

# A new species of *Streptocarpus* (Gesneriaceae) endemic to Madagascar

Gwyneth MACMASTER  
Michael MÖLLER  
Mark HUGHES

Royal Botanic Garden Edinburgh, 20a Inverleith Row, Edinburgh EH3 5LR (United Kingdom)  
m.hughes@rbge.org.uk

Trevor J. EDWARDS  
University of Natal, Pietermaritzburg 3209 (South Africa)

Dirk U. BELLSTEDT  
University of Stellenbosch, Stellenbosch 7602 (South Africa)

## ABSTRACT

A new species of *Streptocarpus* (*S. lanatus* MacMaster) is described from central Madagascar. Material referable to this new taxon was previously assigned to *S. ibityensis* Humbert, from which it can be distinguished by its densely woolly leaves, smaller corolla lobes with purple markings, and lack of staminodes. It is endemic to Mt Itremo, where it grows in the shelter of boulders and small caves. Evidence in the form of a molecular phylogeny is presented to highlight the distinctiveness of the new species from related taxa. Both *S. lanatus* and *S. ibityensis* are classified in the IUCN category "Vulnerable".

## KEY WORDS

Gesneriaceae,  
*Streptocarpus*,  
Madagascar,  
Mt Itremo,  
new species.

## RÉSUMÉ

Une nouvelle espèce de *Streptocarpus* (Gesneriaceae) endémique de Madagascar. Une nouvelle espèce de *Streptocarpus* (*S. lanatus* MacMaster) est décrite du centre de Madagascar. Le matériel rapporté à ce taxon était auparavant attribué à *S. ibityensis* Humbert, duquel il peut être distingué par ses feuilles densément laineuses, une corolle à lobes plus petits à taches pourpres et l'absence de staminodes. Elle est endémique du Mont Itremo où elle pousse dans les éboulis et de petites grottes. Une phylogénie moléculaire est présentée pour caractériser cette nouvelle espèce vis-à-vis des taxons apparentés. *S. lanatus* et *S. ibityensis* sont classés dans la catégorie « Vulnérable » de l'IUCN.

## MOTS CLÉS

Gesneriaceae,  
*Streptocarpus*,  
Madagascar,  
Mont Itremo,  
nouvelle espèce.

## INTRODUCTION

*Streptocarpus* is a genus of Gesneriaceae containing *c.* 146 species which are distributed in Africa, Madagascar and the Comoro Islands. A monograph of the Malagasy and Comorian species (HUBERT 1971) included 41 species, none of which are shared with mainland Africa. This pattern of endemism is repeated within Madagascar, and although a small number of species are widespread (e.g., *S. thompsonii* R.Br.), a considerable number are narrow range endemics. During an expedition to Madagascar in 2002 by one of the authors, population-level collections of *S. ibityensis* Humbert were made from Mount Ibity and Mount Itremo for use in a population genetic study. Upon growing plants from seed from these collections at the Royal Botanic Garden Edinburgh, it became apparent that the collections from Mount Itremo were a different taxon. This taxon was considered distinct enough from *S. ibityensis* to warrant recognition at specific rank, and is described below as *S. lanatus* MacMaster. The original description of *S. ibityensis* included material that we now consider to belong to *S. lanatus*, hence a revised description of *S. ibityensis* is also presented. *S. lanatus* is distinct from *S. ibityensis* in having a smaller, more zygomorphic corolla with purple striations on the lower lobes, no staminodes, and a more markedly woolly appearance, which makes it vegetatively reminiscent of *Colpogyne betsiliensis* (Humbert) B.L.Burtt. Both *S. lanatus* and *S. ibityensis* have very restricted distributions, being limited to areas of occupancy of less than 2 km<sup>2</sup> at the summits of their respective mountains. This means they fall into the IUCN category “Vulnerable” (VU), as they are prone to the effects of “human activities or stochastic events within a very short time period” (IUCN 2001).

Molecular evidence for the distinctiveness of the new taxon is presented in Figure 1, which shows a phylogram of a maximum parsimony analysis of ITS and *trnL-F* intron-spacer sequences from both *S. ibityensis* and *S. lanatus* and a selection of other Malagasy species. The two sampled individuals of *S. lanatus* cluster together with 100% bootstrap support, while the *S. ibityensis* samples form a clade with 99% boot-

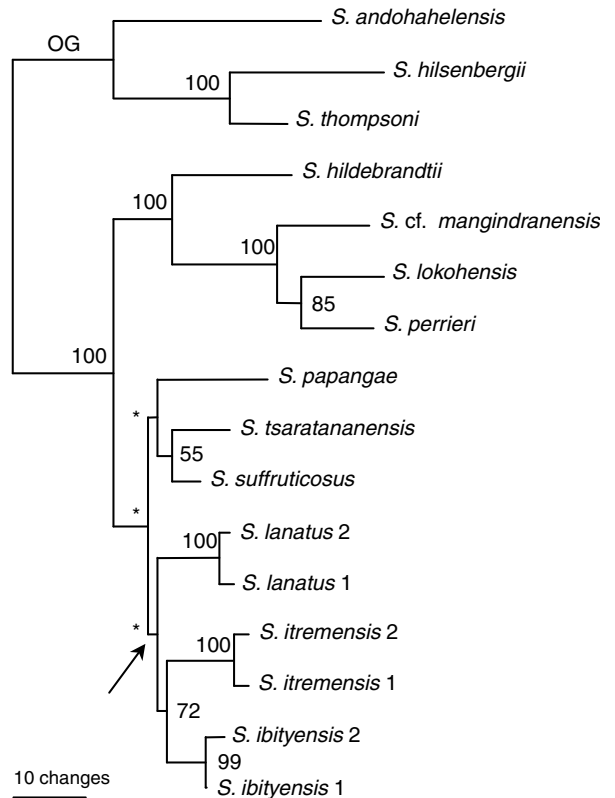


FIG. 1. — One of three most parsimonious trees depicted as a phylogram from a maximum parsimony analysis of nuclear ribosomal ITS and chloroplast *trnL-F* intron-spacer sequence data plus gap matrix (CI = 0.848, RI = 0.820). The analysis was carried out using default settings in PAUP using the branch-and-bound search option (with ambiguously aligned regions excluded: 15 characters at the 3'-end of ITS1) (SWOFFORD 2002). Arrow indicates branch collapsing in the strict consensus tree. Numbers represent bootstrap support values of 10000 full heuristic search replicates and MULTREES off. \*, branches with less than 50% bootstrap support values; **OG**, outgroup. Vouchers are held at E. Sequence and specimen information are given in Table 1.

strap support. Although these clades remain unresolved in a basal polytomy in the strict consensus tree, it is obvious that there is a considerable genetic distance between *S. lanatus* and the *S. ibityensis* samples (5.0-5.1% for ITS).

### ***Streptocarpus lanatus* MacMaster, sp. nov.**

TYPIUS. — *Möller 01-19*, Fianarantsoa province, Col d'Itremo, 20°35'04.1"S, 46°34'54.3"E, 1550 m, Mar. 2001 (holo-, E).

TABLE 1. — List of collector numbers, collection localities and GenBank accession numbers for the individuals used in the molecular phylogenetic analysis. \*, from MÖLLER & CRONK 2001. Abbreviations: **AGGS**, American Gloxinia & Gesneriad Society; **LG**, Laurent Gautier; **MM**, **MMO**, Michael Möller; **PBZT**, Parc botanique et zoologique de Tsimbazaza; **RBGE**, Royal Botanic Garden Edinburgh.

Taxon	Locality	Collector / Accession number	GenBank No. <i>trnL-F</i>	GenBank No. ITS
<i>S. andohahelensis</i> Humbert	Madagascar; Tulear, Col de Beampingaratra	RBGE 19972885	This study	AF 316903*
<i>S. hildebrandtii</i> Vatke	Ex cult. (PBZT) (Madagascar)	RBGE 19972891	This study	AF 316930*
<i>S. hilsenbergii</i> R.Br.	Madagascar; Mandrake Valley	RBGE 19631505	This study	AF 316956*
<i>S. ibityensis</i> Humbert-1	Madagascar; Antananarivo Prov., Mt Ibity	RBGE 19932867	This study	AF 316926*
<i>S. ibityensis</i> Humbert-2	Madagascar; Antananarivo Prov., Mt Ibity	MMO 01-32/C/1	This study	This study
<i>S. itremensis</i> B.L.Burt-1	Madagascar; Antananarivo Prov., Mt Ibity	MM-9723	This study	AF 316928*
<i>S. itremensis</i> B.L.Burt-2	Madagascar; Antananarivo Prov., Mt Ibity	MMO 01-38/AA	This study	This study
<i>S. lanatus</i> MacMaster-1	Madagascar; Fianarantsoa Prov., Col d'Itremo	MMO 01-19/A/1	This study	This study
<i>S. lanatus</i> MacMaster-2	Madagascar; Fianarantsoa Prov., Col d'Itremo	MMO 01-19/A2/1	This study	This study
<i>S. lokohensis</i> Humbert	Madagascar; Antrisanana Prov., Ambodilaitra Mt	RBGE 19990132	This study	This study
<i>S. cf. mangindranensis</i> Humbert	Madagascar; Antsiranana Prov., Manongarivo	LG 3477	This study	This study
<i>S. papangae</i> Humbert	Madagascar; Tulear, Col de Beampingaratra	RBGE 19972886	This study	AF 316929*
<i>S. perrieri</i> Humbert	Madagascar; Antananarivo, Angavo near Ankazobe	RBGE 19972892	This study	AF 316931*
<i>S. suffruticosus</i> Humbert	Madagascar; Antsiranana Prov., Marojejy NR 12	MM-9877	This study	This study
<i>S. thompsonii</i> R.Br.	Ex cult. (AGGS) (Madagascar)	RBGE 19941334	This study	AF 316908*
<i>S. tsaratananensis</i> Humbert ex B.L.Burt	Madagascar; Antsiranana Prov., Manongarivo	LG 3600	This study	This study

*Streptocarpo ibityensi similis sed faciem lanatum habens, lobis corollae minoribus et purpureo-striatis differt.*

Rosulate perennial herb. Leaves 22-50 × 6-19 mm, oblanceolate with rounded apex or lanceolate-elliptic with acute apex, base attenuate-acute, slightly asymmetric, margin crenate-subdentate, upper and lower surfaces densely covered in slender, curly, white lanate-tomentose hairs *c.* 4 mm long, sometimes obscuring the alternate venation.

Inflorescences 1-5; peduncles 42-94 mm long, minutely pubescent, hairs sometimes glandular; pedicels slender, 5-12 mm, minutely glandular. Calyx segments divided to base, 1.1-3.0 × 0.5-0.8 mm with minute glandular hairs. Corolla 7-8.5 mm long, pouch shaped, constricted underneath 2-3 mm from base, lower three lobes with bright purple broken lines extending down inside of tube; tube white outside, 3-6.5 mm long, 2.0-3.9 mm diameter at widest point,

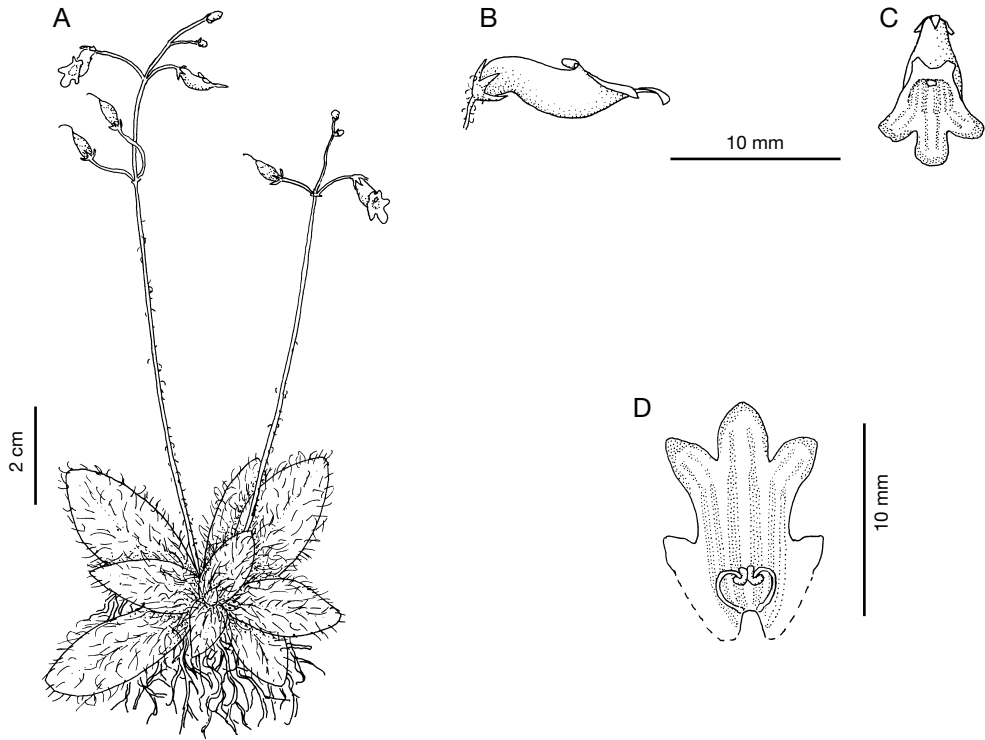


FIG. 2. — *Streptocarpus lanatus* MacMaster: **A**, whole plant; **B**, flower side view; **C**, flower front view; **D**, dissected flower. Drawing by Christina OLIVER.

1.8-3.5 mm at mouth with minute glandular hairs outside, glabrous inside; upper lip consisting of two lobes  $1.0 \times 1.0$  mm; lower lip consisting of three lobes, median lobe  $1.5-2.0 \times 1.1-2.0$  mm, laterals  $1.4-1.9 \times 1.0-1.5$  mm. Stamens arising from base of the corolla tube; filaments 3.5 mm, slender, glabrous; anthers 0.9 mm, basifixed, extrorse, staminodes absent. Ovary 1.0-1.8 mm with minute glandular hairs; style 2.0-3.5 mm with tiny glandular hairs extending up  $1/3-1/2$  length; stigma capitate, white to pale pink, smooth. Capsule 4.8-7.5 mm with minute glandular hairs. Seeds *c.* 0.5 mm, elliptic, seed coat verruculose. Note that due to a paucity of entire floral material on herbarium sheets, measurements for the three lower corolla lobes were taken from cultivated material. — Fig. 2.

**DISTRIBUTION AND ECOLOGY.** — Endemic to Mount Itremo, central Madagascar. Occurring at

altitudes of up to 1700 m, growing under boulders and in caves on the exposed summit. Flowering period March-April.

**PARATYPES.** — MADAGASCAR. *Labat 3051*, Madagascar, Fianarantsoa, Ambatofinandrahana, Itremo, Massif de l'Itremo, Antsirakambiaty,  $20^{\circ}35'22''\text{S}$ ,  $46^{\circ}34'1''\text{E}$  (P); *Humbert 28362*, W of Itremo (west Betsileo) among overhanging rocks with gneiss and granites, 1500-1700 m, 1955 (P); *Keraudren-Aymonin & Aymonin 25795*, Itremo, with rocks, July 1970 (P); *Humbert 30032*, west of Itremo (west Betsileo) among overhanging rocks with gneiss and granites, 1500-1700 m, 1955 (P); *Clement, Phillipson & Rafamantanantsoa 2019*, 44 km west of Ambatofinandrahana,  $20^{\circ}30'00''\text{S}$ ,  $46^{\circ}34'1''\text{E}$ , exposed rocky slope below boulder outcrop, 1650 m, Mar. 1992 (E); *Rosser 10072*, Itremo (centre-west), rocks with quartzite, 1700 m, Mar. 1956 (P); *Möller s. n.*, cultivated material grown from seed taken from *Möller 01-19* and cultivated at the Royal Botanic Garden Edinburgh (E, spirit collection, accession No. 20020508).

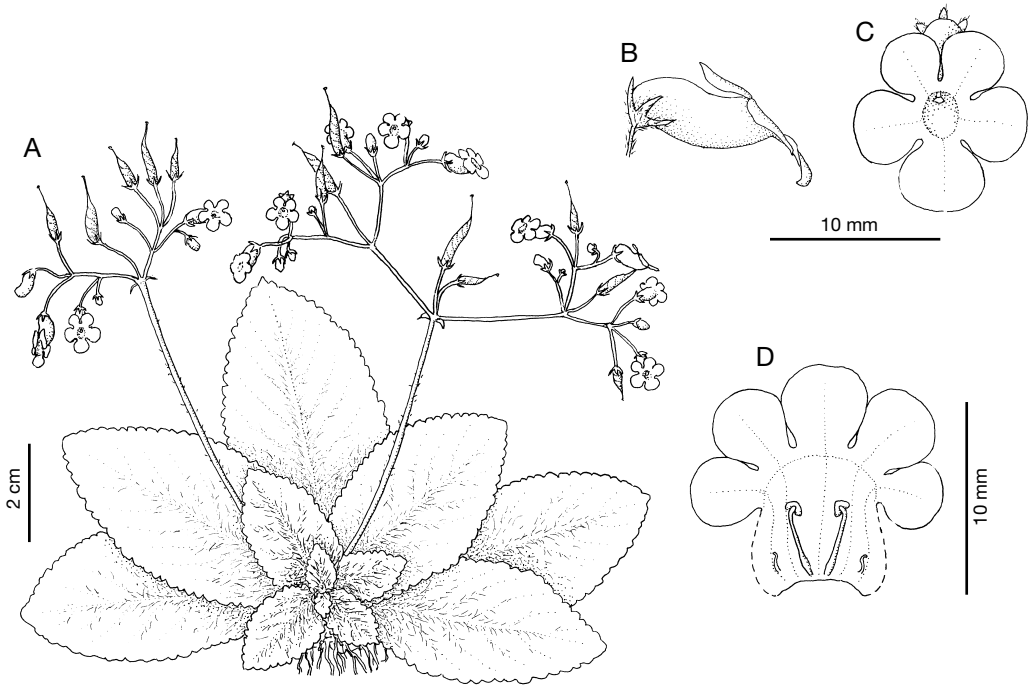


FIG. 3. — *Streptocarpus ibityensis* Humbert: **A**, whole plant; **B**, flower side view; **C**, flower front view; **D**, dissected flower. Drawing by Christina OLIVER.

### *Streptocarpus ibityensis* Humbert

TYPUS. — *Perrier de la Bâthie* 8522, Madagascar, Centre (pentes occidentales), Mont Ibity, sud d'Antsirabe, 1 900-2 300 m (holo-, P).

Rosulate perennial herb. Leaves 29-68 × 9-27 mm, oblanceolate with rounded apex or lanceolate-elliptic acute apex, base attenuate-acute, slightly asymmetric, margin crenate-subdentate, upper and lower surfaces covered in laterally compressed hairs *c.* 2 mm long, sometimes obscuring the alternate venation. Inflorescences 1-6; peduncles slender, 53-80 mm long, minutely pubescent, hairs sometimes glandular; pedicels slender, 4-11 mm, pubescent, sometimes densely so, with occasional minute glandular hairs. Calyx segments divided to base, 1.1-2.0 × 0.5-1.0 mm, pubescent, glandular hairs outside. Corolla 7-9 mm long, pouch-shaped, white at base with pale lilac stripes on the outside of the tube, lobes white to pale lilac; tube 4.3-6.1 mm long, 2.8-3.8 mm diameter at

widest point, 1.9-3.0 mm at mouth, minutely pubescent outside, glabrous inside, upper lip consisting of two lobes 1.2-4.0 × 0.7-5.0 mm; lower lip consisting of three lobes, median lobe 2.5-4.0 × 3.0-4.0 mm, laterals 2.4-3.0 × 2.5-3.0 mm. Stamens arising from the base of the corolla tube; filaments 3.0-4.1 mm, slender, glabrous; anthers basifixed, extrorse; posterior staminode smaller than laterals. Ovary 1.5-2.3 mm with minute glandular hairs; style 3-4 mm, glabrous, pale to deep pink; stigma capitate, papillate. Capsule 6-10 mm with minute glandular hairs. Seeds *c.* 0.5 mm, elliptic, seed coat slightly verruculose. — Fig. 3.

DISTRIBUTION AND ECOLOGY. — Endemic to Mount Ibity, central Madagascar. Occurring at altitudes of up to 1750 m, growing under boulders and in caves. Flowering period March-May.

MATERIAL EXAMINED. — MADAGASCAR. *Clement et al.* 1547, Ibity sud, May 1971 (E); *Möller* 9722, Antananarive Prov., north side on plateau of

mountain, 19°10'S, 47°28'E, 1700 m, May 1997 (E); *Dorr 3863*, Mt Ibity (sud), Mar. 1985 (E); *Clement et al. 2144*, north end of Mt Ibity, 27 km west of Antsirabe, 20°05'30"S, 47°00'00"E, open slopes with *Uapaca bojeri* woodland, Apr. 1992 (E); *Möller 01-32*, north facing slope of Rasters Peak on Mt Ibity, 20°03'48.8"S, 47°00'31.4"E, 1730 m, Mar. 2002 (E); *Möller s. n.*, cultivated material grown from seed taken from *Möller 01-32* and cultivated at the Royal Botanic Garden Edinburgh (E, spirit collection, accession No. 20020521).

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### REFERENCES

- HUMBERT H. 1971. — Gesnériacées: 47-163, in LEROY J.-F. (ed.), *Flore de Madagascar et des Comores*, fam. 180. Muséum national d'Histoire naturelle, Paris.
- IUCN 2001. — *IUCN Red List Categories and Criteria*. Version 3.1. IUCN Species Survival Commission, Gland, Switzerland; Cambridge, UK.
- MÖLLER M. & CRONK Q.C.B. 2001. — Evolution of morphological novelty: a phylogenetic analysis of growth patterns in *Streptocarpus* (Gesneriaceae). *Evolution* 55: 918-929.
- SWOFFORD D.L. 2002. — PAUP\*. *Phylogenetic Analysis Using Parsimony (\*and Other Methods)*. Version 4. Sinauer Associates, Sunderland, Massachusetts.

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