

Endemic Families of Madagascar.

XI. A new critically endangered species of *Schizolaena* (Sarcolaenaceae) from Tapia woodland in south-central Madagascar

David RABEHEVITRA

Missouri Botanical Garden,
Madagascar Research and Conservation Program,
B.P. 3391, Antananarivo 101 (Madagascar)
david.rabehevitra@mobot-mg.org

Porter P. LOWRY II

Missouri Botanical Garden,
P.O. Box 299, St. Louis, MO 63166-0299 (USA),
and Muséum national d'Histoire naturelle,
Département Systématique et Évolution,
case postale 39, 57 rue Cuvier, F-75231 Paris cedex 05 (France)
lowry@mnhn.fr

Rabehevitra D. & Lowry II P. P. 2009. — Endemic Families of Madagascar. XI. A new critically endangered species of *Schizolaena* (Sarcolaenaceae) from Tapia woodland in south-central Madagascar. *Adansonia*, sér. 3, 31 (1): 149-155.

ABSTRACT

Schizolaena isaloensis Rabehevitra & Lowry is described based on material from a small area of highly degraded, seasonally burned Tapia woodland near the southern limit of the Isalo National Park in south-central Madagascar. The species is illustrated and colour photographs are presented of an isolated remnant individual. The species most closely resembles another subhumid forest member of the genus, *S. microphylla* H.Perrier, from which it differs by several leaf characters, including the size and shape of the blade, the form of the apex, the prominence of the secondary venation on the abaxial surface and the density of its indumentum, and by its smaller flowers with more narrow petals. *Schizolaena isaloensis* is assigned a preliminary conservation status of Critically Endangered using the IUCN Red List criteria.

KEY WORDS

Sarcolaenaceae,
Schizolaena,
conservation,
Madagascar,
Isalo National Park,
Tapia woodland,
new species.

RÉSUMÉ

Familles endémiques de Madagascar. XI. Une nouvelle espèce de Schizolaena (Sarcolaenaceae) en danger critique des bois de Tapia du Centre-Sud de Madagascar.

Schizolaena isaloensis Rabehevitra & Lowry est décrite à partir de matériel provenant d'une petite zone fortement dégradée de bois de Tapia, brûlée de façon saisonnière, proche de la limite sud du Parc national de l'Isalo au Centre-Sud de Madagascar. L'espèce est illustrée et des photographies couleurs d'un individu isolé sont présentées. Cette espèce est la plus proche d'un autre membre du genre également des forêts subhumides, *S. microphylla* H. Perrier, duquel elle diffère par plusieurs caractères foliaires, dont la taille et la forme du limbe, la forme de l'apex, la proéminence de la nervation secondaire sur la face abaxiale et la densité de la pubescence ainsi que par ses fleurs plus petites aux pétales plus étroits. Une analyse préliminaire du statut de conservation selon les critères de la Liste Rouge de l'UICN indique que *S. isaloensis* est à rattacher à la catégorie « en danger critique d'extinction ».

MOTS CLÉS

Sarcolaenaceae,
Schizolaena,
conservation,
Madagascar,
Parc national d'Isalo,
bois de Tapia,
espèce nouvelle.

INTRODUCTION

Madagascar's Tapia woodland, a localized form of sclerophyllous evergreen forest, is the natural habitat of many species, including at least seven members of the island's endemic plant families, five of which are restricted to this formation. Tapia woodland is an open, fire-adapted community that once covered large areas in the central portion of the country, but whose extent, structure and floristic composition have been severely impacted as a result of regular, frequent burning by humans following settlement within the last several centuries. Today, Tapia woodland occupies at most c. 132 000 ha (Moat & Smith 2007) and is highly fragmented into small, often isolated stands, although many characteristic species also occur in severely degraded landscapes no longer recognizable as woodland. Some taxa are able to persist in these disturbed areas, such as *Sarcolaena oblongifolia* F. Gérard (Sarcolaenaceae) and *Uapaca bojeri* Baill. (Euphorbiaceae), whose Malagasy name, *tapia*, is used for this formation, where it is often a dominant element. Many other species, however, are highly threatened, apparently unable to withstand the increasingly intense pressure from regular burning and are no longer able to reproduce. Here we describe one such species belonging

to another genus of Sarcolaenaceae, *Schizolaena* Thouars, recently collected for the first time ever in flower and fruit.

Schizolaena was most recently revised by Lowry *et al.* (1999), who recognized a total of 18 species, to which one novelty has since been added (Lowry & Rabehevitra 2006). Most members of the genus occur in humid to subhumid forest, but one species, *S. microphylla* H. Perrier, is found in Tapia woodland, growing almost exclusively on quartzite, marble or gneiss outcrops from the Ibity massif south to Ambatofitorahana. In the course of examining material for their revision, Lowry *et al.* (1999) had excluded several sterile collections previously ascribed to *S. microphylla* made on sandstone and sandy soils in the area around the town of Ranohira whose foliar features clearly differed from the remainder of the material. However, because no flowering or fruiting specimens were available, they were unable to describe this entity. During a series of recent visits to the area, Missouri Botanical Garden botanists located several individuals in two populations along the main road leading to the southwestern part of the island, but were unable to find any fertile trees until September 2005, when an individual was observed with both flowers and young fruits. The collection they made now provides ample material to describe this new species.

SYSTEMATICS

Genus *Schizolaena* Thouars*Schizolaena isaloensis*

Rabehevitra & Lowry, sp. nov.

(Figs 1; 2)

Haec species a Schizolaena microphylla foliis ambitu plus variabilibus (ellipticis usque ovatis obovatisve), apice acutis usque subrotundatis (interdum emarginatis), venatione secundaria prominente, costa abaxialiter indumento vestita atque petalis minoribus spatulatis basem versus angustatis differt.

TYPUS. — **Madagascar.** Prov. Fianarantsoa, Fivondronana Ranohira, PK 742 on Route Nationale 7, c. 20 km WSW of Ranohira, [anthropogenic grassland near remnant] sclerophyllous evergreen forest [woodland], 22°46'32"S, 45°00'47"E, 1023 m, 14.IX.2005, fl., y.fr., *Randri-anarivelo, Rabehevitra, Rakotoarivony, Randriatsivery & Rasoafaranaivo 254* (holo-, MO!; iso-, Gl, Kl, Pl, TEF!, WAG!).

PARATYPES. — **Madagascar.** Prov. Fianarantsoa, plateaux et vallées de l'Isalo à l'W de Ranohira, grès et sables siliceux, [22°28'S, 45°20'E], 800-1250 m, 29.I-2.II and 8-10.IV.1955, ster., *Humbert 29766A* (P). — 2^e col des Tapias, à la sortie d'Isalo, [22°47'S, 45°00'E], VII.1969, ster., *Morat 3367* (TAN). — Isalo, bois de Tapia, grès, 900 m, X.1924, fl., *Perrier de la Bâthie 16589* (K, MO, P). — Isalo, degraded woodland 4 km E of Ilakaka River, 22°40'44"S, 45°15'21"E, 840m, 19.III.2005, ster., *P. B. Phillipson et al. 5804* (MO, P, TEF). — Ranohira, PK 712, [22°38'S, 45°20'E], 23.VII.1951, ster., *Service Forestier 13891* (P). — Massif gréseux de l'Isalo, à l'ouest de Ranohira, [22°28'S, 45°20'E], 17-18.VI.1958, ster., *Service Forestier (Capuron) 18567bis* (P). — Isalo, Ilakaka, plaine, sol sablonneux, [22°41'S, 45°13'E], 23.VII.1955, ster., *Service Forestier 218-R-239* (P). — Tapia de l'Isalo, Canton de Ranohira, 21.VII.1954, ster., *Service Forestier 137-R-141* (P).

DESCRIPTION

Trees c. 4-10 m tall, bark thick, spongy. Twigs with stellate indumentum. Leaves elliptic to ovate or obovate, dark green and shiny above (paler in dry material), pale green below, subcoriaceous, 1.4-3.3(-4) × 1.2-2.1(-2.6) cm, with minute stellate indumentum on abaxial surface primarily along the midvein and secondary veins, nearly glabrous or sparsely stellate on adaxial surface (densely stellate in young leaves), especially on the midvein, apex

acute to nearly rounded, sometimes retuse, margin entire, minutely thickened, slightly revolute, base broadly rounded or slightly subcordate to cordate, venation brochidodromous, with 4 or 5 pairs of alternate to subopposite, prominent secondary veins joined by rounded arches, distinctly raised on abaxial surface, midrib weakly channeled above, raised below; petiole 2-4 mm long, with dense stellate indumentum; stipules lanceolate to broadly triangular, pale yellow green, membranous, with nearly obscure parallel venation, 3-4 × 1-1.5 mm, apex acute, base truncate, caducous, leaving a small scar. Inflorescence comprising 1 or 2 (rarely 3) unbranched axes, each with a pair of bracts borne near the middle and bearing 1 or 2 terminal flowers, or rarely a small raceme with 2 or 3 alternate branches, subtended by a pair of bracts, each bearing 1 or 2 flowers, axis 3-4(-6) mm long, densely papillose stellate-strigose, bracts broadly triangular to cordate or nearly circular, 2 × 1.5-2 mm, apex rounded to acute, papillose on both surfaces, with stellate indumentum along the margins, rarely caducous, ultimate axes below the involucre 1.5-2 mm long, densely papillose stellate, involucre in flower with 5 irregular lobes, densely papillose on both surfaces, with stellate indumentum along the margins of the teeth, containing 1 or 2 sessile flowers; sepals 3, imbricate, broadly ovate, adaxially concave, 4-5 × 4 mm at anthesis, glabrous on adaxial surface, with short stellate-papillose indumentum on abaxial surface, apex rounded to acute, margins entire; petals 5, spatulate, narrowed at base, slightly succulent in fresh material, chartaceous when dry, 5-6 × 3 mm, stellate on abaxial surface (sparsely stellate to glabrous toward margins), glabrous on adaxial surface, with minute white striations (in dry material), apex rounded to broadly acute; stamens c. 20, filaments slender, c. 3 mm long, glabrous, anthers elliptic to nearly circular, 0.3-0.4 mm long, introrse, dehiscent through apical to longitudinal slits; ovary broadly depressed ovoid in fresh material, to depressed globose in dry material, c. 1 mm in diam., densely white woolly tomentose, 3-locular; style cylindrical, very slightly curved at anthesis, c. 1.5 mm long, stigma terminal, circular, glabrous. Young fruit subglobose, 5-7 mm in diam., with dense papillose stellate indumentum, exocarp

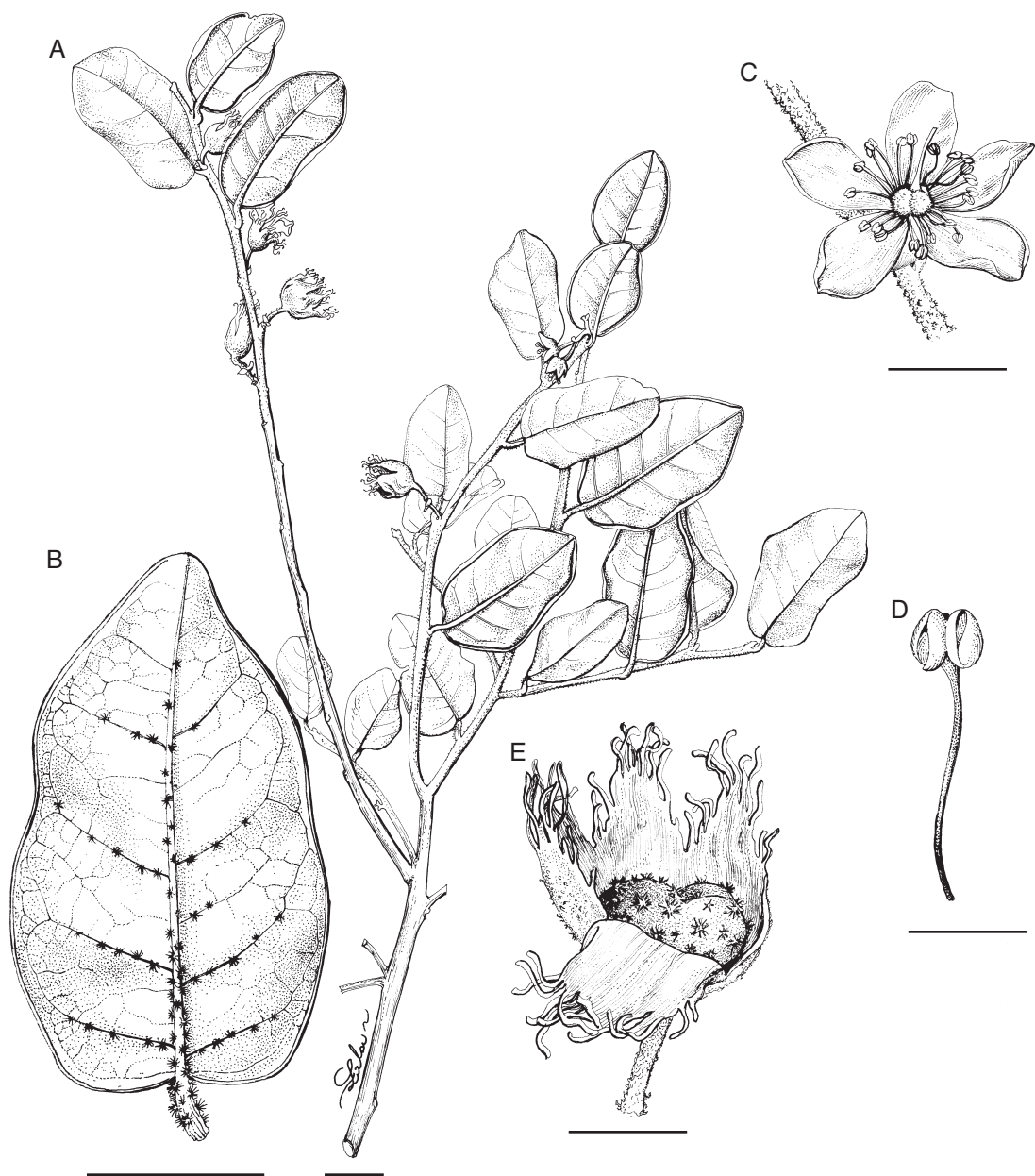


FIG. 1. — *Schizolaena isaloensis* Rabehevitra & Lowry, sp. nov.: **A**, fruiting branch; **B**, abaxial surface of leaf; **C**, flower; **D**, anther; **E**, immature fruit with developing involucre. *Randrianarivelo et al.* 254. Scale bars: A, B, 1 cm; C, 6 mm; D, 1 mm; E, 5 mm.

cartilaginous, rugose, dry sepals and filaments persistent; involucre expanded, broadly funnelform to somewhat cupuliform, hiding the fruit, light green

in fresh material, abaxial and adaxial surfaces sparsely glandular papillose, with 5 broadly ovate to narrowly elliptic, unequal lobes divided $\frac{1}{3}$ to $\frac{1}{2}$ of the

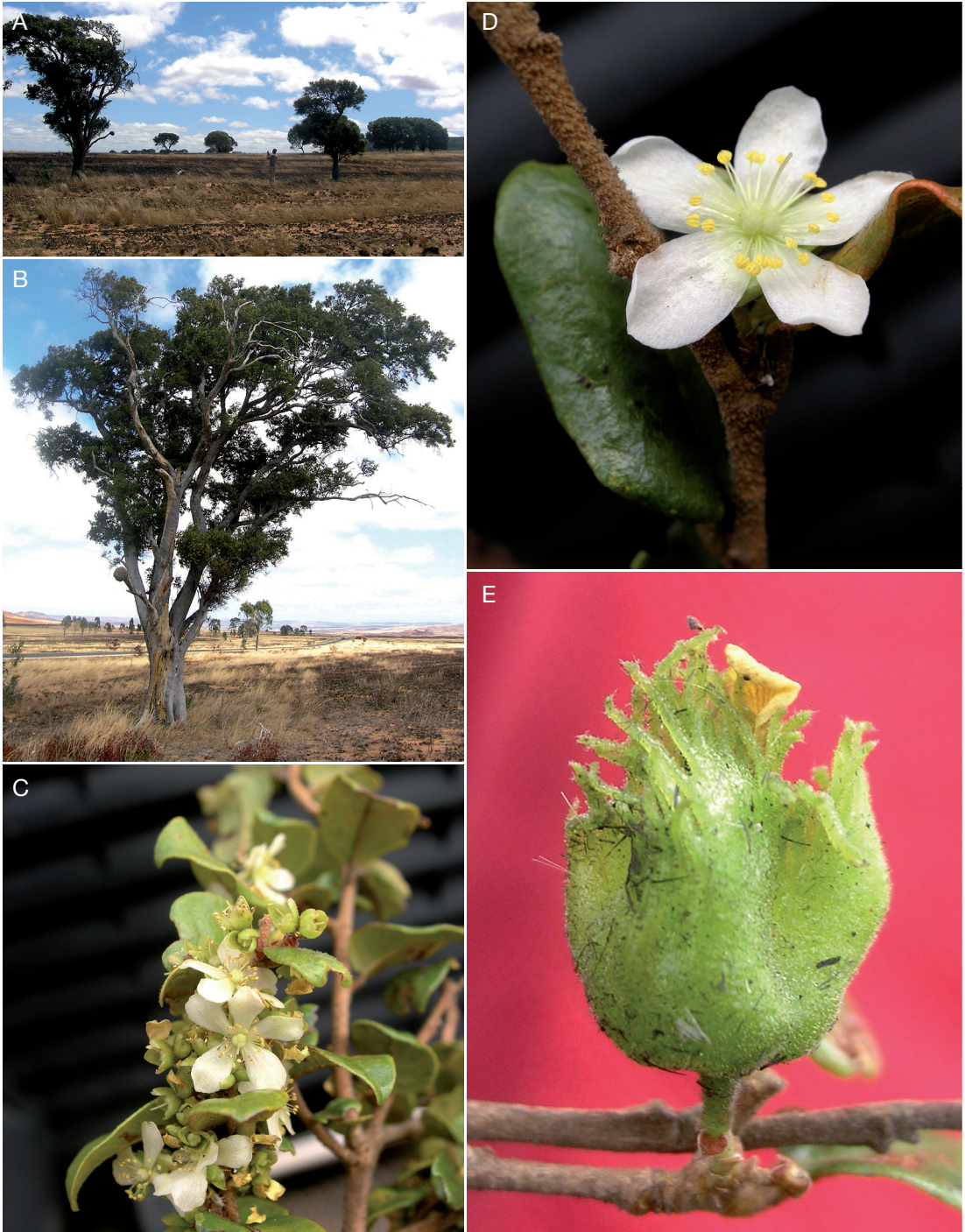


FIG. 2. — Photographs of *Schizolaena isaloensis* Rabehevitra & Lowry, sp. nov.: A, habitat; B, habit; C, inflorescence; D, flower; E, involucre surrounding young fruit (photos: D. Rabehevitra).

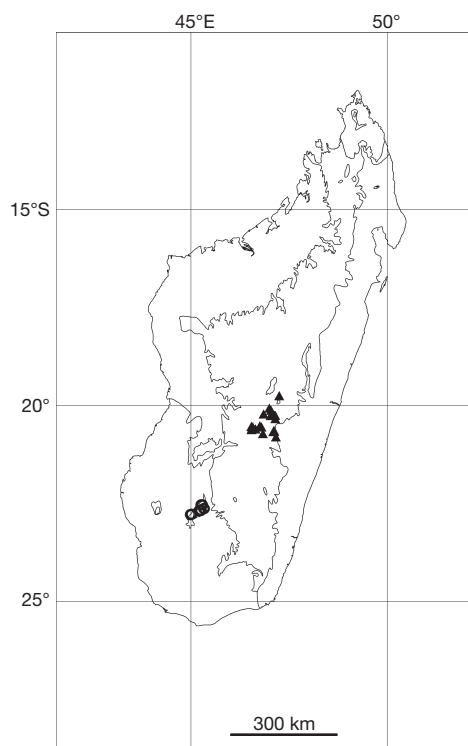


FIG. 3. — Distribution of *Schizolaena isaloensis* Rabehevitra & Lowry (○) and *S. microphylla* (▲), mapped on the bioclimatic zones of Madagascar (after Cornet 1974; see Schatz 2000).

way to the base, each lobe with 9-12(-14) narrowly cylindrical to filiform processes 2.5-4(-5) mm long; seeds 1 or 2 per locule, broadly spherical to ovoid, yellow, 3-4 mm long, 3-5 mm in diam., hylum depressed concave; mature fruit unknown.

REMARKS

A total of seven mature individuals of *Schizolaena isaloensis* were recorded at the site where the type material was collected, situated in open, highly degraded grassland (Fig. 2A) *c.* 4 km from the nearest remnant stand of *Tapia* woodland. Fewer than 30 adult plants of various sizes were observed at the only other recently recorded site *c.* 30 km to the NE where *Phillipson et al.* 5804 was collected. A careful survey of the type locality failed to reveal any seedlings or juvenile individuals. Moreover, observations made over the last several years by

botanists passing through the area indicate that it is subjected to regular annual burning, and while adult trees, with their thick and spongy bark, are clearly adapted to withstand fire, seedlings and young individuals apparently can not survive repeated burning, although some re-growth was observed at both sites, including from two trees that had been cut at the type locality.

The only fertile material of *Schizolaena isaloensis* (the type gathering) was collected late in Madagascar's dry season when very few species flower in this part of the country. Botanists passing through at this time of year typically do not stop to conduct field work, which may explain why no fertile collections of our new species had previously been gathered even though several large, isolated trees are easily visible from the main road.

Using the key to species of *Schizolaena* provided by Lowry *et al.* (1999), material of this new species would be identified as *S. microphylla* based on the small size of its leaves. These two taxa can, however, be distinguished from one another by several foliar and floral features, combined with their different substrate preferences and geographic distributions (Fig. 3), as summarized in the Table 1.

The Isalo area represents the southern limit of *Tapia* woodland, and it is possible that populations of *Schizolaena* once occurred at sites located between the known ranges of *S. isaloensis* and *S. microphylla*. If such populations existed, they may have comprised individuals that exhibited morphologies intermediate between these two species. However, since no plants have been recorded from anywhere within the *c.* 225 km distance separating *S. isaloensis* and *S. microphylla*, and in view of the unambiguous morphological differences that distinguish them, we consider it best to treat our new taxon as distinct at the species level.

CONSERVATION STATUS

Schizolaena isaloensis is currently known only from a very restricted area of highly disturbed anthropogenic grassland outside the southern limit of Isalo National Park, along Route Nationale 7, although a few collections made more than 50 years ago appear to have come from other nearby localities, including from within the park (Fig. 3). Fewer than

TABLE 1. — Characters distinguishing *Schizolaena isaloensis* Rabehevitra & Lowry from *S. microphylla* H.Perrier.

	<i>S. isaloensis</i>	<i>S. microphylla</i>
Leaf blade shape	elliptic to ovate or obovate	elliptic
Size of largest blade (cm)	(2.6-)2.9-4 × (1.5-)2-2.6	1.6-2.6(-3.5) × 1.1-2(-2.4)
Apex	acute to nearly rounded, sometimes retuse	rounded to retuse
Secondary venation on abaxial surface	prominent, raised	not prominent, lighter in colour than the blade
Indumentum		glabrous
adaxial surface	densely stellate in young leaves, sparsely so at maturity	
abaxial surface	densely stellate along midrib and secondary venation (occasionally glabrescent), less abundant elsewhere	glabrous or very sparsely stellate, mostly restricted to midrib
Petals	5-6 × 3 mm, spatulate, narrowed at base	5-6.5 × 3.5 mm, obovate, rounded to broadly cuneate at base
Substrate	sandstone and unconsolidated sand	quartzite, marble and gneiss
Distribution	near Ranohira and Isalo National Park	Ibity S to Ambatofitorahana

10 mature individuals occur at the locality where the type material was gathered, and another *c.* 25-30 trees were observed at the only other recently documented site. The absence of any seedlings or young individuals strongly suggests that no regeneration is occurring. The bark of mature trees showed clear signs of intense burning, reflecting the high level of disturbance in the area. Based on application of the IUCN (2001) threat criteria, we assign *S. isaloensis* a preliminary status of Critically Endangered (D) as the estimated population size is less than 50 individuals.

Acknowledgements

We wish to thank Roy Gereau for assistance with the Latin diagnosis, S. Andriambololonera for help with the threat assessment, R. Lala for the fine illustration, D. Bills for preparing the distribution map, and G. Schatz and T. Haevermans for valuable comments on an earlier version of the manuscript. Fieldwork was carried out as part of the *Atlas of the Vegetation of Madagascar* project in collaboration with the Royal Botanic Gardens, Kew, and was conducted under collaborative agreements between the Missouri Botanical Garden and the Parc botanique et zoologique de Tsimbazaza and the Direction de la Recherche forestière et piscicole, FOFIFA, Antananarivo, Madagascar. We gratefully acknowledge courtesies extended by the Government of Madagascar (Direction générale de

la Gestion des Ressources forestières). This research was conducted with support from the John D. and Catherine T. MacArthur Foundation, the Andrew W. Mellon Foundation, the US National Science Foundation (0743355), and LWO Inc.

REFERENCES

- CORNET A. 1974. — Essai de cartographie bioclimatique à Madagascar. *Notice explicative* 55, ORSTOM, Paris: 1-28.
- IUCN 2001. — *IUCN Red List Categories and Criteria*. Version 3.1. Prepared by the IUCN Species Survival Commission. IUCN, Gland, Switzerland, 30 p.
- LOWRY II P. P. & RABEHEVITRA D. 2006. — Endemic families of Madagascar. IX. A new littoral forest species of *Schizolaena* (Sarcolaenaceae). *Adansonia*, sér. 3, 28 (1): 149-153.
- LOWRY II P. P., SCHATZ G. E., LEROY J.-F. & WOLF A.-E. 1999. — Endemic families of Madagascar. III. A synoptic revision of *Schizolaena* (Sarcolaenaceae). *Adansonia*, sér. 3, 21 (2): 183-212.
- MOAT J. & SMITH P. 2007. — *Atlas of the Vegetation of Madagascar*. Royal Botanic Gardens, Kew, 124 p.
- SCHATZ G. E. 2000. — Endemism in the Malagasy tree flora, in LOURENÇO W. R. & GOODMAN S. M. (eds), Diversity and endemism in Madagascar. *Mémoires de la Société de Biogéographie*. Société de Biogéographie, MNHN, ORSTOM, Paris: 1-9.

Submitted on 20 December 2007;
accepted on 4 July 2008.