

Endemic families of Madagascar. XV.
A new critically endangered species
of *Schizolaena* Thouars (Sarcolaenaceae)
from northeastern Madagascar

Toky RALAINAORINA,
Chris BIRKINSHAW
& Porter P. LOWRY II



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Adansonia is a fast track journal published by the Museum Science Press, Paris

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ISSN (imprimé / *print*): 1280-8571/ ISSN (électronique / *electronic*): 1639-4798

Endemic families of Madagascar. XV. A new critically endangered species of *Schizolaena* Thouars (Sarcolaenaceae) from northeastern Madagascar

Toky RALAINAORINA
Chris BIRKINSHAW

Missouri Botanical Garden, Madagascar Research and Conservation Program
boîte postale 3391, Antananarivo 101 (Madagascar)
toky.ralainaorina@mobot.org (corresponding author)
chris.birkinshaw@mobot.org

Porter P. LOWRY II

Missouri Botanical Garden
4344 Shaw Blvd., St. Louis, MO 63110 (USA)
pete.lowry@mobot.org
and Institut de Systématique, Évolution, et Biodiversité (ISYEB)
Muséum national d'Histoire naturelle, Centre national de la recherche scientifique,
Sorbonne Université, École pratique des Hautes Études-Paris Sciences et Lettres,
Université des Antilles, case postale 39, 57 rue Cuvier, 75231 Paris cedex 05 (France)
porter.lowry@mnhn.fr

Submitted on 17 June 2025 | accepted on 19 November 2025 | published on 14 September 2026

Ralainaorina T., Birkinshaw C. & Lowry II. P. P. 2026. — Endemic families of Madagascar. XV. A new critically endangered species of *Schizolaena* Thouars (Sarcolaenaceae) from northeastern Madagascar. *Adansonia*, sér. 3, 48 (18): 197-204.
<https://doi.org/10.5252/adansonia2026v48a18> <http://adansonia.com/48/18>

ABSTRACT

KEY WORDS
Sarcolaenaceae,
Schizolaena impressa,
Ambatobiribiry,
Makirovana-
Tsihomanaomby,
impressed venation,
involucre,
ex situ conservation,
seedlings,
conservation status,
new species.

Schizolaena impressa Ralainaorina, Birkinshaw & Lowry, sp. nov. (Sarcolaenaceae) is newly described. It is known only from the degraded and highly threatened forest of the Ambatobiribiry Massif and the less impacted Makirovana-Tsihomanaomby protected area, both in the SAVA Region of northeastern Madagascar. It resembles two other members of the genus that also occur in the humid forests of this region, *S. masoalensis* Lowry, G.E. Schatz, J.-F. Leroy & A.-E. Wolf and *S. raymondii* Lowry & Rabehevitra, but differs in several characters, in particular the deeply impressed secondary venation on the upper surface of its leaves, as well as the granular structure of the involucre that surrounds and completely encloses the fruit, even when ripe. A preliminary assessment of its conservation status according to IUCN Red List criteria indicates that *S. impressa* Ralainaorina, Birkinshaw & Lowry, sp. nov. is Critically Endangered [CR].

RÉSUMÉ

MOTS CLÉS
Sarcolaenaceae,
Schizolaena impressa,
Ambatobiribiry,
Makirovana-
Tsihomanaomby,
nervation imprimée,
involucre,
conservation *ex situ*,
plantules,
statut de conservation,
espèce nouvelle.

Familles endémiques de Madagascar. XV. Une espèce nouvelle de Schizolaena Thouars (Sarcolaenaceae) du nord-est de Madagascar en danger critique d'extinction.

Schizolaena impressa Ralainaorina, Birkinshaw & Lowry, sp. nov. (Sarcolaenaceae) est nouvellement décrite. Elle est connue uniquement de la forêt dégradée et hautement menacée du massif d'Ambatobiribiry et de l'aire protégée de Makirovana-Tsihomanaomby, moins impactée, les deux situées dans la région SAVA au nord-est de Madagascar. Cette espèce ressemble à deux autres membres du genre qui se trouvent également dans les forêts humides de cette région, *S. masoalensis* Lowry, G.E. Schatz, J.-F. Leroy & A.-E. Wolf et *S. raymondii* Lowry & Rabehevitra, mais en diffère par plusieurs caractères, en particulier la nervation fortement imprimée sur la face supérieure des feuilles, ainsi que la structure granuleuse de l'involucre qui entoure et renferme complètement le fruit, même à maturité. Une analyse préliminaire du statut de conservation selon les critères de la Liste rouge de l'UICN indique que *S. impressa* Ralainaorina, Birkinshaw & Lowry, sp. nov. est en Danger critique d'extinction [CR].

INTRODUCTION

This is the fifteenth in a series of papers focusing on Madagascar's endemic plant families, which began in 1998 with a synoptic revision of the genus *Melanophylla* Baker (Schatz *et al.* 1998), placed at the time in its own family, Melanophyllaceae Takht. ex Airy Shaw, but subsequently transferred to the more widespread family Torricelliaceae H. H. Hu (Plunkett *et al.* 2018). Since then, revisions have been published for 10 other genera belonging to three more endemic families, viz. Asteropeiaceae Takht. ex Reveal & Hoogland (Schatz *et al.* 1999b), Sarcolaenaceae Caruel (Lowry *et al.* 1999, 2000; Schatz *et al.* 2000, 2001; Lowry *et al.* 2002; Hong-Wa 2009), and Sphaerosepalaceae Tiegh. ex Bullock (Schatz *et al.* 1999a). Subsequent to the publication of these revisions, extensive field work conducted in Madagascar over the last several decades has generated large amounts of new material, including collections of eight additional new species described in some of these genera (Lowry & Rabehivitra 2006; Schatz & Lowry 2006; Rabehivitra & Lowry 2009; Lowry *et al.* 2014, 2019; Andriamihajarivo *et al.* 2016). In this paper, we add to this growing list with the description of a new, distinctive, and highly threatened species of *Schizolaena* Thouars (Sarcolaenaceae) recently discovered in north-eastern Madagascar.

In 2003, the Ambatobiribiry Forest in NE Madagascar was identified as one of 79 “orphan” Priority Areas for Plant Conservation (PAPCs) in Madagascar (Missouri Botanical Garden 2005). At the time, it covered an area of c. 622 hectares and its designation as a site of botanical importance was based on a unique combination of environmental parameters including geology (basalt), elevation (0–336 m), and bioclimate (humid), supported by results from limited botanical inventory work (117 collections) conducted mostly during colonial times, which suggested that Ambatobiribiry had a diverse flora, including local endemics such as *Chouxia macrophylla* G.E. Schatz, Gereau & Lowry (Sapindaceae) and *Calantica sphaerocephala* Appleq., Phillipson & G.E. Schatz (Salicaceae) (Schatz *et al.* 1999; Applequist *et al.* 2014), as well as several undescribed species.

Sadly, despite the identification of Ambatobiribiry as a PAPC, no conservation actions were undertaken at the site. By 2018, only about 150 ha of forest remained and deforestation was continuing unabated, so with some urgency, funds were obtained for fieldwork to inventory what remained of the forest and collect seeds of all native species encountered so they could be used for *ex-situ* conservation. During this work, material was collected that clearly belonged to *Schizolaena* but could not be identified to any described species. After obtaining additional material and carefully comparing it with available herbarium specimens of the published members of the genus, it became clear that it represents a new species, which we describe here.

MATERIAL AND METHODS

Field work was conducted following standard inventory methods used in Madagascar by the Missouri Botanical Garden. Each forest fragment in the Ambatobiribiry area was visited at various times of year according to a planned schedule in order to maximize the number of fertile plants encountered and thereby ensure optimal sampling. Specimens were prepared using the protocol described in Dold *et al.* (2000). Detailed field notes were entered into the Tropicos® database along with photos of living material; leaf samples were also collected in silica gel and deposited at MBG's DNA Bank. Dried specimens were compared with material in the herbaria of the Parc Botanique et Zoologique de Tsimbazaza (TAN) and the Muséum national d'Histoire naturelle in Paris (P) as well as images available on JSTOR, and an initial identification was attempted using the available taxonomic literature. The terminology used for the description of the new species published here follows Harris & Harris (2001). Most measurements were taken from dried specimens, although for certain structures (in particular flowers), rehydrated material was used.

A provisional risk of extinction assessment was conducted based on the IUCN Red List Categories and Criteria (IUCN 2012) and Guidelines (IUCN Standards and Petitions Committee 2024), for which the area parameters of Extent of Occurrence (EOO) and Area of Occupancy (AOO) were calculated using GeoCAT (Bachman *et al.* 2011).

HERBARIUM ABBREVIATIONS

G	Jardin botanique de Genève, Genève;
K	Royal Botanic Gardens, Kew;
MO	Missouri Botanical Garden, Saint Louis;
P	Muséum national d'Histoire naturelle, Paris;
TAN	Parc botanique et zoologique de Tsimbazaza, Herbar de Tananarive, Madagascar.

SYSTEMATICS

Family SARCOLAENACEAE Caruel

Genus *Schizolaena* Thouars

Schizolaena impressa

Ralainarina, Birkinshaw & Lowry, sp. nov.

(Figs 1; 2; 4; Table 1)

DIAGNOSIS. — *Schizolaena impressa* Ralainarina, Birkinshaw & Lowry, sp. nov. most closely resembles *S. masoalensis* Lowry, G.E. Schatz, J.-F. Leroy & A.-E. Wolf and *S. raymondii* Lowry & Rabehivitra but differs in having leaves with an oblong to obovate, asymmetrical blade (vs ovate to elliptic in *S. masoalensis* and elliptic to slightly obovate in *S. raymondii*), the largest measuring 5–6(–7) × 2–3 cm (vs 7–9.5 × 4–4.5 cm in *S. masoalensis* and 5.5–7.5 × 2.8–4.4 cm in *S. raymondii*), and deeply impressed secondary venation on the upper surface (vs slightly raised in *S. masoalensis* and *S. raymondii*), inflorescences with a peduncle 21.5–33.5(–35.5) mm long (vs 6.5–8.5 × 3.5–4 mm in *S. masoalensis* and 5–7.5 × 2.5–3.2 mm in *S. raymondii*), a calyx with short

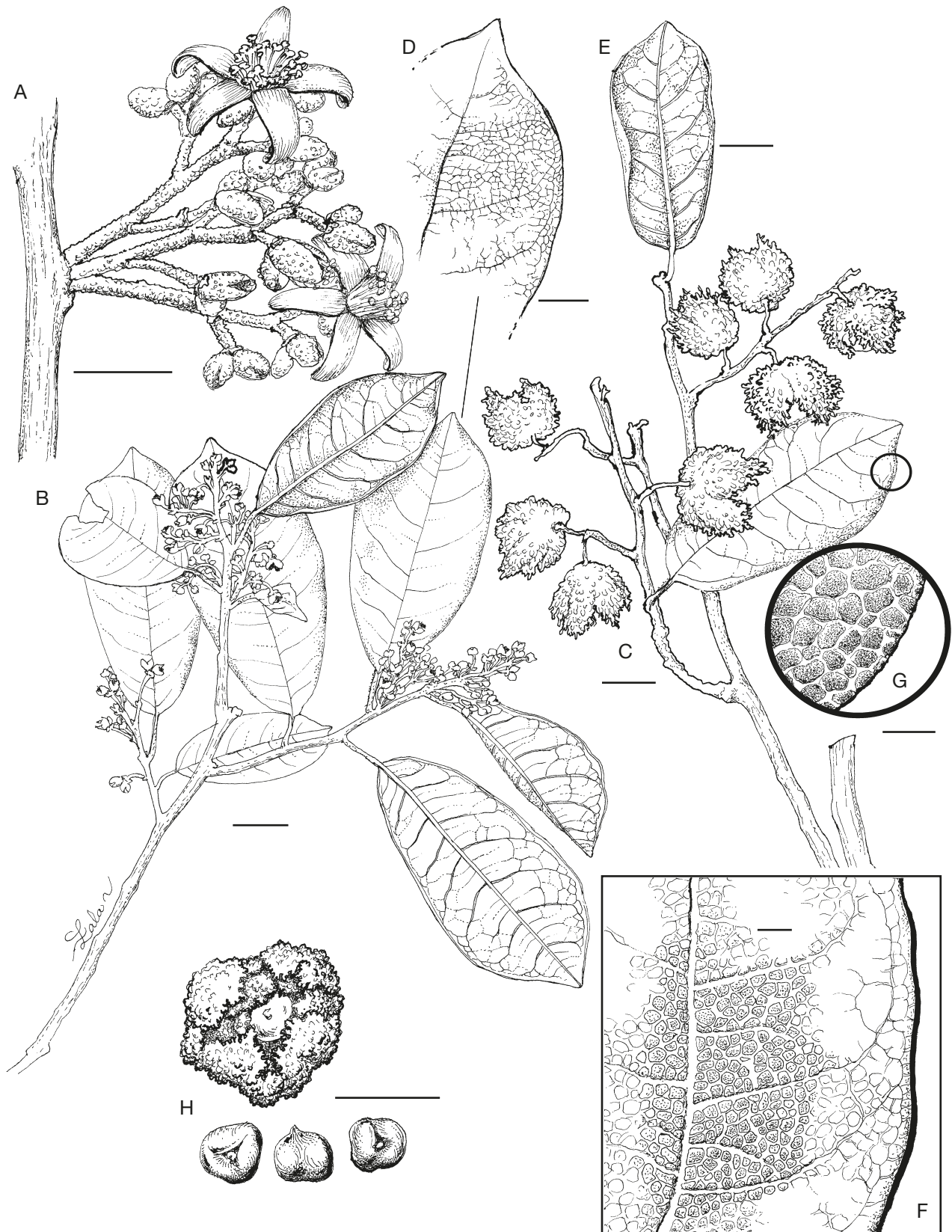


FIG. 1. — *Schizolaena impressa* Ralainarina, Birkinshaw & Lowry, sp. nov.: **A**, inflorescence with two open flowers; **B**, flowering branch; **C**, fruiting branch; **D**, adaxial leaf surface; **E**, abaxial leaf surface; **F**, detail of adaxial leaf surface; **G**, close-up of adaxial leaf surface; **H**, mature fruit covered by involucre and seeds. Scale bars: A, 3 cm; B, C, E, H, 1 cm; D, 5 mm; F, G, 1 mm. Drawing by Roger Lala Andriamiarisoa.

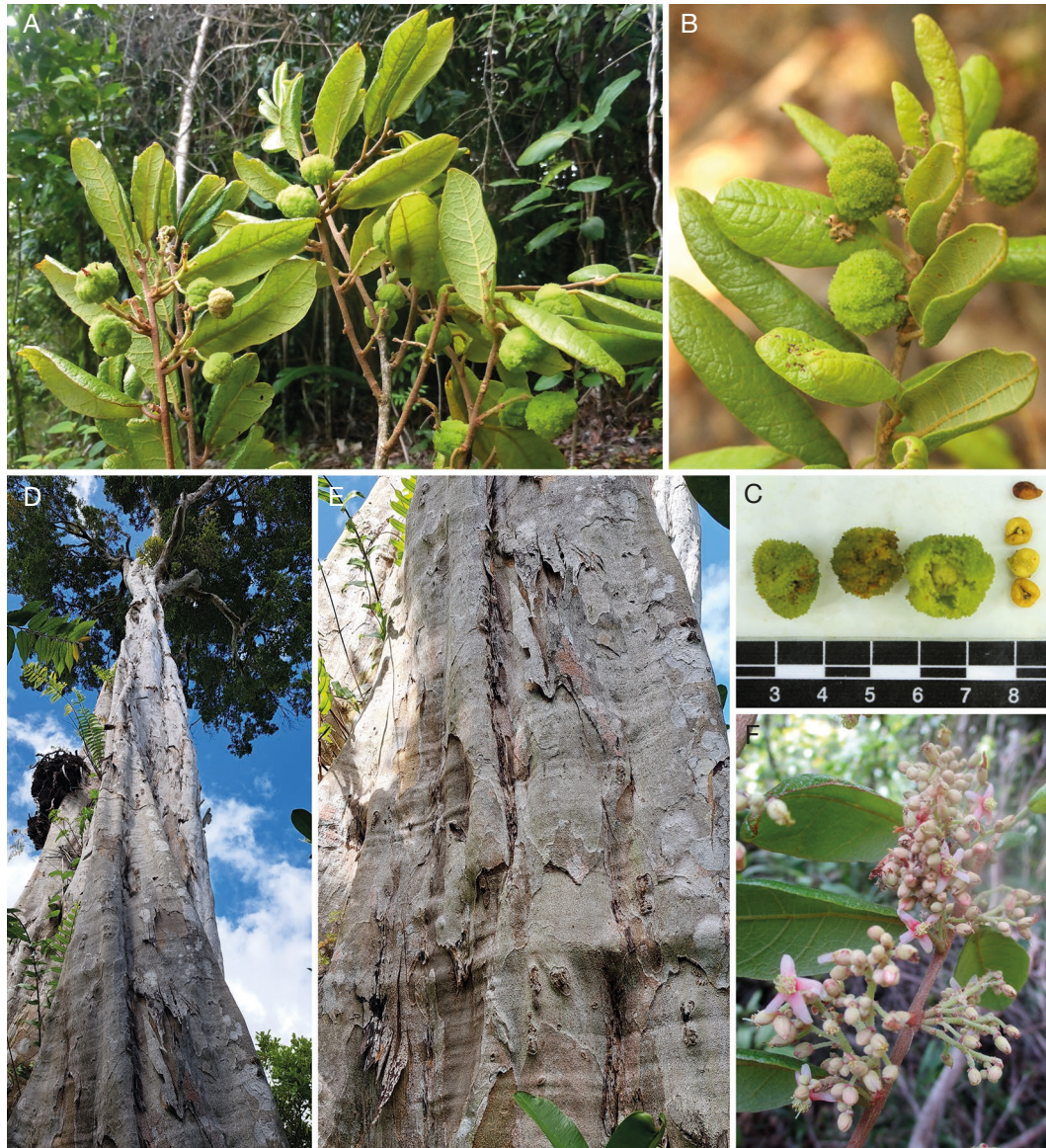


FIG. 2. — Photos of *Schizolaena impressa* Ralainaorina, Birkinshaw & Lowry, sp. nov.: **A**, branch with nearly mature involucres surrounding fruits; **B**, detail of branch with nearly mature involucres (note impressed venation on adaxial leaf surface); **C**, nearly mature involucres containing fruits, with removed seeds; **D**, trunk and crown of tree (c. 25 m in height); **E**, detail of bark on lower portion of trunk; **F**, inflorescence with a few open flowers. Photos: A, D. Ravelonarivo (*Ravelonarivo et al.* 5005); B-C, C. Birkinshaw (*Birkinshaw* 2301); D-E, T. Ralainaorina (*C. Rakotonirina* 1167); F, C. Rakotonirina (*C. Rakotonirina* 1204).

stellate-papillose indument on the abaxial surface (vs densely woolly villous in *S. masoalensis* and short stellate-villous in *S. raymondii*), petals 3–4 mm long (vs 5–6 mm in *S. masoalensis* and 7–(8) mm in *S. raymondii*), a subglobose fruit at maturity 5–6 mm in diameter (vs subglobose, 14–16 mm diam. in *S. raymondii* and unknown in *S. masoalensis*) that is entirely covered and obscured by the expanded, granular, broadly funnellform to somewhat cupuliform involucre (vs involucre broadly cupulate to funnellform and fleshy in *S. raymondii*, and unknown in *S. masoalensis*).

TYPE MATERIAL. — **Madagascar** • SAVA region [Antsiranana Prov.], Dist. Sambava, Fir. Anjangoveratra, Fkt. Seranampotaka, Andohananjombalava, forêt d’Antsahakasaka, forêt de basse altitude; [14°05’56”S, 50°02’38”E](#); 236 m alt.; 10.XII.2022; fr.; Martial leg.; T. Ralainaorina & P. P. Lowry II det.; *Martial* 1715; holotype: TAN!; isotype: G[G00341900]!, K!, MO!, P[P00722748]!

PARATYPES. — **Madagascar** • SAVA region [Antsiranana Prov.], Dist. Sambava, Commune de Bemanevika, Fokontany d’Antsahakajohy, formation végétale de forêt de basse altitude, forêt d’Anjombavolo, fragment de forêt; [14°11’36”S, 50°04’18”E](#); 114 m alt.; 10.XI.2021; fr.; Martial *et al.* leg.; T. Ralainaorina det.; *Martial et al.* 1320; MO, P, TAN • Commune d’Anjangoveratra, Fokontany Seranampotaka, Andohananjombalava, forêt d’Antsahakasaka, forêt de basse altitude; [14°05’56”S, 50°02’38”E](#); 236 m alt.; 10.XII.2022; fr.; Martial leg.; T. Ralainaorina & P. P. Lowry II det.; *Martial* 1715; MO, P, TAN • Rural town Bemanevika, Antsakajohy, fragmented and degraded forest of Ambatobiribiry, humid evergreen forest; [14°10’37”S, 50°05’08”E](#); 161 m alt.; 24.XI.2022; fr.; Birkinshaw *et al.* leg.; T. Ralainaorina & P. P. Lowry II det.; *Birkinshaw et al.* 2301; MO, P, TAN • Fokontany d’Antsahakajohy, forêt de basse altitude d’Anjombavolo, fragment de forêt; [14°10’37”S, 50°05’08”E](#); 136 m alt.; fr.; 13.XI.2021; C. Rakotonirina *et al.* leg.; T. Ralainaorina & P. P. Lowry II det.; *C. Rakotonirina et al.* 832; MO,

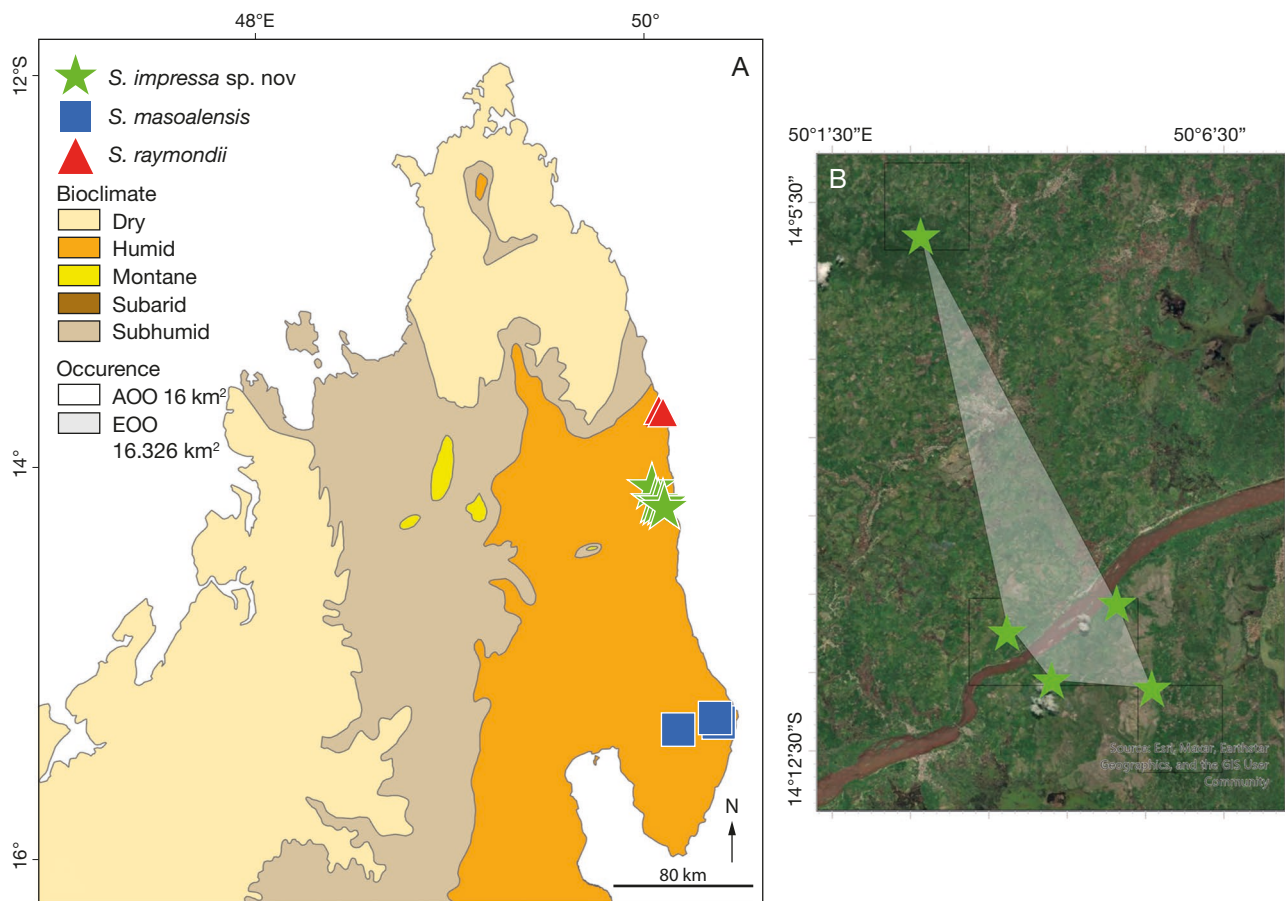


FIG. 3. — Geographic distribution of *Schizolaena impressa* Ralainaoarina, Birkinshaw & Lowry, sp. nov.: **A**, distributions of *S. impressa* (★), *S. masoalensis* Lowry, G.E. Schatz, J.-F. Leroy & A.-E. Wolf (■), and *S. raymondii* Lowry & Rabehevitra (▲), mapped on the bioclimatic zones of Madagascar (after Cornet 1974); **B**, precise location of known occurrences of *S. impressa* sp. nov. at Ambatobiribiry (4 sites in the south) and Makirovana-Tsihomanaomby (1 site in the north). Source: Esri, Maxar Earthstar Geographics, and the GIS User Community.



FIG. 4. — Seedlings of *Schizolaena impressa* Ralainaoarina, Birkinshaw & Lowry, sp. nov. **A**, seedlings associated with *Martial 1715* collected at Tsihomanaomby forest, growing at the Tzaratanana nursery; **B**, seedling associated with *Martial 1715* collected at Tsihomanaomby, growing in the field gene bank at Anjangoveratra. Photos: A, T. Ralainaoarina; B, C. Birkinshaw.

P, TAN • Antsakajoy, forêt d'Ambatobiribiry, forêt de basse altitude; 14°11'35"S, 50°04'18"E; 104 m alt.; 30.V.2022; fl.; C. Rakotonirina *et al.* leg.; T. Ralainaorina & P. P. Lowry II det.; C. Rakotonirina 1164; MO, P, TAN • Antsakajoy, forêt de basse altitude; 14°10'37"S, 50°05'08"E; 147 m alt.; ster.; 22.VII.2022; C. Rakotonirina *et al.* leg.; T. Ralainaorina & P. P. Lowry II det.; C. Rakotonirina *et al.* 1166; MO, P, TAN • same data; 14°11'36"S, 50°04'18"E; 109 m alt.; ster.; 29.VIII.2021; C. Rakotonirina *et al.* leg.; T. Ralainaorina & P. P. Lowry II det.; C. Rakotonirina *et al.* 1167; MO, P, TAN • same data; 14°10'37"S, 50°05'08"E; 136 m alt.; bud; 29.VIII.2021; C. Rakotonirina *et al.* leg.; T. Ralainaorina & P. P. Lowry II det.; C. Rakotonirina *et al.* 1176; MO, P, TAN • same data; 14°11'36"S, 50°04'18"E; 109 m alt.; ster.; 30.VIII.2021; C. Rakotonirina *et al.* leg.; T. Ralainaorina & P. P. Lowry II det.; C. Rakotonirina *et al.* 1184; MO, P, TAN • same data; 14°10'37"S, 50°05'08"E; 141 m alt.; fl.; 25.IX.2022; C. Rakotonirina *et al.* leg.; T. Ralainaorina & P. P. Lowry II det.; C. Rakotonirina 1204; MO, P, TAN • same data; 14°10'52"S, 50°05'09"E; 257 m alt.; ster.; 26.IX.2022; C. Rakotonirina *et al.* leg.; T. Ralainaorina & P. P. Lowry II det.; C. Rakotonirina *et al.* 1221; MO, P, TAN • Fokontany Antsakajohy, forêt Ankatribe, Ambatobiribiry; 14°10'59"S, 50°03'44"E; 145 m alt.; y. fr.; 20.X.2022; C. Rakotonirina *et al.* leg.; T. Ralainaorina & P. P. Lowry II det.; C. Rakotonirina *et al.* 1255; MO, P, TAN • 14°11'42"S, 50°05'35"E; 163 m alt.; ster.; 20.X.2022; C. Rakotonirina *et al.* leg.; T. Ralainaorina & P. P. Lowry II det.; C. Rakotonirina *et al.* 1264; MO, TAN • 14°10'37"S, 50°05'08"E; 146 m alt.; ster.; 06.I.2023; C. Rakotonirina *et al.* leg.; T. Ralainaorina & P. P. Lowry II det.; C. Rakotonirina *et al.* 1275; MO, P, TAN • commune de Bemanevika, Fokontany d'Antsakajohy, forêt de basse altitude d'Anjombavolo; 14°10'51"S, 50°03'43"E; 203 m alt.; fr.; 11.XI.2021; D. Ravelonarivo *et al.* leg.; T. Ralainaorina det.; D. Ravelonarivo *et al.* 5005; MO, P, TAN.

PHENOLOGY. — *Schizolaena impressa* Ralainaorina, Birkinshaw & Lowry, sp. nov. has been collected in flower in March and May, and fruiting material has been collected from September to November.

DISTRIBUTION AND ECOLOGY. — *Schizolaena impressa* Ralainaorina, Birkinshaw & Lowry, sp. nov. is known from only five site occurrences in northeastern Madagascar, four in remnant forest patches of Ambatobiribiry c. 12 air-km to the NW of Sambava, and one in the Makirovana-Tsihomanaomby protected area located another 10 air-km farther to the NNW (Fig. 3). It occurs in humid forest at elevations of c. 100–260 m, and grows on substrates derived from igneous rocks, such as basalt and gabbro.

CONSERVATION STATUS. — *Schizolaena impressa* Ralainaorina, Birkinshaw & Lowry, sp. nov. was collected for the first time in the small, fragmented, degraded, and threatened forest patch that occurs on the Ambatobiribiry Massif, which today occupies a total of c. 108 ha. Four mature trees were located there, but a thorough search of the entire area failed to reveal any other mature plants or any young individuals. The primary threats to the forest at Ambatobiribiry include vanilla cultivation and illegal logging. The practice of cultivating vanilla results in openings in the canopy that cause desiccation of the remaining vegetation and enable freer flow of wind, increasing the intensity and extent of wildfires. Lemur species have been noted to feed on the fruits of several *Schizolaena* species (Eppley *et al.* 2022) and likely serve as seed dispersers, including of *S. impressa* Ralainaorina, Birkinshaw & Lowry, sp. nov., so unsustainable hunting of lemurs at Ambatobiribiry, which has almost led to their extinction, can be projected to compromise regeneration. Following our inventory work at Ambatobiribiry, five more mature individuals of *Schizolaena impressa* Ralainaorina, Birkinshaw & Lowry, sp. nov. were located within the Makirovana-Tsihomanaomby protected area situated about 10 air-km to the NNW. Detailed searches in this area did not reveal any other adult trees, although given that the forested area is more extensive at this site, covering a total of c. 2650 ha, it is possible that additional individuals occur in this subpopulation. However, no signs of natural regeneration were

recorded, and Makirovana-Tsihomanaomby faces the same threats as Ambatobiribiry, albeit much attenuated because it is a formally designated and managed protected area.

Schizolaena impressa Ralainaorina, Birkinshaw & Lowry, sp. nov. has a geographic range in the form of an EOO of 16.3 km² and an AOO of 16 km². It is known from 15 georeferenced collections that represent five sites of occurrence (Fig. 3), all of which are subjected to threats, primarily due to forest degradation for vanilla cultivation, resulting in continuing decline in habitat quality and likely also in number of mature individuals. With respect to the most serious plausible threat (forest degradation), the distribution of *S. impressa* sp. nov. comprises five locations and the species would therefore qualify for Endangered status under IUCN Red List Criterion B (IUCN 2012). However, with just nine mature individuals known from these sites, application of Criterion D results in a provisional assessment of Critically Endangered (CR D).

ETYMOLOGY. — The name chosen for this species reflects the fact that its leaves have distinctively impressed venation on the upper surface (Figs 1E, 2B).

VERNACULAR NAME. — Voandrozana (*C. Rakotonirina et al.* 1275).

DESCRIPTION

Trees c. 9–30 m tall. Twigs with stellate indumentum. Leaves oblong to obovate, asymmetrical, dark green and shiny above (discolorous in dry material), pale green below, subcoriaceous, 5–6(–7) × 2–3 cm, with stellate indumentum on adaxial surface primarily along the midvein, secondary and tertiary veins, densely pubescent with stellate indumentum on abaxial surface, apex acute to nearly rounded, sometimes retuse, margin entire, slightly revolute (sinuate in dry material), base obtuse, asymmetrical, venation brochidodromous, veins prominent on both surfaces, slightly darker on adaxial surface, with 8 to 11 pairs of alternate to subopposite, prominent secondary veins joined by rounded arches, distinctly raised on abaxial surface, impressed on adaxial surface, midrib weakly channeled above, raised below; petiole 6.6–10(–12) mm long, with dense stellate indumentum; stipules intra-petiolar, lanceolate to broadly triangular, pale yellowish white, densely pubescent, 1–1.8 × 0.5–0.7 mm, apex acute, base truncate, caducous, leaving a small scar. Inflorescence axillary, a branched panicle with 2 or 3 branches, each with a basal bract and a pair of bracts borne near the middle and bearing 1 or 2 terminal flowers, axes c. 21.5–33.5(–35.5) mm long, densely stellate pubescent, bracts broadly triangular to cordate or nearly circular, 1.8 × 0.5–1 mm, apex rounded to acute, papillose on both surfaces, with stellate indumentum along the margins, rarely caducous, ultimate axes below the involucre 1–1.5 mm long, densely stellate-papillose, involucre in flower with 5 irregular lobes, densely papillose on both surfaces, with outgrowths on the upper surface bearing stellate indumentum, containing 1 or 2 sessile flowers; sepals 3, imbricate, broadly ovate, adaxially concave, 2–3 × 2 mm at anthesis, glabrous on adaxial surface, with short stellate-papillose indumentum on abaxial surface, apex rounded to acute, margins entire; petals 5, oblong, slightly succulent when fresh, chartaceous when dry, 3–4 × 2 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 slightly

TABLE 1. — Characters distinguishing *Schizolaena impressa* Ralainaoarina, Birkinshaw & Lowry, sp. nov. from the two species it most closely resembles, *S. masoalensis* Lowry, G.E. Schatz, J.-F. Leroy & A.-E. Wolf and *S. raymondii* Lowry & Rabehevitra.

	<i>S. impressa</i> sp. nov.	<i>S. masoalensis</i>	<i>S. raymondii</i>
Leaf shape and secondary venation on adaxial surface	oblong to obovate, asymmetrical, secondary venation deeply impressed	ovate to elliptic, secondary venation slightly raised	elliptic to slightly obovate, secondary venation slightly raised
Size of largest leaf blade (cm)	5-6(-7) × 2-3	7-9.5 × 4-4.5	5.5-7.5 × 2.8-4.4
Peduncle length (mm)	21.5-33.5(-35.5)	10-15	(4)-7-11
Calyx indumentum (abaxial surface)	short stellate-papillose	densely woolly villous	short stellate-villous
Petal length (mm)	3-4	5-6	7(-8)
Fruit shape, size	subglobose, 5-6 mm in diam.	not known	subglobose, 14-16 mm diam.
Involucre in fruit	granular, broadly funnelform to somewhat cupuliform, entirely covering and obscuring the fruit	not known	sparsely stellate pubescent, broadly cupulate to funnelform, surrounding but not totally obscuring the fruit
Distribution	Ambatobiribiry, Makirovana-Tsihomanaomby	Masoala Peninsula	Manakana

elliptic to nearly circular, 0.3-0.4 mm long, introrse, dehiscent by apical to longitudinal slits; ovary broadly depressed ovoid in fresh material, 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. Nearly mature fruit subglobose, 5-6 mm in diam., with dense stellate-papillose indumentum, exocarp cartilaginous, rugose, dry sepals and filaments persistent; involucre expanded, granular, broadly funnelform to somewhat cupuliform, completely obscuring the fruit, light green in fresh material, abaxial surface covered with numerous thick processes, adaxial surface sparsely glandular papillose, involucre with 5 broadly ovate to narrowly elliptic, unequal lobes divided $\frac{1}{3}$ to $\frac{1}{2}$ of the way to the base, each lobe with 9 to 12 filiform processes, (1-)2-4 mm long; seeds 1 or 2 per locule, broadly spherical to ovoid, yellow, 3-4 mm long, 3-5 mm in diam., hilum depressed concave.

NOTES

Using the key to species of *Schizolaena* provided by Lowry *et al.* (1999) and the information in Lowry & Rabehevitra (2006), material of this new species would be identified as either *S. masoalensis* Lowry, G.E. Schatz, J.-F. Leroy & A.-E. Wolf or *S. raymondii* Lowry & Rabehevitra, both of which also occur in northeastern Madagascar. These three taxa can, however, be distinguished from one another by several morphological features, as summarized in the Table 1, as well as differences in their substrate preferences and geographic distributions (Fig. 3). However, what most strikingly distinguishes *S. impressa* Ralainaoarina, Birkinshaw & Lowry, sp. nov. is the fact that its mature fruit is entirely covered by the expanded, granular, broadly funnelform to somewhat cupuliform involucre that encloses and totally obscures the fruit, which is easily observed in the field.

Given the precarious status of *Schizolaena impressa* Ralainaoarina, Birkinshaw & Lowry, sp. nov., efforts are being made to ensure the survival of this highly threatened species by means of *ex-situ* conservation methods. Seeds collected from the two subpopulations at Ambatobiribiry and Makirovana-

Tsihomanaomby have been propagated and the resulting seedlings have been out-planted in the Field Gene Bank at Makirovana-Tsihomanaomby (located in the grounds of the secondary school at Anjangoveratra) and in the *ex-situ* conservation collection at Parc Ivoloïna (situated close to Tomasina in east-central Madagascar). Currently 15 young plants of *Schizolaena impressa* Ralainaoarina, Birkinshaw & Lowry, sp. nov. are growing at Makirovana-Tsihomanaomby and at Ivoloïna, the tallest of which has reached 39 cm in height.

Acknowledgements

The fieldwork conducted in the forest fragments on Ambatobiribiry Massif that led to the discovery of the new species described here was supported by a grant from the National Geographic Society (NGS-73402R-20, CB as PI), and additional searches for this species at Makirovana-Tsihomanaomby as well as work to collect and propagate seeds were supported both by the *Fondation Franklinia* and the U.K. Government's Biodiverse Landscape Fund. We thank the Coordinator of the MBG-Madagascar Conservation Unit, Jeannie Raharimampionona, and the manager of the Makirovana-Tsihomanaomby protected area, Dorian Andriandrainy, for logistical support; field botanists Desiré Ravelonarivo, Martial and Casmir Rakotonirina for their important contributions to field work; Roger Lala Andriamiarisoa for the excellent illustration; and the curators of the following herbaria for providing access to their collections: MO, P and TAN. We gratefully acknowledge courtesies extended by the Government of Madagascar (ministère de l'Environnement et Développement Durable, permits no. 044/21/MEDD/SG/DGGE/DAPRNE/SCBE.Re and 429/21/MEDD/SG/DGGE/DAPRNE/SCBE.Re). The referees of the article Louis Nusbaumer (Conservatoire et Jardin botaniques de Genève and University of Geneva), Gregory Wahlert (University of California Santa Barbara Cheadle Center for Biodiversity and Ecological Restoration) and Thierry Deroin (MNHN) are also thanked for the valuable comments and suggestions they provided on a previous version of the manuscript.

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Submitted on 17 June 2025;
accepted on 19 November 2025;
published on 14 September 2026.