

THREE NEW SPECIES AND TWO NEW RECORDS OF *GREIGIA* REGEL (BROMELIACEAE) FROM BOLIVIA

BETTINA WILL

Botanik/Paläobotanik, Forschungsinstitut Senckenberg and J.W. Goethe-Universität,
Senckenberganlage 25, D-60325 Frankfurt/Main, Germany.

THORSTEN KRÖMER*

Centro de Investigaciones Tropicales, Universidad Veracruzana,
Interior de la Ex-hacienda Lucas Martín, Privada de Araucarias s/n, Col. 21 de Marzo,
C.P. 91019 Xalapa, Veracruz, Mexico. Email: tkroemer@gmx.de

MICHAEL KESSLER

Systematic Botany, University of Zürich, Zollikerstrasse 107, CH-8008 Zürich, Switzerland.

DIRK N. KARGER

Institute of Plant Sciences, University of Göttingen, Untere Karspüle 2,
37073 Göttingen, Germany.

HARRY E. LUTHER

Mulford B. Foster Bromeliad Identification Center, Marie Selby Botanical Gardens,
811 South Palm Avenue, Sarasota, FL 34236, USA.

ABSTRACT. We describe three new endemic species of *Greigia* Regel (Bromeliaceae) from Bolivia: *Greigia acebeyi* B. Will, T. Krömer, M. Kessler, D. Karger and H. Luther, *Greigia marioae* B. Will, T. Krömer, M. Kessler, D. Karger and H. Luther, *Greigia membranacea* B. Will, T. Krömer, M. Kessler, D. Karger and H. Luther. *Greigia danielii* L.B. Smith and *G. stenolepis* L.B. Smith vel aff. are reported for the first time for Bolivia. A key to the eight Bolivian species of *Greigia* is provided.

Key words: Bolivia, Bromeliaceae, *Greigia*, new species

INTRODUCTION

The genus *Greigia* Regel comprises large, mostly terrestrial bromeliads occurring in disturbed vegetation along roadsides and trails as well as in the understory of upper montane forests from Mexico to the tropical Andes as well as in temperate rain forests of central and southern Chile (Will and Zizka 1999, Krömer 2000, Krömer et al. 2006). *Greigia* was first reported for Bolivia by Luther (1998a, 1998b) who described the three new species *G. atrocastanea*, *G. cochabambae*, and *G. kessleri* based on a limited number of herbarium collections. Subsequent collections, especially by T. Krömer and A. Acebey, have expanded the number of specimens available from Bolivia. These have been studied by B. Will in the scope of a revision of the genus. As a result of this work we here de-

scribe three further new species from Bolivia and list two species as first records for the country (Krömer et al. 1999). The number of *Greigia* species now known from Bolivia (eight) is striking considering that a decade ago this genus was unknown from this country. This reflects the reluctance of many botanists to collect these large and unspectacular plants as well as the lack of detailed studies on the genus until recently (e.g., Will and Zizka 1999). It is especially noteworthy that although some species are more widespread, all eight species have been recorded within an area of about 15 × 20 km in the Yungas of La Paz department. Such a high local species density is previously unreported in *Greigia*. We anticipate that additional species await discovery in Bolivia and elsewhere in the tropical Andes.

MATERIALS AND METHODS

Morphological studies of *Greigia* from Bolivia (19 herbarium collections, 29 specimens) and

* Corresponding author.

from Chile, Colombia, Costa Rica, Ecuador, Guatemala, Honduras, Mexico, Panama, Peru, and Venezuela (354 collections, 433 specimens) were undertaken by B. Will. In the descriptions, the following types of bracts were recognized: scape bracts (\pm spread out along the scape); outer primary bracts (outermost of the primary bracts); primary bracts (bracts directly encircling the flowers at the base of the flower head), and floral bracts (subtending individual flowers). The full length of the leaf sheath was measured from bottom up to the turning point from convex to concave.

KEY TO THE SPECIES OF *GREIGIA* IN BOLIVIA

- 1a. Leaf blades sparsely lepidote abaxially with very small, brown scales 0.11–0.17 mm 2
- 2a. All primary bracts entire or some bracts entire and some with few 0.1–0.5 mm long teeth 3
- 3a. Sepals 23–27 mm long; primary bracts completely dark brown, 51–55 mm long; leaf sheaths stramineous to light brown *G. atrocastanea*
- 3b. Sepals 13–17 mm long; primary bracts partially light brown or light castaneous with paler apex, 22–38 mm long; leaf sheaths distinctly castaneous proximally, paler distally *G. danielii*
- 2b. All primary bracts serrate or spinose at apex or up to upper half with 0.3–2.4 mm long spines 4
- 4a. Leaf sheaths reddish-castaneous, 2.5–3.5 cm long; primary bracts largely stramineous, castaneous towards base, 36–39 mm long; sepals 12–16 mm long. *G. marioae*
- 4b. Leaf sheaths stramineous, 10 cm long; primary bracts largely dark castaneous, apices stramineous or light brown, 63 mm long; floral bracts 27 mm long; sepals 19–20 mm long *G. acebeyi*
- 1b. Leaf blades \pm densely lepidote abaxially with 0.3–0.9 mm long \pm white to yellow scales 5
- 5a. Primary bracts wholly stramineous *G. cochabambae*
- 5b. Primary bracts largely castaneous 6
- 6a. Petals 17–23 mm long; sepals 15–20 mm long; primary bracts densely spinose in upper two thirds *G. kessleri*
- 6b. Petals 36–48 mm long; sepals 23–24 mm long; primary bracts entire or spinulose only distally 7
- 7a. Petals 41–48 mm long; leaf sheaths reddish brown; primary bracts 65–80 mm long, with membranous margins only at bases; most primary bracts entire, some finely spinulose apically, the spines 0.2–0.4 mm long *G. stenolepis* vel aff.
- 7b. Petals 36 mm long; leaf sheaths mostly stramineous or light brown; primary bracts 80–90 mm long, with distinct membranous margins up to lower half; all primary bracts spinulose or serrate distally, the spines 0.2–1.6 mm long *G. membranacea*

NEW SPECIES

Greigia acebeyi B. Will, T. Krömer, M. Kessler, D. Karger and H. Luther, sp. nov. TYPE: Bolivia—Dept. La Paz: Prov. Nor Yungas, Carretera La Paz—Caranavi, near Unduavi 14 km down towards Yolosa, 2800 m, 24 Nov 1998, T. Krömer and A. Acebey 181 (Holotype: GOET; Isotypes: LPB, SEL).

FIGURE 1.

Greigia squamis minutissimis (0.16 mm longis), *brunneis*, *sparsis* in pagina abaxiali laminarum praestans; vaginae foliorum usque 10 cm longae, stramineae; bractae primariae usque 63 mm longae, atrocastaneae, apice pallide brunneae vel stramineae, serratis vel spinosis, spinis 0.7–1.6 mm longis; bractae florales 27 mm longae; sepala 19–20 mm longa.

Plants terrestrial, caulescent, stems ca. 1 m long, covered by leaves. **Leaf sheaths** 10 \times 4.0 cm, \pm distinct, ovate; spinose in upper third with triangular, castaneous, 1.6–1.8 mm long spines; straw-colored (concolorous with the blades) ab- and adaxially, sparsely lepidote ab- and adaxially with dark brown, small, appressed scales; thin coriaceous, distinctly finely nerved abaxially, finely adaxially, without membranous margins. **Leaf blades** 95 \times 2.5 cm, linear-attenuate, ensiform, slightly narrowed toward base, tip of the apex attenuate, dark brown, with very short mucro, margin revolute; laxly spinose toward base with narrowly triangular, 0.5–1.8 mm long spines, centrally entire, serrulate toward apex with antrorse, 0.6–0.8 mm long spines; stramineous; sparsely lepidote with very small (0.16 mm), individual, \pm appressed, brown punctuate-lepidote abaxially, very sparsely lepidote with similar scales adaxially; thick papery, hardened and slightly vaulted toward base, finely nerved ab- and adaxially. **Scapes** visible (elongated, not hidden by bracts), flattened. **Scape bracts** not known. **Inflorescences** lateral, ca. 13 flowered, 6.5 (excluding petals) \times 7 cm, compound (with two-flowered branches). **Outer primary bracts** 6.3 \times 2.6 cm, exceeding the sepals when in fruit; base slightly spoon-shaped, ovate-acuminate, with distinct 25 mm long apex, extending into a firm, dark tip plus a fine mucro; serrate at apex with 0.7–1.6 mm long, slightly antrorsely curved, castaneous spines; apex light brown to stramineous, rest dark castaneous and lustrous abaxially, apex stramineous, the rest light golden brown and lustrous adaxially; lepi-

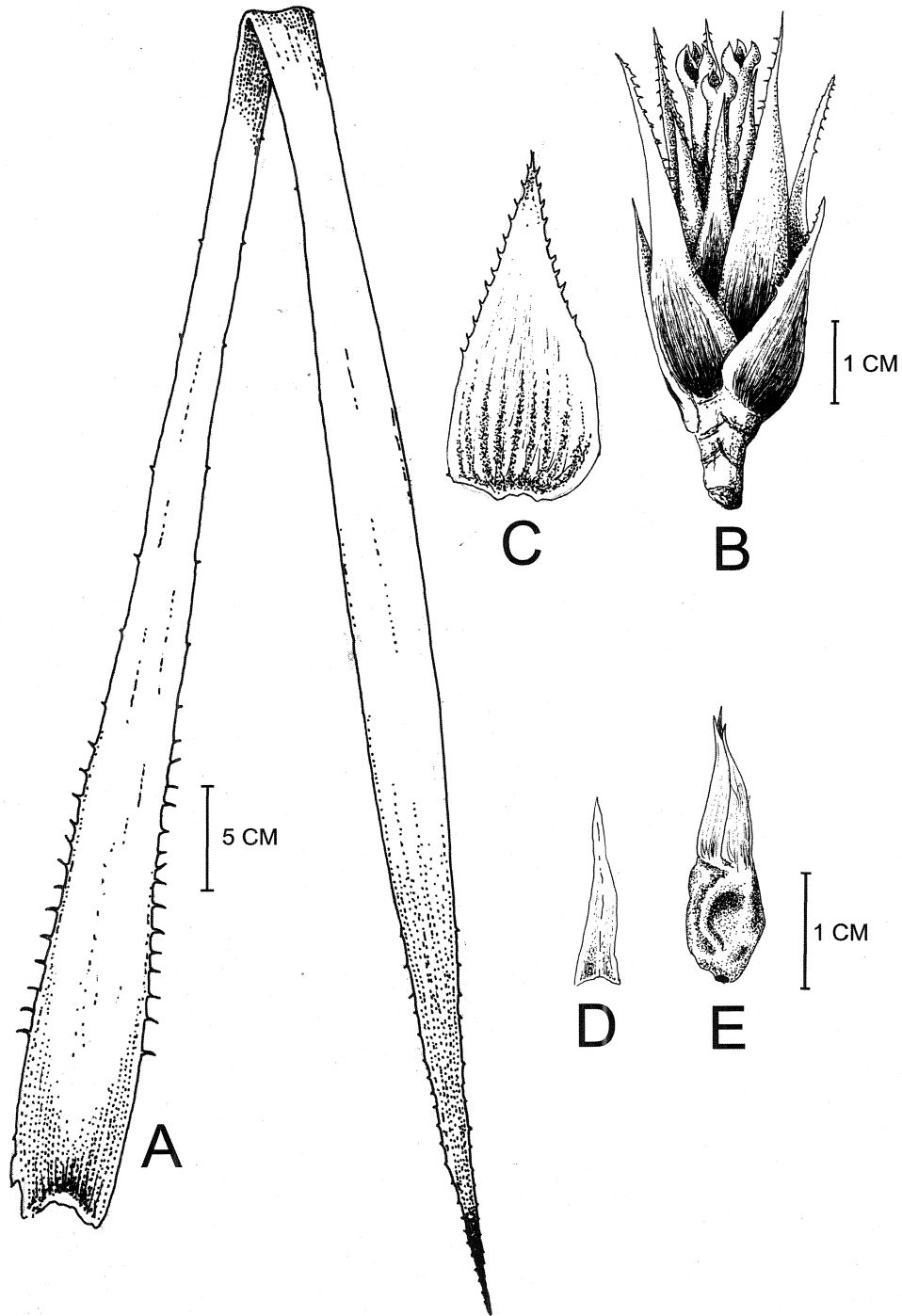


FIGURE 1. *Greigia acebeyi*: A. Leaf blade. B. Inflorescence. C. Primary bract. D. Floral bract. E. Fruit (drawing of T. Krömer & A. Acebey 181 by Dirk N. Karger).

dote with brown, appressed scales, densely and paler toward apex, glabrous at base abaxially, lepidote with brown fringed scales adaxially; thin crustaceous, (without membranous margin), ecarinate, distinctly nerved toward apex abaxially, not nerved adaxially. **Floral bracts** 27 × 10 mm, exceeded by the sepals when in fruit, lanceolate, acute, with apical, retrorsely curved mucro; entire; light castaneous with paler margin, slightly lustrous abaxially, light golden brown and lustrous adaxially; sparsely lepidote with brown, appressed, fringed scales abaxially; papery, distinctly wide carinate (when in fruit), with 1.3 mm wide membranous margin in lower two thirds, few fine nerves abaxially. **Flowers** purple. **Sepals** 19–20 × 7 mm, free, asymmetrical, entire; light golden brown, slightly lustrous ab- and adaxially (when in fruit base castaneous); sparsely brown, appressed lepidote becoming glabrous toward base abaxially, lepidote with similar scales adaxially; thin crustaceous (without membranous margin), distinctly carinate, inconspicuously to finely nerved ab- and adaxially. **Petals**, **Anthers** not known. **Epigynous tube** none. **Ovaries**, **Styles**, **Stigmata** not known. **Fruits** 18 × 9 mm (excluding persistent sepals), clavate-trigonous, dark castaneous. **Seeds** 2.0–2.2 × 1.1–1.2, ± almond-shaped, distinctly reddish.

Comments. This species and *G. marioae* are both characterized by very small (0.11–0.17 mm long), brown, sparse scales abaxially on the leaf surfaces and by all primary bracts being serrate or spinose apically with 0.3–2.4 mm long spines. They differ from each other by the coloration and length of the leaf sheaths (stramineous, 10 cm long in *G. acebeyi* vs. reddish-brown, 2.5–3.5 cm long in *G. marioae*), the coloration and length of the primary bracts (largely dark castaneous, apically straw-colored or light brown, 63 mm long vs. largely stramineous, only castaneous towards base, 36–39 mm long), and the length of the sepals (19–20 mm vs. 12–16 mm). *Greigia acebeyi* is known only from the type collection made at 2800 m on a steep road bank through humid cloud forest.

We name this species after Bolivian botanist and specialist on the aroids of Bolivia Amparo Acebey who, together with T. Krömer, has collected the holotype material of all three species described here.

Greigia marioae B. Will, T. Krömer, M. Kessler, D. Karger and H. Luther, sp. nov. TYPE: Bolivia—Dept. La Paz: Prov. Nor Yungas, Parque Nacional Cotapata, camino principal desde la Estación Biológica Tunquini hacia la mina, 16°11'S, 67°52'W, 2500 m, 21 May

2000, T. Krömer and A. Acebey 1164 (Holotype: GOET; Isotypes: LPB, SEL).

FIGURES 2, 4, 5.

Greigia squamis minutissimis (0.11–0.17 mm longis) brunneis in pagina abaxiali laminarum vaginisque foliorum fusco-brunneis praestans; bractee stramineae, basin castaneae, 36–39 mm longae, apicibus serratis vel spinosis, spinis bractearum primariorum 0.3–2.4 mm longis; sepala 12–16 mm longa.

Plants terrestrial, caulescent; stems 11 mm thick, **Leaf sheaths** 2.5–3.5 × 2.4–3.7 cm, distinct, widely ovate, clasping the stem, distinctly spoon-shaped; entire or spinose toward apex with flat, triangular, castaneous, 0.6–1.5 mm long spines; reddish-castaneous, stramineous at apex abaxially, centrally light castaneous, the base and apex stramineous adaxially; sparsely lepidote ab- and adaxially with small, individual, light brown, appressed scales; thin coriaceous, finely nerved ab- and adaxially. **Leaf blades** 45–75 × 1.3–1.7 cm, linear attenuate, only slightly narrowed toward base (± ensiform), tip of the apex attenuate into a thin, ± subulate-flattened, light brown tip (no mucro), margin revolute; spinose toward base with flat, narrow, triangular, castaneous, 0.6–3.4 mm long spines, elsewhere serrate with slightly antrorsely curved, dark tipped 0.4–1.4 mm long spines, becoming denser toward apex; stramineous to light brown ab- and adaxially; sparsely lepidote with very small (0.11–0.15 mm), light brown, appressed scales ab- and adaxially; papery, slightly hardened toward base, inconspicuously nerved ab- and adaxially. **Scapes** 1.3–2.6 cm long, visible (elongated, not hidden by bracts), flattened; castaneous, lustrous. **Scape bracts** 1.1–1.5 × 0.6–1.0 cm, widely triangular-ovate, cucullate, without distinction between base and blade, without a mucro, entire; castaneous ± lower ½, rest straw or light castaneous, dull or slightly lustrous ab- and adaxially; sparsely lepidote with light brown, appressed scales toward base abaxially, thin crustaceous, without membranous margin, wide carinate, few distinct nerves abaxially, finely nerved adaxially. **Inflorescences** lateral, at least 2 per plant, ca. 11 to 15 flowered, 3.5–3.9 × 3–5 cm, compound (two-flowered branches). **Outer primary bracts** 3.6–3.9 × 1.6–1.7 cm, equalling the petals at anthesis, narrowly ovate-acuminate, some with distinct, 20 mm long apex, some without distinction of base and blade, extended into a thin tip (no mucro); upper third to half spinose with 0.3–2.4 mm long, triangular or irregularly curved, dark castaneous spines; castaneous toward base, rest straw abaxially, light castaneous toward base, rest straw adaxially, dull or slightly lustrous ab- and adaxially; very sparsely lepidote in ca. upper half

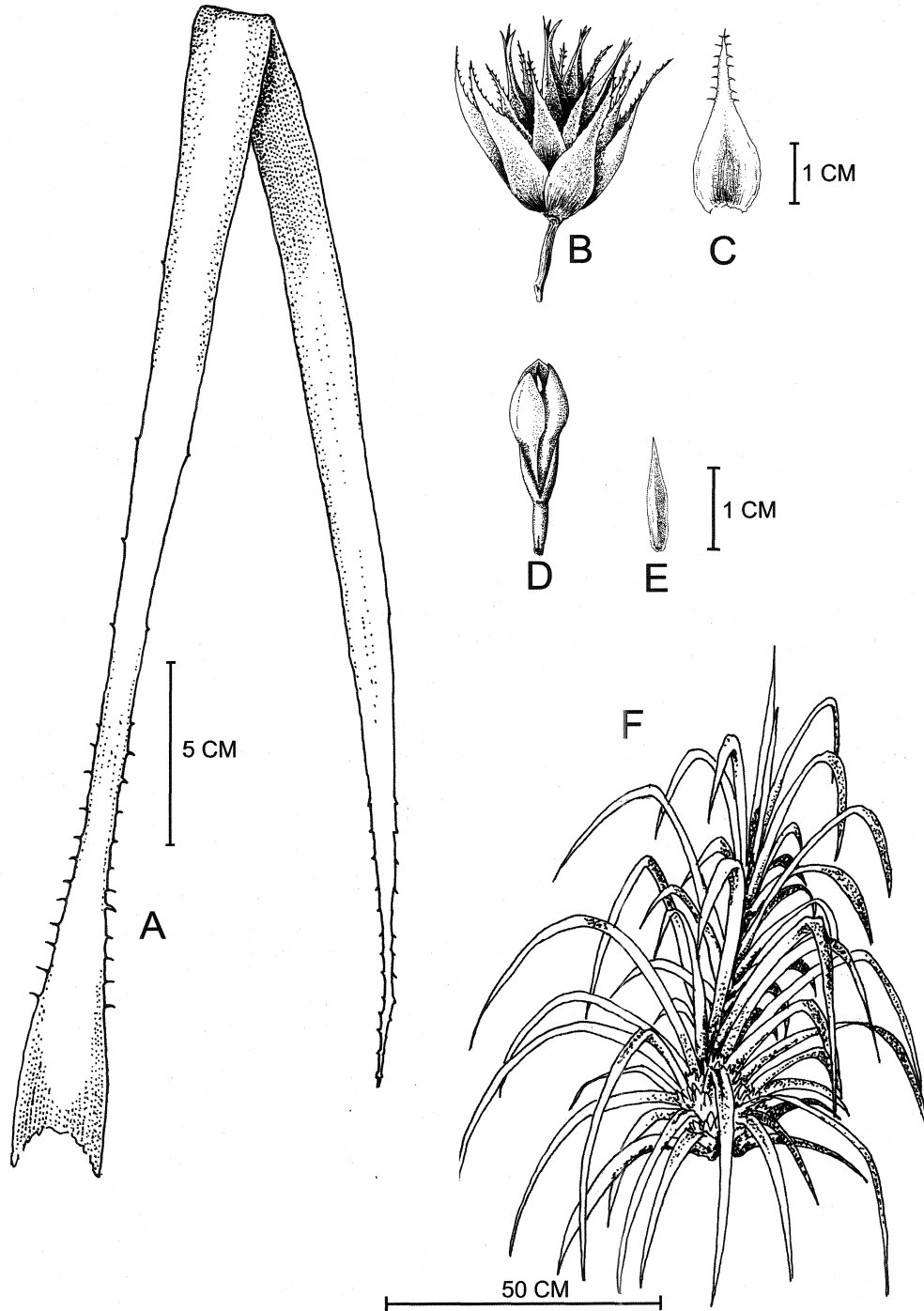


FIGURE 2. *Greigia maritima*: A. Leaf blade. B. Inflorescence. C. Primary bract. D. Flower. E. Floral bract. F. Habit (drawing of T. Krömer & A. Acebey 1164 by Dirk N. Karger).

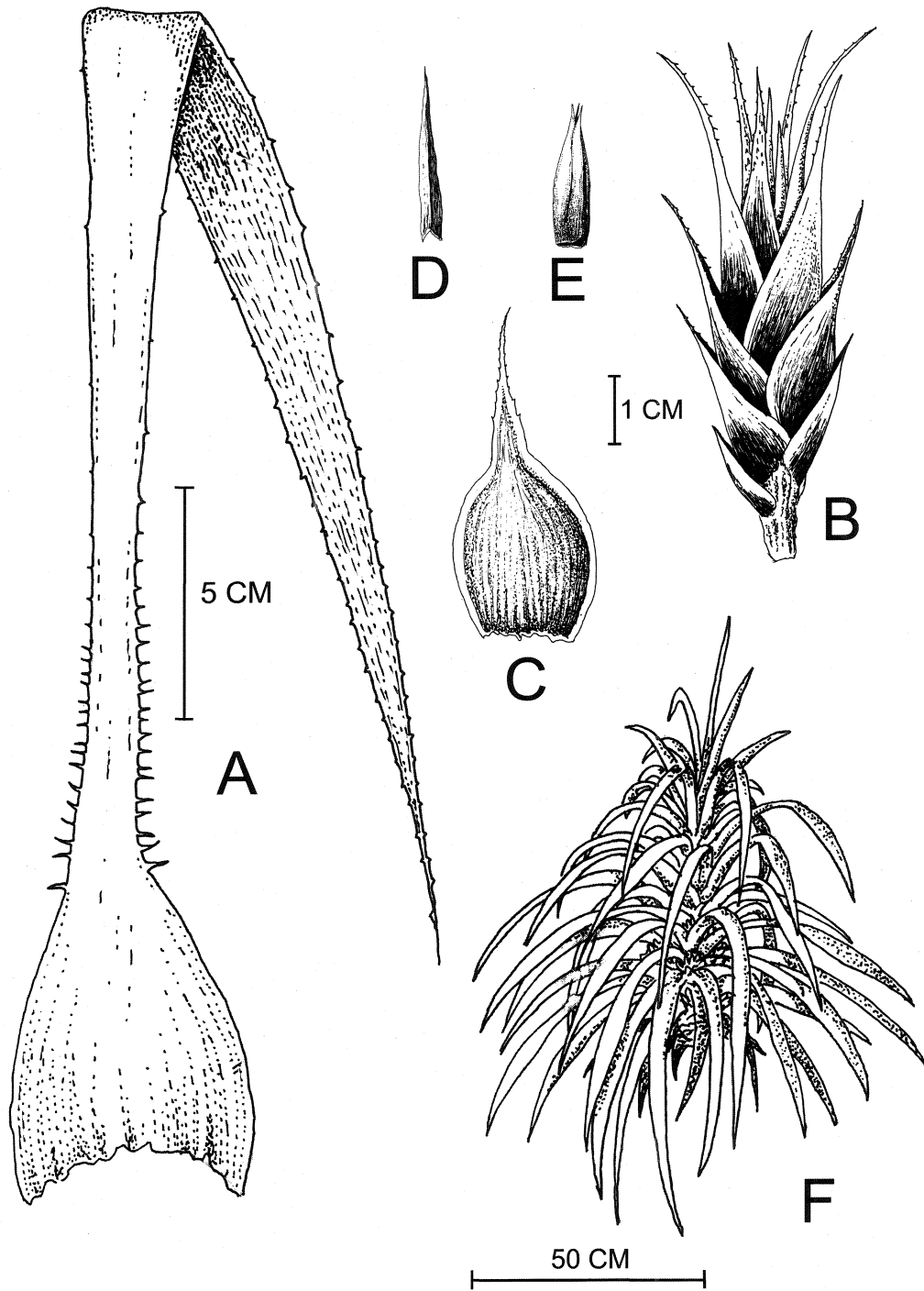


FIGURE 3. *Greigia membranacea*: A. Leaf blade. B. Inflorescence. C. Primary bract. D. Floral bract. E. Fruit. F. Habit (drawing of T. Krömer & A. Acebey 132 by Dirk N. Karger).



FIGURE 4.

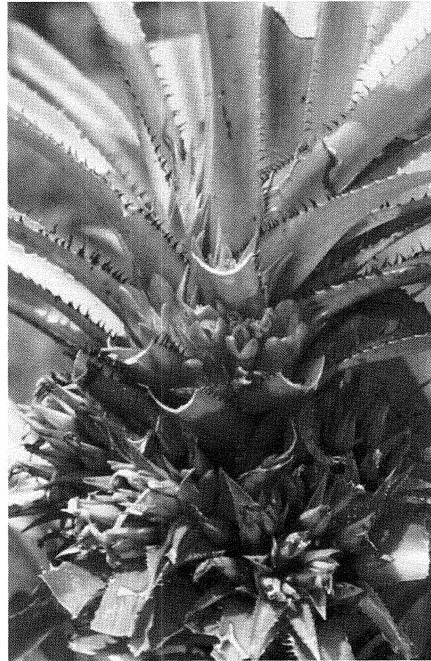


FIGURE 5.



FIGURE 6.



FIGURE 7.

FIGURES 4–7. FIGURE 4. Habit of *Greigia marioae*. FIGURE 5. Rosette with inflorescences of *Greigia marioae*. FIGURE 6. Rosette with inflorescences of *Greigia membranacea*. FIGURE 7. Habit of *Greigia membranacea* (all photos by T. Krömer).

with small, yellow, appressed scales abaxially, lepidote with small, light brown, short fringed, appressed scales adaxially; thin crustacious, some with 0.4–0.8 mm wide membranous margin toward base, ecarinate (outermost two finely carinate), very finely nerved abaxially, inconspicuously nerved adaxially. **Floral bracts** 15–29 × 5–10 mm, lanceolate-long acuminate, slightly ensiform, sometimes asymmetric, some with fine, castaneous apical mucro, entire or with few 0.1–0.16 mm long spines; toward base and keel castaneous abaxially, rest straw and slightly lustrous ab- and adaxially; sparsely lepidote with light brown, appressed scales abaxially; papery, distinctly narrow carinate lower third, with 0.4–0.8 mm wide membranous margin, inconspicuously nerved abaxially, not adaxially. **Flowers** sessile. **Sepals** 12–16 × 4–6 mm, free, triangular-ovate, mucro like floral bracts, entire; at base castaneous, rest straw, dull abaxially, similar but paler adaxially; very sparsely lepidote with small, yellow, short fringed scales ab- and adaxially; mostly papery, base thin crustacious (without membranous margin), carinate toward base only, finely nerved ab- and adaxially. **Petals** 19 mm long, lobes 11 × 5–7 mm. **Filaments** 56 × 1.1 mm. **Anthers** 2.8–3.4 × 0.6–1.0 mm, dorsifixed. **Epigynous tubes** none. **Ovaries** 6–10 × 4 mm, distinctly clavate, stramineous, trigonous. **Fruits** 14–16 × 6–7 mm (excluding persistent sepals), ellipsoidal-trigonous; dark castaneous, slightly lustrous. **Seeds** 1.6–1.9 × 0.8–1.2 mm, ± almond-shaped, distinctly reddish-brown.

Paratype. Bolivia—Dept. La Paz, Prov. Nor Yungas, Parque Nacional Cotapata, camino principal hacia la mina, 16°11'S, 67°53'W, 2700 m, 21 Nov 2000, *T. Krömer and A. Acebey 1749* (LPB, GOET, SEL).

Comments. This species is closest to *G. acebeyi*. Their differentiation is discussed under the latter species. The paratype of *G. marioae* differs from the type collection in some important features: leaf sheath entire vs. spinose toward apices, primary bracts lacking membranous margin and lacking distinction of blade and apex vs. membranous margin toward base and distinct 20 mm long apex, floral bracts 20–29 × 6–10 mm vs. 15 × 5 mm. However, the remaining similarities especially the small leaf blade scales served as a basis for the decision to group these specimens together with *G. marioae*. This preliminary decision will have to be re-evaluated as a larger number of specimens might become available in the future.

Greigia marioae is known from two collections made at 2500–2700 m in humid montane forest above Tunquini Biological Station in Co-

tapata National Park, about 15 km across a valley from the type locality of *G. acebeyi*.

We take pleasure in naming this species after Dr. Mario Baudoín, past director of the Ecology Institute of the Universidad de San Andrés in La Paz and of the Dirección Nacional Conservación de Biodiversidad (DNCEB), who was instrumental in the creation of Cotapata National Park and the Tunquini Biological Station.

Greigia membranacea B. Will, T. Krömer, M. Kessler, D. Karger and H. Luther, sp. nov.
TYPE: Bolivia—Dept. La Paz, Prov. Nor Yungas, Carretera La Paz-Caranavi, near Unduavi 3 km down towards Yolosa, 16°18'S, 67°53'W, 3100 m, 20 Oct 1998, *T. Krömer and A. Acebey 132* (Holotype GOET; Isotypes LPB, SEL).

FIGURES 3, 6, 7.

A Greigia stenolepe L.B. Smith *petalis brevioribus* (36 mm vs. 41–48 mm longis), *bracteis primariis longioribus* (80–90 mm vs. 65–80 mm longis) *cum marginibus membranaceis amplioribus spinisque* 0.2–1.6 mm (vs. 0.2–0.4 mm) longis, *vaginis stramineis vel pallide brunneis* (vs. *fusco-brunneis*) *differt*.

Plants terrestrial, caulescent, stems ca. 1 m long, covered by leaves. **Leaf sheaths** 11–14 × 4.8–6.5 cm, distinct, ± ovate; entire except sometimes with few triangular, dark tipped, 0.6–1.5 mm long spines toward apex; light brown, toward apex stramineous abaxially, mostly stramineous adaxially; densely lepidote with brown, short fringed appressed scales ab- and adaxially; thin coriaceous, distinctly nerved ab- and adaxially, (no membranous margin). **Leaf blades** 54–113 × 2.2–3.3 cm, linear-attenuate, distinctly ensiform, distinctly narrowed toward base; tip of the apex attenuate with castaneous, very short mucro; margin flat or revolute; spinose toward base with triangular, dark-tipped, 0.9–2.9 mm long spines, the rest laxly serrulate, becoming denser toward apex with antrorse, brown-tipped, 0.5–1.0 mm long spines; greenish-stramineous or brown, mostly with paler median stripe; lepidote to densely lepidote with whitish, 0.5–0.78 mm long, ± overlapping scales with thick cellwalls abaxially, glabrous adaxially; thick papery, slightly hardened toward base; finely nerved ab- and adaxially. **Scapes** 2.5–4 mm long, visible (elongated, not hidden by bracts), flattened. **Scape bracts** 3.2–3.8 × 1.4–1.9 cm, triangular or ovate, acute, slightly cucullate; without a mucro, entire; castaneous and slightly lustrous, margin and apex paler abaxially, light golden brown and slightly lustrous adaxially; sparsely lepidote to lepidote with yellow, appressed scales abaxially, sparsely lepidote toward apex only adaxially; thin crustacious, some with 1.5–2 mm wide membranous margin in lower

third, distinctly widely carinate, finely nerved ab- and adaxially. **Inflorescences** lateral, at least 2 per plant, 13-flowered, 8.5–10 × 5–6 cm, compound (6 branches with two flowers plus one terminal flower). **Primary bracts** 8.2–9.0 × 2.6–3.8 cm, (much) exceeding the sepals at anthesis; outermost primary bracts ovate-attenuate, the inner ovate-acuminate with slightly spoon-shaped base and distinct 33–45 mm long apex, extending into a firm, castaneous tip (some with a fine mucro); spinulose at apex with 0.28–1.6 mm long, ± triangular, straight, castaneous spines; apex stramineous (to light brown), the rest dark castaneous abaxially, similar but lighter adaxially; conspicuously, densely lepidote with yellow, appressed scales, at apex, becoming fewer proximally abaxially, similar but with fringed scales adaxially; thin coriaceous, toward base with 1.6–2.1 mm wide membranaceous margin, ecarinate, finely nerved toward apex abaxially, not nerved adaxially. **Floral bracts** 35–41 × 10–13 mm, exceeded by the sepals at anthesis, lanceolate, acute-acuminate; with castaneous mucro; entire or with few minute 0.1–0.2 mm spines at apex; apex darker than base ab- and adaxially (color varies); sparsely lepidote with yellow, appressed scales toward apex abaxially; papery to thin crustaceous, distinctly narrow carinate, some with 1.4–2.0 mm wide membranaceous margin in lower ½, finely nerved abaxially. **Flowers** 55–58 × 7–9 mm, sessile, purple. **Sepals** 23–24 × 4–6 mm, free, lanceolate, acute, entire; mostly straw, toward apex light brown ab- and adaxially; lepidote with light brown, appressed scales abaxially, with fringed scales adaxially; papery to thin crustaceous, some with 0.9 mm membranaceous margin toward base, slightly narrow carinate, inconspicuously nerved ab- and adaxially. **Petals** 36–40 mm long, lobes 16 × 6–7 mm, ovate-acute, pink sparsely appressed lepidote abaxially, with fringed scales adaxially; tube 20–24 mm long, distinctly broadening upwards. **Filaments** 0.7–0.8 mm wide. **Anthers** 5.5 × 1.3–1.6 mm, exceeded by the petals at anthesis, dorsifixed; apex acute, base obtuse. **Epigynous tubes** none. **Ovary** 15 × 3–5 mm, tubular, light brown. **Styles** 32 × 0.3 mm. **Stigmata** 3.2–3.6 × 0.3–0.6 mm, the three stigmatic branches separately spiral. **Fruits** and **Seeds** not known.

Paratypes. Bolivia—Dept. La Paz, Prov. Nor Yungas, 1.1 km camino Chuspipata-Yolosa, 16°17'S, 67°48'W, 2750 m, 26 Sep 1999, *T. Krömer* and *A. Acebey* 885 (LPB, GOET, SEL); Dept. La Paz, Prov. Nor Yungas, Trocha al Valle de Coscapa, Parque Nacional Cotapata, 3250 m, 11 Sep 1997, *M. Kessler*, *J. Gonzales*, *K. Bach* and *A. Portugal* 11840 (LPB, GOET, SEL).

Comments. This new species, named for its conspicuous membranaceous primary bract margins, differs from *G. stenolepis* by its shorter petals (36 mm vs. 41–48 mm long), longer primary bracts (80–90 mm vs. 65–80 mm long) with more extensive membranaceous margins and 0.2–1.6 mm long spines on all primary bracts (vs. primary bracts entire to finely spinulose apically with spines 0.2–0.4 mm long), and straw-colored to light brown (vs. reddish brown) leaf sheaths. *Greigia membranacea* has been collected at 2750–3250 m in humid cloud forest and on steep roadsides near the type locality.

NEW RECORDS FOR BOLIVIA

Greigia danielii L.B.Smith

A single, sterile collection from Bolivia (Dept. La Paz, Prov. Nor Yungas, 10 km de Chuspipata a Coroico, 16°24'S, 67°47'W, 2500 m, 20 Sep 1997, *M. Kessler* 12135, LPB, GOET, SEL) is assigned to this species, otherwise only known from Colombia (Smith and Downs 1979), because of the similarity of leaf and scale characters. However, the Bolivian collection differs from Colombian specimens by its shorter leaf sheaths (2.8 cm vs. 4.9–8.5 cm long), and somewhat sparser and darker sheath and leaf surface scales, and fertile material is needed to corroborate the identification. Typically, *G. danielii* is characterized by sparsely lepidote leaves with very small scales, 22–38 mm long, mostly entire (some with few minute spines) primary bracts with pale apices, 13–17 mm long sepals, and leaf sheaths castaneous in lower half.

Greigia stenolepis L.B.Smith *vel aff.*

This species, previously only reported from Colombia (Smith and Downs 1979) but now also known from Ecuador, is taxonomically one of the most difficult in the genus, showing considerable variation. The current state of research portrays it as a species group possibly comprising several taxa. In Bolivia, this species is known from a single, fertile collection (Bolivia—Dept. La Paz, Prov. Nor Yungas, cerca de Cotapata, 16°17'S, 67°53'W, 3450 m, 09 Oct 1997, *S.G. Beck* 24400, LPB, GOET) characterized by densely lepidote leaf blades with thickened scales; reddish brown leaf sheaths; largely castaneous, 65–80 mm long, apically entire to finely spinulose primary bracts with distinct membranaceous margins; and 41–48 mm long petals. These characters do not necessarily occur in other populations of *G. stenolepis* in the same combination.

ACKNOWLEDGEMENTS

We thank Prof. Dr. Georg Zizka for his support, Amparo Acebey, Kerstin Bach, Jasivia Gonzales, and Ana Portugal for fieldwork assistance, Marcus Lehnert for translating the Latin diagnoses, Vladimir Rivera Jiménez for preparing the photo plate, and the directors and curators of the following herbaria: B, BM, BR, CAS, COL, CONC, CR, DS, F, GB, GFW, GH, HBG, HEID, HUA, K, L, LPB, M, MO, NY, RSA, S, SEL, SGO, U, UC, US, VEN, and WU (acronyms after Holmgren et al. 1990) for the loan of specimens under their care.

LITERATURE CITED

- Holmgren, P.K., N.H. Holmgren, and L.C. Barnett. 1990. Index Herbariorum. Part I: The Herbaria of the World. New York Botanic Garden, Bronx.
- Krömer, T. 2000. Distribution of terrestrial bromeliads along the La Paz to Caranavi road in Bolivia. *Journal of the Bromeliad Society* 50: 158–164.
- Krömer, T., M. Kessler, B.K. Holst, H.E. Luther, E.J. Gouda, P.L. Ibisch, W. Till, and R. Vásquez. 1999. Checklist of Bolivian Bromeliaceae with notes on species distribution and levels of endemism. *Selbyana* 20: 201–223.
- Krömer, T., M. Kessler, and S.K. Herzog. 2006. Distribution and flowering ecology of bromeliads along two climatically contrasting elevational transects in the Bolivian Andes. *Biotropica* 38: 183–195.
- Luther, H.E. 1998a. Miscellaneous new taxa of Bromeliaceae (XII). *Selbyana* 19: 83–90.
- . 1998b. Miscellaneous new taxa of Bromeliaceae (XIII). *Selbyana* 19: 218–226.
- Smith, L.B. and R.J. Downs. 1979. Bromelioideae (Bromeliaceae) *In* *Flora Neotropica*, Monograph 14, part 3.
- Will, B. and G. Zizka. 1999. A review of the genus *Greigia* Regel (Bromeliaceae) in Chile. *Harvard Papers in Botany* 4: 225–240.