slightly cordate and sometimes asymmetrical; margin crenate; variegated; main veins 7–9 pairs; bullate; adaxial side pilose on mounds with appressed hairs pointing toward top of mound; abaxial surface minutely and loosely pilose on areolae and tomentose on veins; foliar nectaries lacking; petiole 3–7.5 cm long, clasping at base, tomentose. *Inflorescences* axillary, cymose, many-flowered; peduncle ca. 17 cm long, with loose small hairs; bracts elliptic, 6–8 × 2.1–2.4 mm, 3–5-toothed in distal third with glandular teeth at tip; loose small hairs present; pedicels 0.6 cm long, pilose; bracteoles elliptic, 4–5 × 2–2.2 mm long, with loose small hairs. *Sepals* free to base, oblique, subequal, elliptic, 4–6 × 2–2.2 mm, 3–5-toothed in distal third with glandular teeth at tip; apex acute; tomentose becoming pilose outside, having a few short hairs present inside; parallel veins 3; dorsal sepal slightly larger, more erect, lanceolate. *Corolla* erect, white or pale purple, with ventral yellow markings on throat, campanulate, the outside shortly tomentose in all parts exposed in bud, the inside glabrous; tube 2–3 mm long, 2 mm wide at base, not spurred, ca. 6–7 mm wide at throat; limb slightly zygomorphic; lobes subequal, spreading (ventral lobe less so), suborbicular, 2–3.5 mm long, the ventral and dorsal lobes dentate-fimbriate at margin, rounded at apex; stamens included, inserted on lower half of corolla tube; filaments free, short, glabrous; anthers not coherent, orbicular, dehiscing by longitudinal slits; staminode dorsal, 0.5 mm long, without anther; nectary consisting of a dorsal gland obtuse to obscurely 3-lobed and a ventral gland acute to apiculate, 1–1.2 mm tall, glabrous; ovary ovoid, 1 × 1.5 mm, densely covered with ascending hairs; style 3.5–4 mm long, curved in proximal 1/3 and at apex toward ventral lobe of corolla, glabrescent; stigma capitate, 1 × 0.7–0.8 mm, with long papillae (another ovary had a style 1 mm long and a patelliform stigma, 0.5 × 1.2 mm).

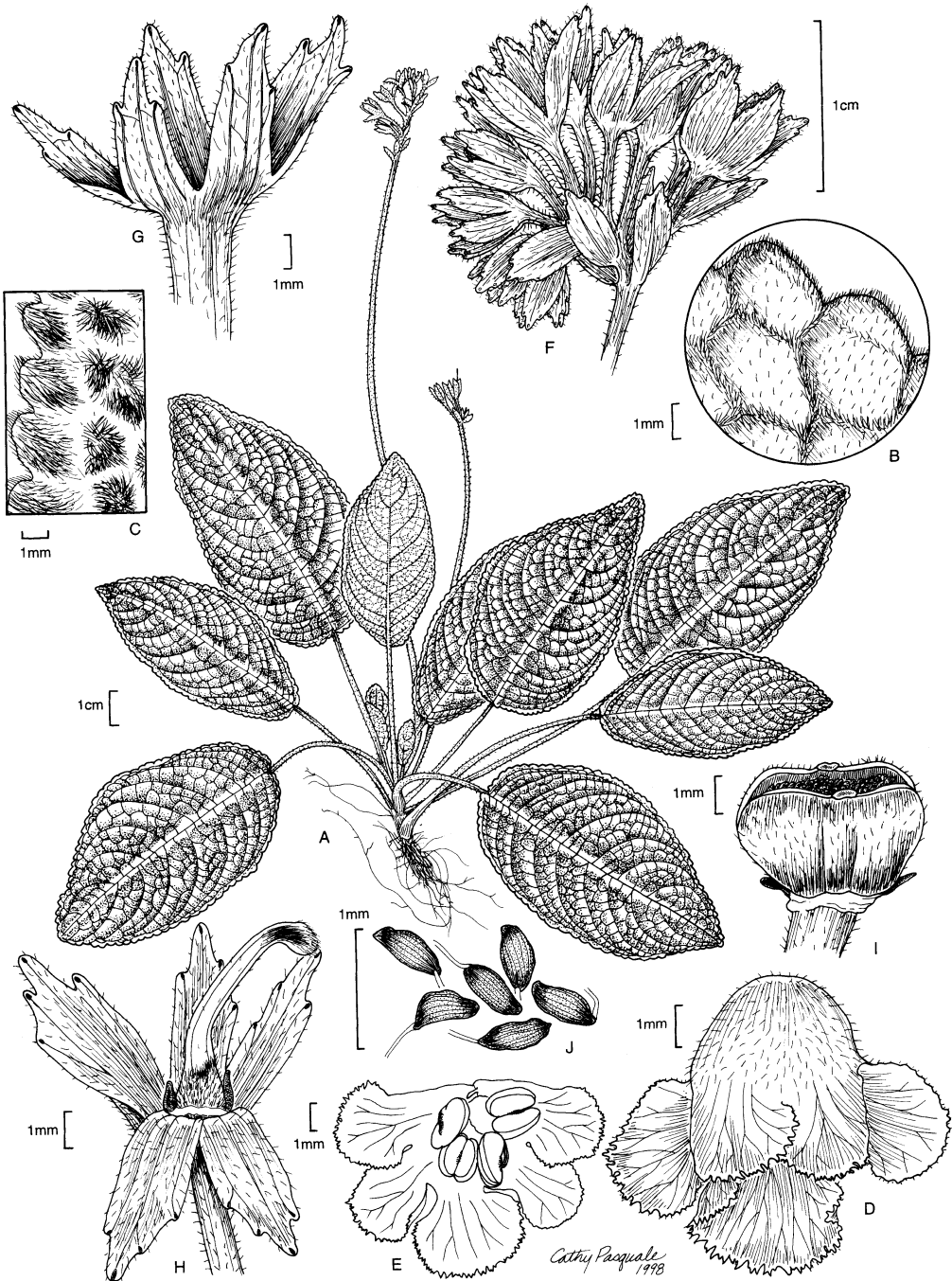


FIG. 1. *Lampadaria rupestris*. A. Whole plant. B. Detail of the leaf margin (abaxial view). C. Detail of the leaf margin (adaxial view). D. Corolla (adaxial view). E. Corolla (opened dorsally). F. Flower head. G. Calyx (side view). H. Calyx (with two sepals bent), nectary, and gynoecium. I. Capsule (calyx removed). J. Seeds. (From McDowell 4872; NY, US.)

Capsule surrounded by persistent sepals, valves $2.5\text{--}3 \times 4\text{--}5$ mm wide, wider in distal half, truncate at apex, laterally compressed, with short appressed hairs; seeds black, variable in shape, often elliptic, 0.75 mm long, striate longitudinally, with long funicles.

In the subfamily Gesnerioideae, the size of stamens and style can vary greatly during anthesis, so measurements taken from one collection reflect only the stage of maturity of the flower that was examined. Although coherent or adnate anthers are a prominent character in neotropical Gesneriaceae, free anthers are not uncommon among the species that have a rotate or slightly zygomorphic corolla without a spur (Wiehler, 1983). On herbarium specimens of the type collection, many seeds are detached in barely opened fruits. No seed has been seen on fully opened fruits. It is possible that the seeds are released well before completion of dehiscence.

Distribution and ecology.—The new species, *Lampadaria rupestris*, is known only from the north of the Potaro-Siparuni Region in Guyana. One collection was made about 10 km north of Mt. Wokomung at 650 m near a stream; the type collection about 5 km SE of Mt. Ebini, between 275 and 350 m in wet rainforest where the plants were growing on rocks. Flowering has been observed in May and June, and fruiting in May.

Etymology.—The specific epithet refers to the rocky habitat of the new species.

Additional specimens examined: GUYANA. Potaro-Siparuni Region: Upper Potaro R., 2 km S of camp, along stream, $5^{\circ}18'05''\text{N}$, $59^{\circ}54'40''\text{W}$, 650 m, 3 Jun 2001 (fl), H. D. Clarke 8897 (BRG, CAY, K, MO, NY, P, US).

Cremersia Feuillet & L. E. Skog, gen. nov.

TYPE: **Cremersia platula** Feuillet & L. E. Skog, sp. nov.

Folia opposita, decussata; inflorescentiae bracteatae; nectarium annulare glande singulari, dorsali praeditum; ovarium superum; capsula sicca, late dehiscens, usque ad 180° expansa.

Terrestrial, caulescent herbs. Leaves opposite decussate; venation pinnate; stomata scattered; petiolate. *Inflorescences* axillary,

pedunculate, bracteate. *Flowers* pedicellate; sepals 5; corolla salverform, 5-lobed; stamens 4, included, adnate to corolla base, the thecae dehiscing by longitudinal slits; nectary ring annular with a dorsal gland; ovary superior. *Fruit* a dry capsule, bivalved, dehiscing loculicidally, opening to 180° and thereby placing the 2 rowboat-shaped valves back-to-back; seeds with short, thick funicles.

Etymology.—This new genus is named for Georges Cremers, our friend and colleague, who has been a tireless collector of French Guianan plants since the late 1970s.

Affinities.—The genus *Cremersia* can be separated from other related genera by the combination of the fruit valves dehiscing to 180° and being rowboat-shaped, and the presence of obvious stems. The definite placement of *Cremersia* in one of the six tribes (Beslerieae, Episcieae, Gesnerieae, Gloxinieae, Sinningieae, and Napeantheae) of the subfamily Gesnerioideae is difficult because of the current circumscription of the tribes (Smith, 1997, 2000; Smith & Atkinson, 1998; Zimmer et al., 2002). Compared to *Cremersia*, species in the tribe Napeantheae have stomata grouped in islands and flowers without nectaries; the Beslerieae species lack bracts; and the Gesnerieae have inferior or semi-inferior ovaries and mostly alternate leaves on woody stems. The species in the tribe Sinningieae have semi-inferior ovaries and mostly grow from perennial tubers. The tribes Episcieae and Gloxinieae are richer in genera, but do not exactly encompass the combination of characters exhibited by *Cremersia* either.

The species of the Gloxinieae are characterized by an inferior or semi-inferior ovary, unlike *Cremersia* with its superior ovary. The tribe Episcieae is characterized by a fleshy capsule or a berry, and long, fleshy funicles, whereas *Cremersia* has a dry capsule and short, fleshy funicles. However, the new genus shares a superior ovary and a large dorsal nectariferous gland with other members of this tribe.

The genus *Cremersia* is probably best placed in the tribe Episcieae where it shares several characters with *Rhoogeton*, a small genus with two species from Guyana and eastern Venezuela. They are rupicolous, and

have a clearly long-pedunculate bracteate inflorescence, a capsular fruit opening to 180°, and seeds and placentae that are not coherent in a central cone as in many Episcieae, but which remain in the valves at dehiscence. Long-pedunculate inflorescences are uncommon in the Episcieae, limited to *Rhogeton* and *Paradrymonia* (e.g., *P. pedunculata* L. E. Skog). Molecular evidence (cpDNA *trnL-F* intergenic spacer sequence data) provided by Eric H. Roalson (pers. comm.) also suggests that *Cremersia* is part of the Episcieae and might be sister to a clade containing *Chrysothemis* Decne., *Nautilocalyx*, and *Paradrymonia*.

Cremersia patula Feuillet & L. E. Skog, sp. nov. (Fig. 2)

TYPE: FRENCH GUIANA. Mont Bakra, 52°57'W, 3°18'N, 500 m, 16 Apr 1993 (fl & fr), *G. Cremers 13126* (HOLOTYPE: US; ISOTYPES: B, CAY, NY, P, U).

Monopyli foliis et *Achimeni* corolla similis, sed ovario supero et nectarii glande dorsali differt; *Lembocarpus* fructo similis, sed caule praesenti differt. Bracteae bracteolis parviore; apex sepalorum glandulifer; stylus ad apicem curvatus.

Saxicolous *herbs*, erect, hairy, with fibrous roots. *Stem* thin, erect, terete, ca. 15 cm long, reddish violet, with short erect soft hairs; nectaries present at nodes; unbranched except possibly from base; adventitious roots lacking. *Leaves* opposite, petiolate, equal to unequal in a pair; lamina ovate-elliptic, 5–11 × 2.5–5 cm; apex acute to obscurely acuminate; base round to cordate and often unequal; margin serrulate to biserrulate; main veins 6–9 pairs; foliar nectaries lacking; adaxial surface with scattered hairs and slightly raised veins; abaxial surface with denser scattered hairs on slightly raised, much paler veins; petiole 1.5–7 cm long, clasping at base, with short dense erect soft hairs. *Inflorescences* axillary, sometimes adnate to base of petiole, raceme-like cymes with few flowers; peduncle ca. 7 cm long, with small narrow-triangular bracts 2–3 mm long; pedicels 1–1.5 cm long, with ovate bracteoles up to 5 mm long. *Sepals* free to base, narrowly elliptic, 7–8 × 2–2.2 mm, with 3 parallel veins; pilose on distal half; apex glandular;

dorsal sepal narrower and reflexed under corolla spur. *Corolla* pale purple, salverform, dorsally spurred, nearly transverse in calyx, pilose inside; spur curved toward pedicel, rounded, 5 × 3–3.5 mm, hairy inside; tube slightly “S”-shaped, 15–18 mm long, 2.5 mm wide above base, ca. 8.5 mm wide at throat; lobes subequal, suborbicular, ca. 7–8 mm long; staminal filaments inserted on lower third of corolla tube, the 2 ventral connate at base; anthers coherent in a tetrad, in a pair apically, between the pairs laterally, oblong, dehiscing by longitudinal slits; staminode dorsal, minute, lacking anther; nectary ring reduced to a dorsal gland 0.5–0.6 mm tall; ovary superior, conical and grooved when dry, 2–2.2 mm long, 1 mm wide at base, shortly pilose; style 4–4.3 mm long, curved at apex toward ventral lobe of corolla, glabrous; stigma capitate, 1 × 0.7–0.8 mm, tomentose. *Capsule* surrounded by sepals, the valves 5–6 × 2–2.5 mm; seeds brown, elliptic, 0.5 mm long, striate longitudinally, the funicle short and wide.

Modified stems (tubers or rhizomes) were not observed. In the Gesnerioideae, the size of stamens and style can vary greatly during anthesis, thus measurements taken from one collection reflect only the stage of maturity of the flower that was examined.

Distribution and ecology.—The new species, *Cremersia patula*, is known only from central French Guiana. The collections were made in a mid-elevation primary rainforest where the plants were growing on a talus of granitic boulders or a cliff. Flowering and fruiting have been observed in April and June.

Etymology.—The specific epithet comes from *platulus*, Latin for wide open, referring to the capsule valves that expand to 180°.

Additional specimen examined: FRENCH GUIANA. Mont Bakra, 52°57'W, 3°18'N, Jun 1993 (fl, fr), *J. J. de Granville 14868* (CAY).

The Tribal Placement of *Lembocarpus*

Lembocarpus Leeuwenb. has a superior ovary and an inflorescence and fruit similar to *Cremersia*. When he described the new genus *Lembocarpus*, Leeuwenberg (1958)

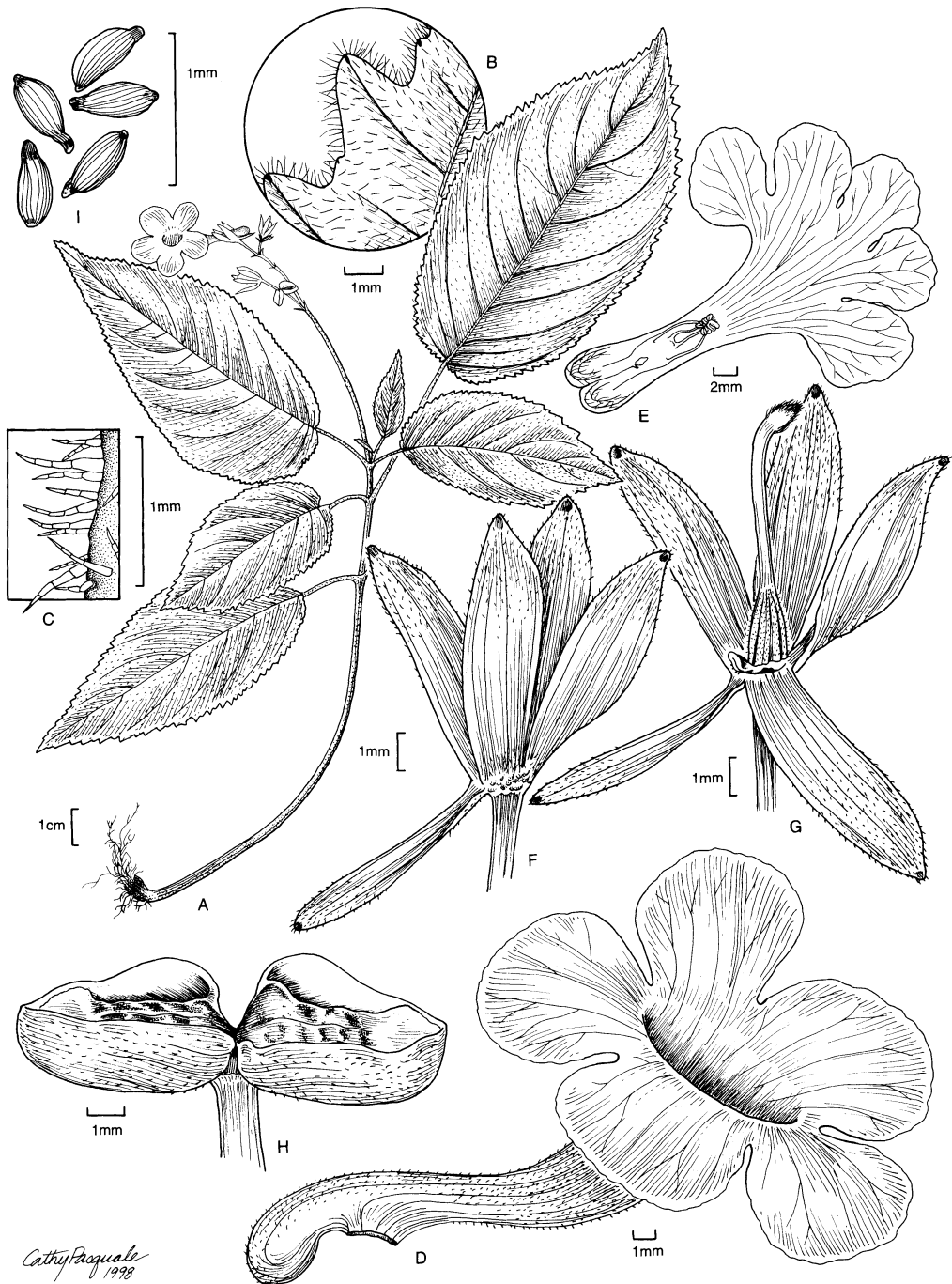


FIG. 2. *Cremersia platula*. A. Whole plant. B. Detail of the leaf margin. C. Trichomes. D. Corolla (side view). E. Corolla (opened dorsally). F. Calyx (side view). G. Calyx (with two sepals bent), nectary, and gynoecium. H. Capsule (calyx removed). I. Seeds. (From *Cremers 13126*; CAY, P. US.)

TABLE I
COMPARISON OF *Cremersia*, *Lembocarpus*, AND *Rhoogeton* WITH THE TRIBES SINNINGIEAE, GLOXINIEAE, AND EPISCIEAE. (CHARACTERS SHARED WITH *Cremersia* ARE IN BOLD TYPE.)

	Tr. Sinningieae	Tr. Gloxinieae	Lembocarpus	Cremersia	Rhoogeton	Tr. Episcieae
Tuber	Sinningia	lacking	present	not seen	present	<i>Chrysothemis</i> <i>Nautilocalyx</i>
Dorsal nectarial glands	1–2	part of a ring, 1–2 , or lacking	lacking	1	1	1(–2)
Ovary position	± inferior	± inferior	superior	superior	superior	superior
Capsule type	dry	dry or fleshy	not dry	dry	dry	fleshy
Capsule opening	various types, not 180°	various types, not 180°	180°	180°	180°	Various types, 180° included
Valves shape in 180°-open fruit	<i>not applicable</i>	<i>not applicable</i>	rowboat-shaped	rowboat-shaped	rowboat-shaped	Transvers. Flat, midrib straight or recurved
Presence in the Guianas	1/3 genera (2/70 sp.)	2/20 genera (3/230)	1/1 sp.	1/1 sp.	2/2 sp.	10/16 genera (40/650 sp.)

suggested its closest relative was another new genus from the Guianas, *Rhoogeton*, mostly on the basis of the presence of small tubers, acaulescent habit, inflorescence structure, and calyx venation. Wiehler (1983) placed *Rhoogeton* in the tribe Episcieae and, with reservation, *Lembocarpus* in the Gloxinieae (including Sinningieae). Wiehler argued that although the superior ovary was unusual in the Gloxinieae, the presence of a tuber placed it close to *Sinningia* Nees. Smith (2001) placed *Lembocarpus* in the tribe Gloxinieae (excluding Sinningieae). As noted by Boggan (1991), however, *Lembocarpus* does not belong in the Gloxinieae (including the Sinningieae). Following Boggan (1991), we argue that a superior ovary is actually unknown in the Gloxinieae and the Sinningieae and that tubers, if unknown in the Gloxinieae, are a prominent feature in most Sinningieae and are also present in the Episcieae in *Chrysothemis*, *Rhoogeton*, and some species of *Nautilocalyx*. Furthermore, Boggan showed that the tuber of *Lembocarpus* is an annual organ with a hairy epidermis and therefore quite different from the tubers known in *Sinningia*. The position of the ovary is an important tribal character (Wiehler, 1983) and thus *Lembocarpus* would be odd in the Sinningieae and even more so in the Gloxinieae. The type of fruit is considered an

important generic character in the Episcieae (Wiehler, 1973, 1983). *Lembocarpus* fruit type is shared only with *Cremersia* and *Rhoogeton*. We propose that *Lembocarpus* is best placed in the tribe Episcieae where it shares characters with *Rhoogeton*, i.e., small tubers, and with *Cremersia* and *Rhoogeton*, i.e., long-pedunculate inflorescences, fruit dehiscence, and valve shape (Table 1).

Acknowledgments

We thank the curators of the herbaria CAY, NY, P, and U for lending the material in their care. We are grateful to Cathy Pasquale-Johnson for the fine artwork and to the Walcott Fund for Botanical Illustration. Dr. Eric Roalson of Washington State University is gratefully acknowledged for his molecular analyses of the two new genera. We want to thank Drs. A. Chautems, A. J. M. Leeuwenberg, and J. F. Smith for helpful reviews. This paper is published as Studies on the Flora of the Guianas No. 96. It is No. 58 in the Smithsonian's Biological Diversity of the Guianas Program publication series.

Literature Cited

Boggan, J. K. 1991. A morphological study and cladistic analysis of *Sinningia* and associated genera

- with particular reference to *Lembocarpus*, *Lietzia*, *Paliavana*, and *Vanhouttea* (Gesneriaceae: Gloxinieae). MS thesis. Cornell University, Ithaca, New York.
- Burt, B. L. & H. Wiehler.** 1995. Classification of the family Gesneriaceae. *Gesneriana* 1: 1–4.
- Feuille, C. & L. E. Skog.** 2003. Novae Gesneriaceae Neotropicarum XII. New species of Gesneriaceae from the Guianas. *Brittonia* 54: 352–361.
- Kvist, L. P. & L. E. Skog.** 1993. The genus *Columnea* (Gesneriaceae) in Ecuador. *Allertonia* 6: 327–400.
- Leeuwenberg, A. J. M.** 1958. The Gesneriaceae of Guiana. *Acta Bot. Neerl.* 7: 291–444.
- . 1960. News and Notes. *Taxon* 9: 220–221.
- Skog, L. E. & F. F. de Jesus.** 1997. A review of *Resia* (Gesneriaceae). *BioLlania, Ed. Espec.* 6: 515–523.
- . & **J. A. Steyermark.** 1991. Novae Gesneriaceae Neotropicarum III. New species from Venezuela. *Novon* 1: 211–222.
- Smith, J. F.** 1997. Tribal relationship within Gesneriaceae: a cladistic analysis of morphological data. *Syst. Bot.* (1996) 21: 497–513.
- . 2000. A phylogenetic analysis of tribes Beslerieae and Napeantheae (Gesneriaceae) and evolution of fruit types: parsimony and maximum likelihood analyses of *ndhF* sequences. *Syst. Bot.* 25: 72–81.
- . 2001. The phylogenetic relationships of *Lembocarpus* and *Goyazia* (Gesneriaceae) based on *ndhF* sequences. *Ann. Missouri Bot. Gard.* 88: 135–143.
- . & **S. Atkinson.** 1998. Phylogenetic analysis of the tribes Gloxinieae and Gesnerieae (Gesneriaceae): data from *ndhF* sequences. *Selbyana* 19: 122–131.
- Wiehler, H.** 1973. One hundred transfers from *Alloplectus* and *Columnea* (Gesneriaceae). *Phytologia* 27: 309–329.
- . 1983. A synopsis of the neotropical Gesneriaceae. *Selbyana* 6: 1–219.
- . 1995. New species of Gesneriaceae from the Neotropics (II). *Gesneriana* 1: 29–97.
- 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. *Amer. J. Bot.* 89: 296–311.