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Additions to the genus *Barleria* in Madagascar

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Summary. Three new species of *Barleria* L. (Acanthaceae) are described from the Antsiranana region of northern Madagascar: *B. speciosa* I. Darbysh., *B. glandulostamina* I. Darbysh. and *B. microcalyx* I. Darbysh. Two subspecies are recognised in the second of these, subsp. *glandulostamina* and subsp. *pseudohumilis* I. Darbysh. The sectional placement and species affinities of each of the new species are discussed and the conservation status of each taxon is assessed: all are considered to be globally threatened.

Key Words. Acanthaceae, Antsiranana, conservation, IUCN Red List assessment, new species.

Introduction

The genus *Barleria* L. (Acanthaceae: Acanthoideae: Barlerieae *sensu* McDade *et al.* 2008) comprises 250 – 300 species. With the exception of a single Amphi-Atlantic species (*B. oenontheroides* Dum. Cours.), it is a palaeotropical genus and is most diverse in eastern and southern Africa, but with further centres of endemism in Madagascar and India (Balkwill & Balkwill 1997, 1998).

In the *Flore de Madagascar et des Comores* account of *Barleria*, Benoist (1967) recorded 27 species. Of these, all but two are endemic to the islands, the exceptions being *B. lupulina* Lindl. which also occurs on the Mascarenes and *B. prionitis* L. for which the Malagasy subsp. *angustissima* (Hochr.) Benoist is nevertheless endemic. Many of these species were known to Benoist from few or even solitary collections. It is no surprise, therefore, that more recent botanical exploration across Madagascar has uncovered several additional undescribed species. A fully revised account of the genus on Madagascar is now desirable; the current paper takes a preparatory step towards this by describing three new species from northern Madagascar for which sufficient material is now available.

It is predicted that additional targeted fieldwork on Madagascar is likely to uncover further new species of *Barleria* as well as providing additional collections of known undescribed species for which we so far have incomplete material. It would also help to resolve some outstanding taxonomic issues within the genus on Madagascar and the Comores, particularly around the challenging *B. vincaefolia* Baker-*B. dulcis* Benoist-*B. comorensis* Benoist species complex.

Materials & Methods

This study is based upon the examination of herbarium specimens held at K, P, and TAN and, where available, photographs of living plants. Specimen duplicates consulted by the authors are marked with an "!". Prior to dissection, flowers were soaked in Aerosol OT 5% solution; other measurements were made on dry material.

Terminology in the description largely follows that applied to *Barleria* in Balkwill & Balkwill (1997). It is common in *Barleria* for the abaxial corolla lobe to split away from the tube considerably earlier than the lateral and adaxial lobes, the resultant limb being highly zygomorphic with a 1-lobed lower lip and 4-lobed upper lip; this is referred to in the descriptions as the "4+1" arrangement.

The species conservation assessments are based on the Categories and Criteria of IUCN (2001). Extent of Occurrence (EOO) is calculated using the Kew Geospatial Conservation Assessment Tool GeoCAT (geocat.kew.org). For Area of Occupancy, we apply a 2×2 km grid cell size following the recommendations on appropriate scale by IUCN (2013).

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As all the new species described here are endemic to Madagascar, they are compared primarily to the species on the island with which they are most likely to be confused rather than to superficially similar species in, for example, continental Africa. Each species is placed within the infrageneric classification provided by Balkwill & Balkwill (1997).

Species accounts

Barleria speciosa *I. Darbysh.* **sp. nov.** Type: Madagascar, Antsiranana, Daraina, forêt d'Antsaharaingy, *Ranirison* PR 701 (holotype K!; isotypes CAS, Daraina, G, TEF).

http://www.ipni.org/urn:lsid:ipni.org:names:77137445-1

Shrub ± 1 m tall; stems subquadrangular, pale buff- or whitish-strigose, densely so on upper internodes. *Leaves* drying green-black, elliptic to narrowly oblong-elliptic, 8.2 – 11.6 × 1.7 – 3.3 cm, base cuneate or cuneate-attenuate, margin entire, apex acute or subattenuate, lamina pale-strigose on margin, midrib, veins beneath and sometimes sparsely so on upper surface, with numerous minute orange subsessile glands towards base beneath; lateral veins 4 – 5 pairs; petiole to 5 mm long, strigose. *Inflorescences* of unilateral (scorpioid) cymes in upper axils, each 3 – 4-flowered, held at a wide angle from or patent to stems; bracts foliaceous; primary peduncle 8 – 21.5 mm long, pale-strigose, flowers within each cyme spaced 4 – 8 mm apart at maturity, sessile on rachis; bracteole pairs offset and slightly unequal, one adpressed to calyx, the other held parallel to rachis, the former obovate or elliptic, 7.5 – 10.5 × 3.2 – 5 mm, apex obtuse or rounded, strigose externally particularly on margin and around midrib, with numerous minute orange subsessile glands elsewhere. *Calyx* drying ink-black; anterior lobe oblong or oblong-obovate, 12.5 – 18 × 5 – 6.5 mm, base cuneate, margin entire, apex truncate and shallowly emarginate, with ± 7 inconspicuous subparallel veins, pale-strigose externally and with numerous minute subsessile glands on both surfaces, these drying purplish- or reddish-black, internal surface with finer appressed hairs towards base; posterior lobe like anterior lobe but oblong or oblong-elliptic, 12.5 – 18.5 × 4 – 7 mm, apex obtuse or subacute; lateral lobes linear-lanceolate, 9 – 12 × 2 – 2.5 mm. *Corolla* 112 – 125 mm long, limb white, drying pinkish-blue with darker venation, tube yellow-green in proximal portion, drying blue-black, densely glandular-pubescent externally, limb also strigose; tube 75 – 82 mm long, cylindrical but throat somewhat widened; limb in "4+1" arrangement; abaxial lobe offset by 10.5 – 14 mm, broadly elliptic, ± 33.5 × 18.5 mm, apex rounded and shallowly notched; lateral lobes oblong-elliptic, 31 – 34.5 × 16.5 – 18.5 mm, apex obtuse and minutely notched; adaxial lobes oblong, 22.5 – 24 × 9 – 10 mm, apex acute. *Stamens* inserted in distal half of corolla tube; filaments c. 55 mm long, pubescent towards base; anthers white, 5.5 – 7 mm long; staminodes 3, slender, 13 – 14 mm long, pubescent towards base, with vestigial antherodes. *Pistil* glabrous; stigma violet, linear, curved, 3 – 4 mm long, apex notched. *Capsule* not seen. Figs 1 & 2.

RECOGNITION. Easily separated from all other Malagasy *Barleria* when in flower by the exceptionally large, white corolla with a long slender cylindrical tube in which the stamens are inserted in the distal half.

DISTRIBUTION. Northern Madagascar, known only from the type.

SPECIMEN EXAMINED. MADAGASCAR. Antsiranana: sous-préfecture de Vohemar, Daraina, forêt d'Antsaharaingy, 12°54'29"S, 49°40'38"E, fl. 19 April 2004, *Ranirison* PR 701 (holotype K!; isotypes CAS, Daraina, G, TEF).

HABITAT & ECOLOGY. Recorded from lowland dry forest with a sparse herbaceous understorey; 90 m alt.

CONSERVATION STATUS. In view of the fact that this species is so showy and yet (to our knowledge) has been collected only once, it is clearly very scarce and localised. Indeed, it appears to be the rarest of the Daraina *Barleria* species. Whilst good forest habitat is still to be found in the Daraina region and the forest patches are currently under 'temporary protection' within the proposed new protected area: Loky-Manambato, there is nevertheless still an inferred threat from habitat degradation through artisanal gold mining activities. Even small scale disturbance could have significant repercussions for the survival of this narrow endemic. It is therefore considered to be **Critically Endangered** [CR B1ab (iii) + 2ab (iii)].

NOTES. This unmistakable and spectacular *Barleria*, one of the largest-flowered species in the genus, does not appear closely allied to any of the other documented Malagasy species. The only species with a vaguely comparable corolla size on the island is *B. pulchra* Benoist which, nevertheless, has corollas only up to c. 80 – 90 mm long. In *B. pulchra* the corollas are purple and the tube is gradually funnel-shaped from below the midpoint; it additionally differs from *B. speciosa* in, for example, the much larger leaves up to 25 × 8 cm, the subsessile inflorescences, and the much larger and sparsely strigulose outer calyx lobes (25 – 35 × 18 – 23 mm *fide* Benoist 1967). The two are not considered to be closely related.

From the combination of the axillary unilateral cymes, the linear stigma and the antherode-bearing lateral staminodes, this species can be placed with confidence in sect. *Barleria* even in the absence of fruiting material (Balkwill & Balkwill 1997; Darbyshire 2009). The long, slender white corollas suggest that *B. speciosa* is adapted to moth pollination. This pollination method is known to occur in a number of species in sect. *Barleria* in tropical Africa and India, such as *B. acanthoides* Vahl, *B. capitata* Klotzsch and *B. noctiflora* L. f. However, in these species, the corolla lobes are always much smaller than in *B. speciosa*.

Fig. 1. *Barleria speciosa*: A habit; B face view of flower. PHOTOS: P. RANIRISON, CONSERVATOIRE ET JARDIN BOTANIQUE DE LA VILLE DE GENÈVE.

Barleria glandulostamina *I. Darbysh.* **sp. nov.** Type: Madagascar, Antsiranana, Daraina, forêt d'Antsahabe, *Ranirison* PR 760 (holotype K!; isotypes CAS, Daraina, G, TEF).

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Perennial herb or shrublet, sarmentose with erect or decumbent leafy branches, 15 – 80 cm tall; stems slender, subterete or somewhat 4-angular, golden-brown strigose, either densely so on upper internodes or hairs restricted to two opposite furrows; basal stems softly woody with brown bark. *Leaves* rather stiff, glossy and somewhat greyish-green in life, drying dark green or green-black above, paler beneath, elliptic or lower leaf pairs obovate, 3.5 – 7.7 × 1.9 – 3.6 cm, base cuneate to obtuse, margin entire, apex acute or lower leaf pairs obtuse or with a short acumen, lamina golden-brown strigose on midrib above and mainly on principal veins beneath or largely glabrous; cystoliths very numerous, conspicuous on upper surface; lateral veins 4 – 6 pairs; petiole 4 – 20 mm long, strigose or glabrous. *Inflorescences* terminal, shortly spiciform or subcapitate, 1.5 – 3 cm long, comprising a series of sessile, decussately arranged cymules, each single-flowered or those at lowermost inflorescence nodes 2-flowered, the whole inflorescence drying ink-black or turning brown-scarious; bracts rapidly reducing upwards, lowermost pairs appearing like reduced leaves, those in mid-portion of the spike typically oblanceolate, 8 – 13 × 1.5 – 6.5 mm, often outcurved, strigose on main veins and margin, surface finely puberulous and with a patently glandular-pubescent margin; bracteoles linear, then 6 – 11.5 × 0.8 – 1.2 mm, or those at lowermost inflorescence nodes sometimes oblanceolate and up to 13.5 × 3.5 mm, apiculate, indumentum like that of bracts. *Calyx* anterior lobe broadly elliptic, ovate or suborbicular, 8.5 – 14 × 3.8 – 10 mm, base attenuate or cuneate, margin entire, apex attenuate- to acuminate-apiculate, sometimes bifidly so, or rarely emarginate, external surface with prominent palmate-reticulate venation, very finely puberulous, hairs slightly longer and more conspicuous on main veins and margin, the latter also glandular-pubescent and with stiff long yellowish eglandular hairs; posterior lobe like anterior lobe but often more ovate-elliptic, 10 – 15 mm long, apex shortly attenuate- to acuminate-apiculate or obtuse-apiculate; lateral lobes linear-lanceolate, 4.5 – 7.5 × 0.5 mm. *Corolla* white, drying blue-black with darker venation, 16.5 – 18.5 mm long, finely and inconspicuously glandular-pubescent externally mainly on limb; tube 8 – 9 mm long, infundibuliform, ± 2 mm in diam. in the basal cylindrical portion, throat widened to 3.5 – 5 mm; limb in "4+1" arrangement; abaxial lobe offset by 3 – 4.5 mm,

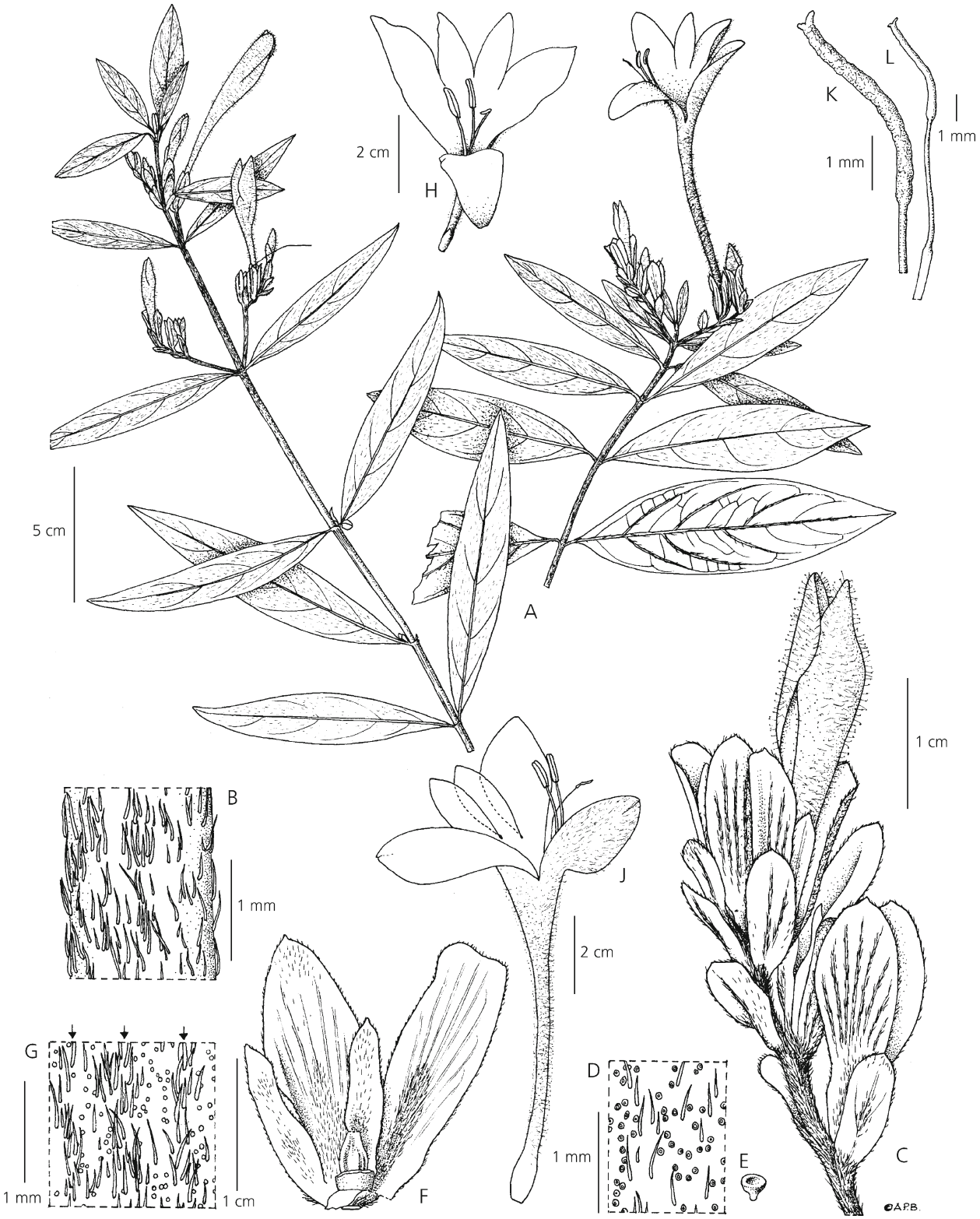

Fig. 2. *Barleria speciosa* **A** habit; **B** young stem indumentum; **C** inflorescence; **D** bracteole indumentum, external surface; **E** enlargement of a single gland from the bracteoles; **F** dissected calyx, internal surface with posterior lobe to the right, and with ovary; **G** indumentum of external surface of anterior calyx lobe, arrows indicate the position of the main veins; **H** face view of flower; **J** side view of corolla with androecium and stigma; **K** stigma; **L** stigma and upper portion of style, showing narrowed apical portion. All drawn from *Ranirison* 701. DRAWN BY ANDREW BROWN.

broadly obovate, 7 – 8.2 × 6.7 – 7 mm, apex rounded or truncate; lateral lobes elliptic, 5 – 7 × 3.5 – 5 mm, apex obtuse or rounded; adaxial lobes elliptic, 5 – 6.5 × 2.5 – 3.5 mm, apex acute or obtuse. *Stamens* inserted 3 – 4.3 mm from base of corolla tube; filaments 9.5 – 10.5 mm long, with numerous short-stalked capitate glands particularly in distal half; anthers grey, 1.8 – 2.4 mm long; staminodes 3, reduced to hairy protrusions, lacking discernible filaments. *Ovary* finely pubescent distally; style with few fine hairs towards base; stigma white, clavate, 0.6 – 1 mm long. *Capsule* flattened-fusiform, unbeaked, 8.5 – 10.5 mm long, flanks finely pubescent; immature seeds only seen, 4, clothed in silky hygroscopic hairs drying purple-black.

RECOGNITION. Morphologically similar to *Barleria humilis* Benoist from western Madagascar, from which it differs in having densely glandular (not glabrous) staminal filaments, a pubescent (not glabrous) ovary and capsule, longer bracteoles (6 – 11.5 mm vs 2 – 3.5 mm long) and a more conspicuous glandular pubescence along the calyx margin.
DISTRIBUTION. Northern Madagascar.

subsp. **glandulostamina**

Stems rather densely strigose throughout. *Leaves* strigose on midrib above and main veins beneath, more sparsely so between the veins beneath. Outer calyx lobes broadly ovate to elliptic, length : width ratio 1.45 – 2.25 : 1, apex attenuate to acuminate, apiculate. Figs 3A – B, & 4.

SPECIMENS EXAMINED. MADAGASCAR. Antsiranana: Ankarana Special Reserve, E sector, trail to Lac Vert, 12°56'36"S, 49°7'24"E, fl. & fr. 16 Oct. 2003, *Daniel, McDade & Ranarivelo* 10458 (CAS, K!, TAN); sous-préfecture de Vohemar, Daraina, forêt d'Antsahabe, 13°10'51"S, 49°33'13"E, fl. & fr. 1 May 2004, *Ranirison* PR 760 (holotype K!; isotypes CAS, Daraina, G, TEF); Ankarana [National Park] Special Reserve along trail and side trails from park entrance (along RN 6 on E side) to Lac Vert (c. 9 km distance), 12°58'S, 49°8'E, fl. 9 – 10 May 2006, *Daniel et al.* 10567 (CAS, K!, TAN); Ambilobe, Mahamasina Réserve Spéciale d'Ankarana, dépression d'Amposately, 12°55'29"S, 49°5'24"E, fl. 15 May 2007, *Bardot-Vaucoulon* 1810 (K!, MO, P, TAN); eastern sector of Ankarana [National Park] Special Reserve, 2.1 km W of village of Mahamasina along trail to Ambohimalaza, 12°58'9"S, 49°7'11"E, fl. 17 July 2011, *Daniel et al.* 11844 (CAS, K!, TAN).
HABITAT & ECOLOGY. Recorded from transitional forest, including seasonally moist forest with an understory of bamboo, semi-evergreen dry forest, and dry deciduous forest; it is usually found on limestone, but has been recorded from alluvial sandy clay soils; 100 – 450 m alt.
CONSERVATION STATUS. Recorded from a very small range in N Madagascar (EOO: 94 km^2, AOO 16 km^2, four locations) mostly within the Ankarana Special Reserve. It was recorded as frequent along a forest trail by T. Daniel (his no. 10567) but no other abundance data are available. Whilst the Ankarana localities should be afforded

Fig. 3. A, B *Barleria glandulostamina* subsp. *glandulostamina*. A habit; B face view of flower. C *B. humilis* for comparison. PHOTOS: A & B P. RANIRISON, CONSERVATOIRE ET JARDIN BOTANIQUE DE LA VILLE DE GENÈVE; C M. THULIN, UPPSALA UNIVERSITY.

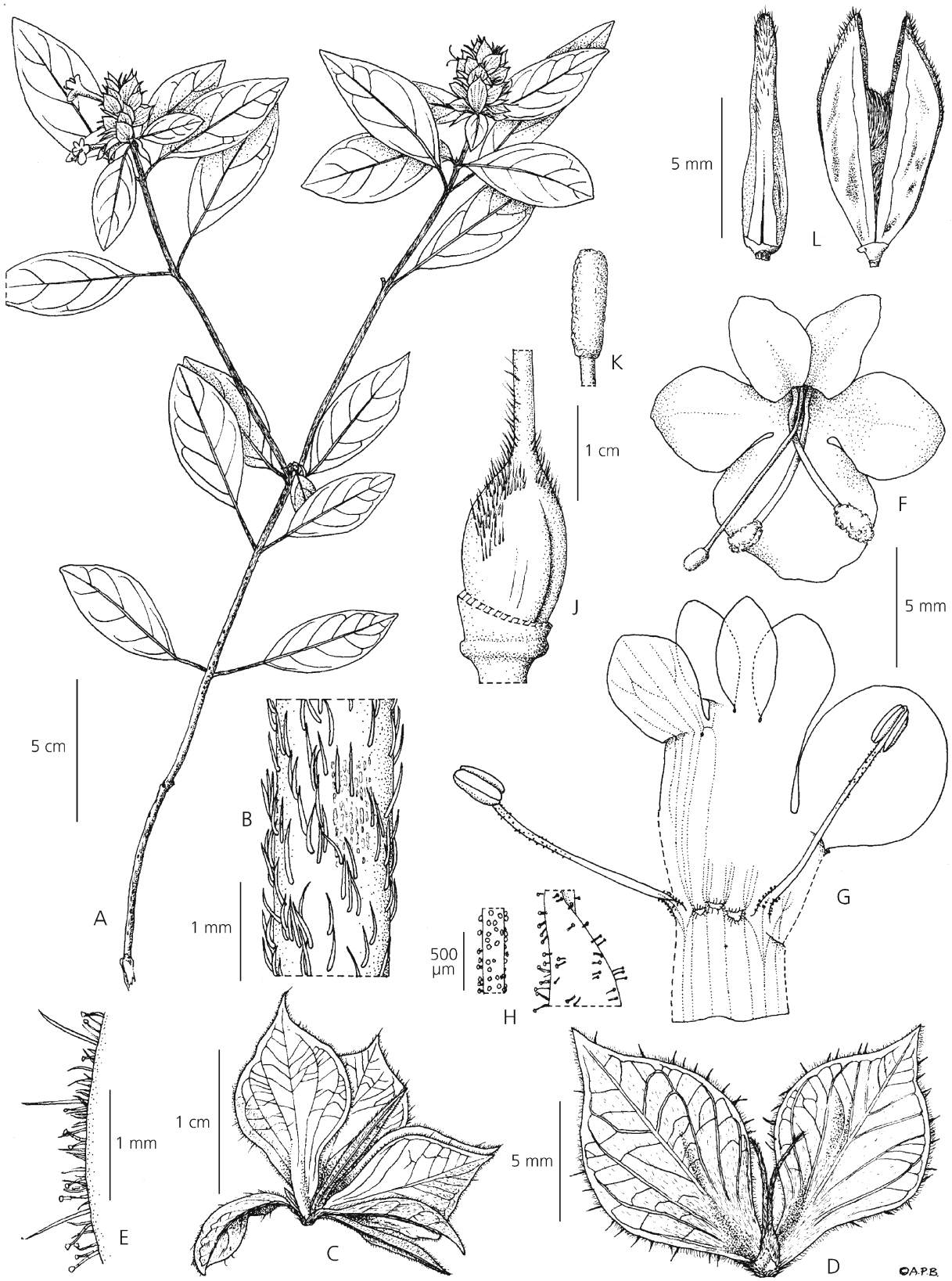

Fig. 4. *Barleria glandulostamina* subsp. *glandulostamina* **A** habit; **B** stem indumentum; **C** cymule showing bract, bracteoles and calyces; **D** dissected calyx, interior face, posterior lobe to the left; **E** indumentum of calyx margin; **F** flower, face view; **G** dissected corolla with androecium; **H** detail of stamina filament indumentum, proximal and distal portions; **J** ovary; **K** stigma; **L** capsule. All drawn from *Ranirison* 760. DRAWN BY ANDREW BROWN.

some protection, the Daraina location only has 'temporary protection' as part of the new proposed Loky-Manambato protected area and there is an inferred threat there from artisanal gold mining. This taxon is therefore considered **Endangered** [EN B1ab (i, ii, iii, iv) +2ab (i, ii, iii, iv)].

NOTES. In addition to the characters listed in the Recognition section above, subsp. *glandulostamina* is readily separated from *Barleria humilis* by the more dense strigose vegetative indumentum and the attenuate to acuminate outer calyx lobes (Table 1; Fig. 3).

subsp. **pseudohumilis** *I. Darbysh.* **subsp. nov.** Type: Madagascar, Antsiranana, slopes and ridge c. 2.2 – 2.5 km SW of village of Anjahakely, *Daniel et al.* 11876 (holotype K!; isotypes CAS, TAN).

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Stems sparsely strigose, mainly in two opposite furrows only. *Leaves* (largely) glabrous. Outer calyx lobes ovate orbicular, length:width ratio 1.05 – 1.2:1, apex shortly attenuate to obtuse, apiculate.

RECOGNITION. Differing from subsp. *glandulostamina* in the more sparse vegetative indumentum and in having proportionally broader, less attenuated outer calyx lobes.

SPECIMENS EXAMINED. MADAGASCAR. Antsiranana: Andranomanitra, Montagne des Français, zone à l'est du pic des orchidées, 12°22'33"S, 49°20'32"E, fl. 18 April 2007, *Bardot-Vaucoulon* 1711 (K!, MO, P, TAN); slopes and ridge c. 2.2 – 2.5 km SW of village of Anjahakely, 12°55'7"S, 49°17'42"E – 12°54'47"S, 49°17'24"E, fl. & fr. 19 July 2011, *Daniel et al.* 11876 (holotype K!, isotypes CAS, TAN).

HABITAT & ECOLOGY. Recorded from semi-deciduous dry forest on limestone substrate; c. 500 m alt.

CONSERVATION STATUS. This subspecies is currently known from only two locations with an estimated AOO of 8 km^2. It was noted as frequent in the forest at Anjahakely by T. Daniel (his no. 11876). This site has suffered from habitat degradation through artisanal gold mining and deforestation, although it is within the proposed new protected area currently referred to as Andavakoera-Andrafiamena-Ambohipiraka. On the Montagne des Français, also a proposed new protected area, charcoal production by local communities is leading to some forest degradation. In view of the very small AOO and the severely fragmented populations, this taxon is therefore considered **Critically Endangered** [CR B2ab (i, ii, iii, iv)].

NOTES. This subspecies is morphologically similar to *Barleria humilis* in vegetative indumentum and calyx shape but the floral characters, nevertheless, clearly place it within *B. glandulostamina* (see Table 1).

The combination of the golden-brown strigose stem indumentum, compound terminal inflorescence and 4-seeded unbeaked capsule would place both *Barleria glandulostamina* and *B. humilis* in sect. *Chrysothrix*, following Balkwill & Balkwill (1997). However, these species look quite different to other species groups currently placed within this section, for example those species from India (*B. lawii* T. Anderson and allies; *B. strigosa* Willd. and allies) and South Africa (*B. ovata* E. Mey. ex Nees and allies), and it remains to be seen whether sect. *Chrysothrix* is a natural grouping. Ongoing molecular studies on the genus, at Rancho Santa Ana Botanic Garden in collaboration with RBG Kew, should help to elucidate this, but the authors consider it quite likely that sect. *Chrysothrix* will prove to be polyphyletic.

Barleria microcalyx *I. Darbysh.* **sp. nov.** Type: Madagascar, Antsiranana, Daraina, forêt d'Antsaharaingy, *Ranirison* PR 669 (holotype K!; isotypes CAS, Daraina, G, TEF).

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Table 1. Comparison of key characters for *Barleria humilis* and *B. glandulostamina*.

Character	B. humilis	B. glandulostamina subsp. glandulostamina	B. glandulostamina subsp. pseudohumilis
Young stem indumentum	Sparsely strigose mainly in two opposite furrows	Rather densely strigose throughout	Sparsely strigose mainly in two opposite furrows
Leaf indumentum	Largely glabrous	Strigose on the midrib above and mainly on the main veins beneath	Largely glabrous
Bracteole length (mm)	2 – 3.5	6 – 11.5	6 – 7.5
Posterior calyx lobe shape	Broadly ovate or ovate-orbicular, apex obtuse or subacute	Broadly ovate or elliptic, apex attenuate to acuminate, apiculate	Ovate-orbicular, apex shortly attenuate to obtuse, apiculate
Anterior calyx lobe length: width ratio	1.05 – 1.25:1	1.45 – 2.25:1	1.05 – 1.2:1
Anterior and posterior calyx lobes: hairs along the margin	With mixed short, fine, inconspicuous glandular and eglandular hairs	Conspicuously glandular-pubescent with interspersed shorter eglandular hairs	Conspicuously glandular-pubescent with interspersed shorter eglandular hairs
Staminal filaments	Glabrous	With numerous short-stalked capitate glands	With numerous short-stalked capitate glands
Ovary / capsule indumentum	Glabrous	Pubescent	Pubescent

Perennial herb or subshrub, 60 – 80 cm tall; young stems drying blackish-brown, subangular, patently glandular-pilose, multicellular hairs appearing deflated in dry state, also with minute white retrorse and antrorse eglandular hairs on two opposite sides, these becoming very dense and conspicuous in two lines on short uppermost internodes and along internodal line, appearing woolly; mature stems softly woody with pale brown bark. *Leaves* chartaceous, ovate or trullate, lower cauline leaves 6.5 – 11 × 3.2 – 5.7 cm, base broadly cuneate or somewhat attenuate, margin entire or obscurely repand, apex acute to obtuse or subattenuate, apiculate; surfaces glabrous except for short glandular hairs towards midrib beneath and longer glandular hairs along margin towards base, lower surface also with numerous sessile glands; lateral veins 4 – 5 pairs; petiole 24 – 52 mm long, patently glandular-pubescent and with dense short woolly hairs in proximal portion of adaxial groove. *Inflorescences* of sessile single-flowered cymes crowded in upper axils between short internodes to form a terminal fascicle; bracts foliaceous but reduced and subsessile, ovate or ovate-elliptic to narrowly so, typically 25 – 40 × 7 – 16 mm, margin glandular-pubescent; bracteoles like bracts but oblong-elliptic to narrowly oblong, 16.5 – 25.5 × 4.5 – 8 mm. *Calyx* hidden within bracteoles, brown in dry state, lobes rather membranous, base thickened; anterior lobe triangular, 4.2 – 4.6 × 2 mm, margin entire, apex subattenuate into a short flexuose point, surfaces glabrous or with minute appressed hairs along margin, venation parallel with central pair of veins most prominent; posterior lobe like anterior lobe but 5 – 5.5 mm long, single central vein most prominent; lateral lobes lanceolate, 4.5 – 5.5 × 1.5 mm, sometimes with few short glandular hairs. *Corolla* pale violet to mauve with a white base to tube, 48 – 63 mm long, sparsely glandular-pubescent externally mainly on lateral lobes; tube 24.5 – 29 mm long, subcylindrical but gradually and narrowly expanded upwards, c. 2.5 – 3 mm in diam. at base, to 5.5 – 6.5 mm at mouth; limb in "4+1" arrangement; abaxial lobe offset from remaining lobes by 4.5 – 8 mm, broadly elliptic, 18.5 – 30 × 12.5 – 16 mm, apex rounded; lateral lobes oblong-elliptic, 17 – 26.5 × 10 – 16 mm, apex rounded and minutely notched; adaxial lobes like lateral lobes but 16.5 – 24 × 8.5 – 11.5 mm. *Stamens* attached 7 – 9.5 mm from base of corolla tube; filaments 27.5 – 32.5 mm long, shortly hairy at base;

Fig. 5. *Barleria microcalyx*: face view of flower. PHOTO: P. RANIRISON, CONSERVATOIRE ET JARDIN BOTANIQUE DE LA VILLE DE GENÈVE.

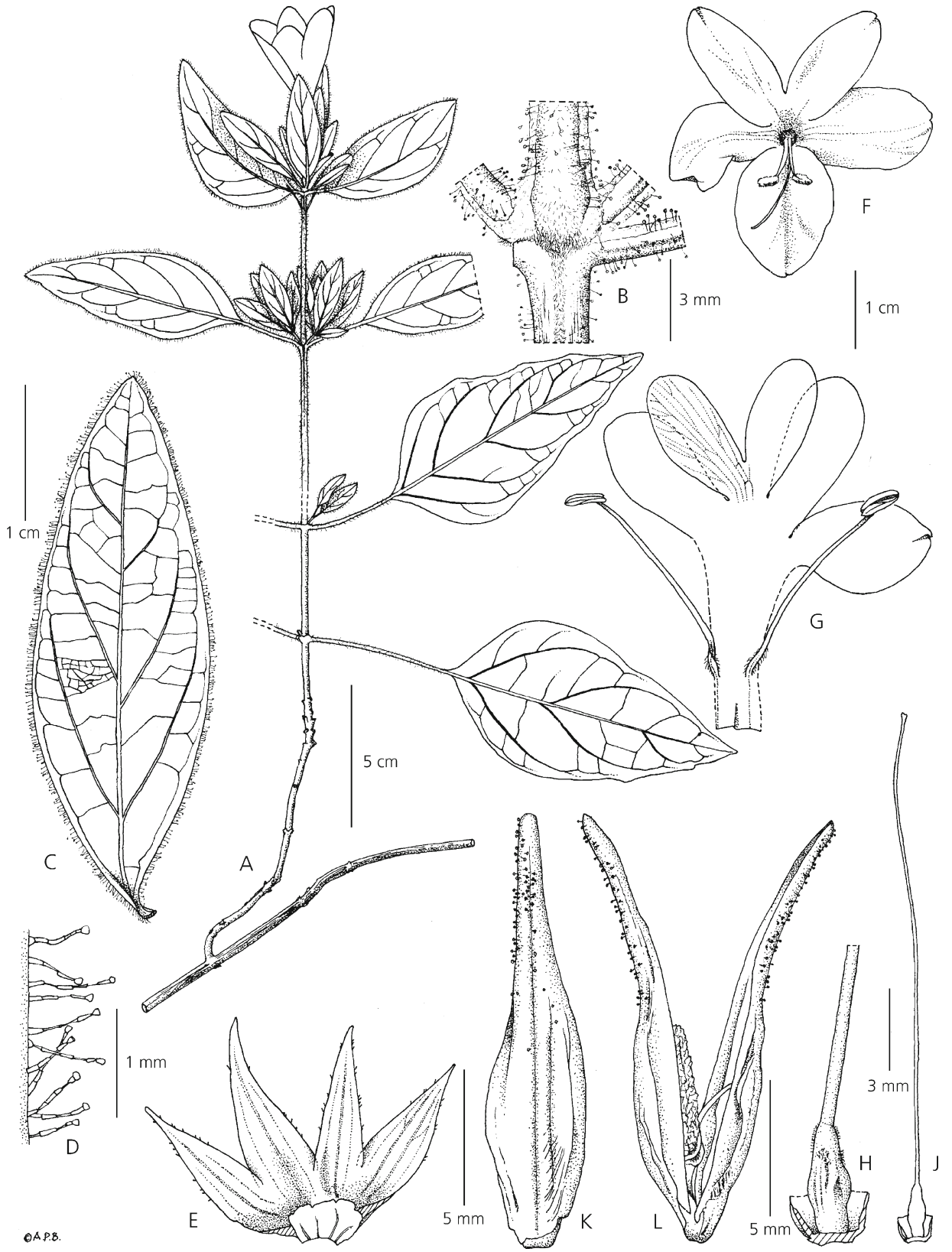

Fig. 6. *Barleria microcalyx* **A** habit; **B** stem indumentum; **C** bract, adaxial surface; **D** indumentum on bract margin; **E** calyx, internal surface, anterior lobe to the right; **F** flower, face view; **G** dissected corolla with androecium; **H** ovary; **J** pistil; **K** capsule valve, lateral view; **L** dehiscing capsule with immature seed. **A** – **E, H & J** from *Ranirison* 669; **F** from photo. by Ranirison, **G** from *Gautier et al.* 4245; **K & L** from *Rakotoarisoa* 429. DRAWN BY ANDREW BROWN.

anthers exserted, 4.7 – 5.5 mm long; staminodes absent. *Ovary* glandular-puberulous distally; style glabrous; stigma violet, linear, 4 – 4.5 mm long. *Capsule* 15 – 16 mm long including sterile beak 6 – 7 mm long, beak glandular-pubescent; septum with a shallow membranous portion; immature seeds 5.5 mm long, clothed in matted buff-coloured hygroscopic hairs. Figs 5 & 6.

RECOGNITION. Differs from all other species in *Barleria* sect. *Somalia* in having the combination of a tiny calyx relative to the corolla (length ratio 0.08 – 0.1 : 1), the absence of staminodes and the short white woolly indumentum in two opposite lines on the uppermost internodes, along the interpetiolar line and within the petiolar groove.

DISTRIBUTION. Northern Madagascar.

SPECIMENS EXAMINED. MADAGASCAR. Antsiranana: sous-préfecture de Vohemar, Daraina, forêt de Bobankora, partie nord, 13°13'S, 49°46'E, fl. 6 March 2003, *Gautier et al.* LG 4245 (CAS, Daraina, G, K!, TEF); sous-préfecture de Vohemar, Daraina, forêt d'Antsaharaingy, 12°54'4"S, 49°39'58"E, fl. & imm. fr. 16 April 2004, *Ranirison* PR 669 (holotype K!; isotypes CAS, Daraina, G, TEF); Vohimarina (Iharana), Befarafara, forêt de Solaniampilàna, environ 20 km au NW de Daraina, route vers Ambilobe, 13°04'44"S, 49°35'11"E, fl. & fr. 14 May 2006, *Rakotoarisoa [with Andriamahay]* 429 (K!, MO, SNGF, TAN).

HABITAT & ECOLOGY. Recorded from lowland dry forest on slopes and ridges, with a sparse herbaceous understorey; 60 – 180 m alt.

CONSERVATION STATUS. This species is recorded from a very restricted range (EOO 257 km^2, AOO 12 km^2, 3 locations). Habitat loss and degradation in the Daraina region through artisanal gold mining and tree felling pose inferred threats to these locations, although the area is currently under 'temporary protection' within the proposed new protected area: Loky-Manambato. It is therefore considered **Endangered** [EN B1ab (i, ii, iii, iv) + B2ab (i, ii, iii, iv)].

NOTES. The two-seeded, prominently beaked capsule with a membranous portion to the septum, the linear stigma and the absence of spines together place *Barleria microcalyx* in *Barleria* sect. *Somalia* (Balkwill & Balkwill 1997; Darbyshire 2009). Six of the species recorded by Benoist (1967) belong to that section: *B. insolita* Benoist, *B. laeta* Benoist, *B. longipes* Benoist (including *B. puberula* Benoist which is probably a distinct species), *B. pulchella* Benoist, *B. separata* Benoist and *B. seyrigii* Benoist. In Benoist's key, *B. microcalyx* would be identified as *B. laeta*, the only other species with a hairy ovary and capsule. Indeed, *B. microcalyx* superficially resembles that species in, for example, leaf shape and corolla size. However, the two are easily separated by a number of characters listed in Table 2. Particularly striking is the minute calyx of the new species which is hidden within the leafy bracteoles, whereas in *B. laeta* the large, leafy calyces are clearly exposed beyond the bracteoles.

A further taxon in *Barleria* sect. *Somalia*, represented only by *Andrianjafy et al.* 420 (CNARP, K, MO, P, TAN) from Baie des Dunes in Antsiranana, is included in Table 2 since it shares with both *B. laeta* and *B.*

Table 2. Comparison of diagnostic characters for *Barleria laeta*, *B. microcalyx* and *B.* sp. (*Andrianjafy et al.* 420). Measurements for *B. laeta* are taken from Benoist (1967) with checking on JSTOR Plant Science.

Character	B. laeta	B. microcalyx	B. sp. (*Andrianjafy et al.* 420)
Young stem indumentum	Finely white-pubescent; short "woolly" indumentum absent	Glandular pilose and uppermost internodes with two lines of minute white woolly hairs, extending along the interpetiolar line and into the petiolar groove	Finely white pubescent with intermixed short glandular hairs on upper internodes; short "woolly" indumentum absent
Mature leaf blade dimensions (cm)	Up to 5 × 3	6.5 – 11 × 3.2 – 5.7	Unknown
Bracteoles	Linear or spathulate, 0.5 – 3.5 mm wide	Oblong-elliptic to narrowly oblong, 4.5 – 8 mm wide	Linear or spathulate, 0.5 – 3.5 mm wide
Calyx lobes	Calyx large and clearly exposed, green; anterior and posterior lobes clearly longer and much wider than lateral lobes; posterior lobe c. 17 – 20 × 8 mm, oblong-elliptic	Calyx minute, hidden within the bracteoles, brown; anterior and posterior lobes subequal in length to lateral lobes and only marginally wider; posterior lobe up to 5.5 × 2 mm, triangular	Calyx small but not hidden within the bracteoles, drying blackish-brown; anterior and posterior lobes unequal, the latter clearly longer than the former and than the lateral lobes, 7.5 – 10 × 1.5 – 2 mm, linear-lanceolate
Corolla length (mm)	c. 45	48 – 63	c. 40
Staminodes	Three short staminodes present, attached in lower third of corolla tube	Absent	Three staminodes present, attached in lower third of corolla tube
Capsule length (mm)	15 – 16	15 – 16	11 – 12
Capsule indumentum	Beak finely pubescent, glabrous below	Beak glandular-pubescent	Glandular-pubescent

microcalyx the hairy ovary and capsule. However, it differs from both in having smaller corollas and capsules, and additionally differs from *B. laeta* in having much smaller and narrower anterior and posterior calyx lobes and from *B. microcalyx* in having smaller and narrower bracteoles and in the posterior calyx lobe being considerably longer than the anterior lobe, not subequal. This specimen almost certainly represents a further new species but more material is required before it can be formally described.

Barleria microcalyx is very unusual in completely lacking staminodes, since in all other of the many species the first author (ID) has studied, the androecium comprises two fertile adaxial stamens and two (lateral pair) or three (lateral pair plus adaxial) staminodes. However, staminodes are much reduced and always lack antherodes elsewhere in sect. *Somalia*, so the discovery of a species in which they have been completely lost is perhaps not unexpected. It should be noted that the illustrations in Benoist (1967) of both *B. laeta* (fig. XXIV, 13 – 16) and *B. insolita* (fig. XXV, 5 – 7) are incorrect in that two antherode-bearing staminodes are drawn, attached in the upper portion of the corolla tube. This would not fit for sect. *Somalia*, and it does not agree with the description given by Benoist who states that the staminodes are reduced to short filaments and are attached in the lower third of the corolla tube in both species.

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