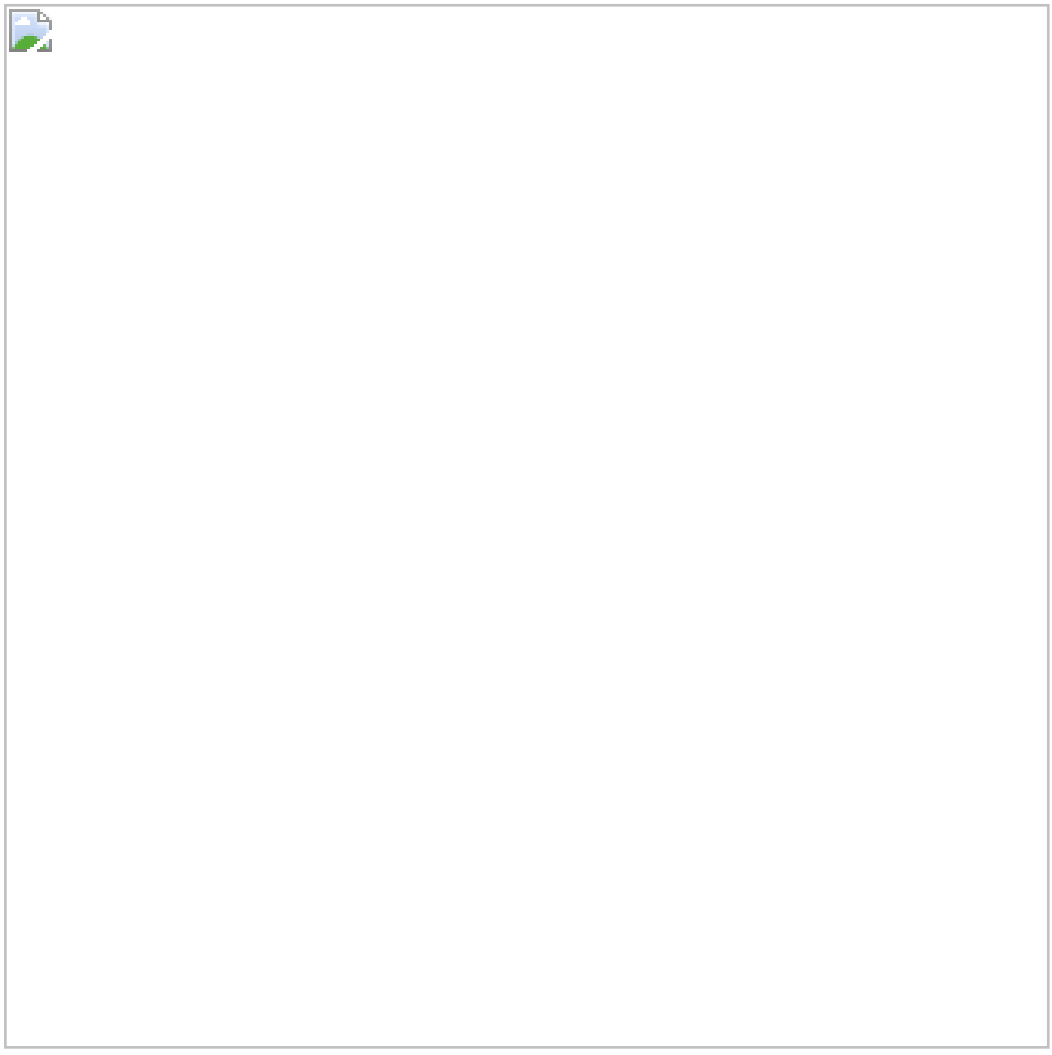

A new species of Linderniella (Linderniaceae) from central Malagasy granitic inselbergs

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A new species of Linderniella (Linderniaceae) from central Malagasy granitic inselbergs

Roger Lala Andriamiarisoa, Marina N. Rabarimanarivo & Stefan Porembski

Abstract

ANDRIAMIARISOA, R.L., M.N. RABARIMANARIVO & S. POREMBSKI (2023). A new species of Linderniella (Linderniaceae) from central Malagasy granitic inselbergs. *Candollea* 78: 11–15. In English, English and French abstracts. DOI: http://dx.doi.org/10.15553/c2023v781a2

A rupicolous, resurrection, inselberg specialist plant is newly described and illustrated. *Linderniella porembskii* Andriamiar. & Rabarim. (*Linderniaceae*) is restricted to central Malagasy granitic inselbergs in the Amoron'i Mania Region. It differs from the other Malagasy species of the genus by its habit with dense and richly branched stems, decumbent to erect, and by being glabrous to glabrescent and having obovoid-acuminate capsule. A detailed description of the species is provided, accompanied by illustrations and an identification key to the Malagasy species of the genus. The new species is assessed as "Endangered" using to IUCN Red List Categories.

Résumé

ANDRIAMIARISOA, R.L., M.N. RABARIMANARIVO & S. POREMBSKI (2023). Une nouvelle espèce de Linderniella (Linderniaceae) des inselbergs granitiques du centre de Madagascar. *Candollea* 78: 11–15. En anglais, résumés anglais et français. DOI: http://dx.doi.org/10.15553/c2023v781a2

Une plante rupicole, reviviscente, spécialistes des inselbergs est nouvellement décrite et illustrée. *Linderniella porembskii* Andriamiar. & Rabarim. (*Linderniaceae*) est restreinte aux inselbergs granitiques du centre de Madagascar, dans la Région d'Amoron'i Mania. Elle se distingue des autres espèces malgaches du genre par son port herbacé avec des tiges richement ramifiées et touffues, décombantes et dressées, des plantes glabres à glabrescentes et sa capsule obovoïde-acuminée. Une description détaillée de l'espèce est fournie, accompagnée d'illustrations et d'une clé d'identification des espèces malgaches du genre. La nouvelle espèce est considérée comme "En danger" selon les Catégories de la Liste rouge de l'UICN.

Keywords

LINDERNIACEAE – *Linderniella* – Madagascar – Inselberg – New species – Resurrection plant

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Introduction

Linderniella Eb. Fisch. et al. (*Linderniaceae*) was newly described based on a molecular phylogenetic analysis (Fischer et al., 2013) and currently includes 16 species formerly treated in the genus *Lindernia* All. (APD, 2023). *Linderniella* comprises small and delicate plants, mainly rupicolous annuals, with the following distinctive characters: plants with rosettes or elongated stems, leaves opposite, veins palmate, flowers with 2 fertile adaxial stamens and 2 abaxial stamens usually reduced to staminodes, rarely fertile, seed surface with rounded pits or bothrospermous seeds (Fischer et al., 2013).

The genus in Madagascar was revised under *Lindernia* by Fischer (1995) and comprises three species currently accepted in *Linderniella*: *L. cerastioides* (Bonati) Eb. Fisch. et al., *L. horombensis* (Eb. Fisch.) Eb. Fisch. et al., and *L. pygmaea* (Bonati) Eb. Fisch. et al. These species are strictly confined to granitic inselbergs and appear to be desiccation-tolerant plants (Rabarimanarivo et al., 2019; Madagascar Catalogue, 2023).

During botanical inventories in 2015 and 2016 on the inselbergs of central Madagascar carried out by the authors and collaborators, three collections of *Linderniella* were collected at two different sites. A morphological comparison of these collections has shown that they differ from the hitherto documented species from Madagascar and they represent a new species which is described and illustrated below.

Key to the species of Linderniella from Madagascar

1. Plants up to 8.5 cm high, glabrous; basal leaves > 12 mm long; corolla up to 15 mm long; pedicel up to 20 mm long ..... ***L. cerastioides***

1a. Plants up to 4.5 cm high, pubescent, rarely glabrous to glabrescent; basal leaves generally < 12 mm long (rarely reaching 14 mm in *L. porembskii*); corolla up to 8 mm long; pedicel up to 8(–10) mm long 2

2. Stems up to 2.5 cm long; leaves and calyx not foveate; leaf blades acuminate at apex with margin sparsely dentate; capsule up to 9–10 mm long ..... ***L. pygmaea***

2a. Stems 2.5–4.5 cm long; leaves and calyx foveate; leaf blades acute to obtuse at apex with margin entire; capsule up to 6 mm long 3

3. Plants fairly pubescent; stems usually single, erect from a basal rosette; basal leaves 6–7 × 1.7 mm; pedicels 4–5 mm long; capsule acuminate-attenuate ..... ***L. horombensis***

3a. Plants glabrous to glabrescent; stems dense and richly branched, decumbent to erect; basal leaves 9–14 × 1.5–2.5 mm; pedicels 5–8(–10) mm long; capsule obovate-acuminate ..... ***L. porembskii***

Taxonomy

Linderniella porembskii Andriamiar. & Rabarim., **sp. nov.** (Fig. 1, 2).

Holotypus: Madagascar. Reg. Amoron'i Mania [Prov. Fianarantsoa]: Ambositra, Ambalamanakana, Réserve Ankazomivady, inselberg côté droit de la route RN 7 vers Fianarantsoa, 20°46'22"S 47°10'51"E, 1706 m, 9.III.2016, fl. & fr., *Rabarimanarivo, Porembski, Giebelmann & Werner 741* (TAN!; iso-: MO [MO-2894736]!).

Linderniella porembskii Andriamiar. & Rabarim. can be distinguished from the most similar L. horombensis (Eb. Fisch.) Eb. Fisch. et al. by its habit with dense and richly branched stems, decumbent to erect (vs. stems usually single, erect from a basal rosette), plants glabrous to glabrescent (vs. pubescent), and its capsules obovate-acuminate (vs. acuminate-attenuate).

Resurrection *herbs*, up to 4.5 cm high, tufted, decumbent to erect, glabrous to glabrescent. *Stems* somewhat succulent, 4-angled, glabrous to glabrescent (with sparse, short, stiff trichomes), highly branched from the base; young branches green (in vivo), adult branches brown to red (in vivo); lowest internode (from base to first node) about 1.5 cm long. *Leaves* somewhat succulent, densely foveate, glabrous to glabrescent, sometimes with sparse and short stiff white hairs at the margin, shortly petiolate; basal leaves 4–12 forming a rosette, spathulate, 9–14 × 1.5–2.5 mm, apex obtuse; upper leaves, opposite, lanceolate to obovate, 3.5–4 × 1–2 mm, sessile, base gradually tapering, apex acute to obtuse, sometimes slightly mucronate and reddish apically, margin entire, glabrous or sparsely pubescent with minute short stiff white hairs, veins palmate, obscurely visible abaxially, inconspicuous adaxially. *Flowers* solitary in the upper leaf axils, pedicellate, erect; pedicels 5–8 mm long, accrescent (up to 10 mm in fruit); calyx foveate, somewhat succulent, green with red lobe margins (in vivo), 3.4–4 mm long, glabrous, with 5 lobes up to 1 mm long, persistent in fruit; corolla white or light purple with purple shading on the throat, 8 mm long, tube 3.5 mm long, upper lip bifid, lower lip 3-lobed with sinuate margins; stamens 4, the abaxial pair reduced with curved and geniculate filaments 0.6 × 0.09 mm, anthers 0.2 mm long, the adaxial pair with straight filaments 0.7 × 0.25 mm long, anthers 0.5 mm long; pistil 4 mm long, style 3 mm long, stigma bilobed. *Mature capsule* distinctly longer than calyx lobes, obovoid acuminate, 6 mm long, dehiscent into two valves when dried or mature. *Seeds* bothrospermous, 0.6 mm long.

Etymology. – The species is named in honor of Prof. Dr. Stefan Porembski, who has studied inselbergs globally and made important contributions to our knowledge, understanding, and conservation of these unique ecosystems. He published many articles dealing with these subjects, including

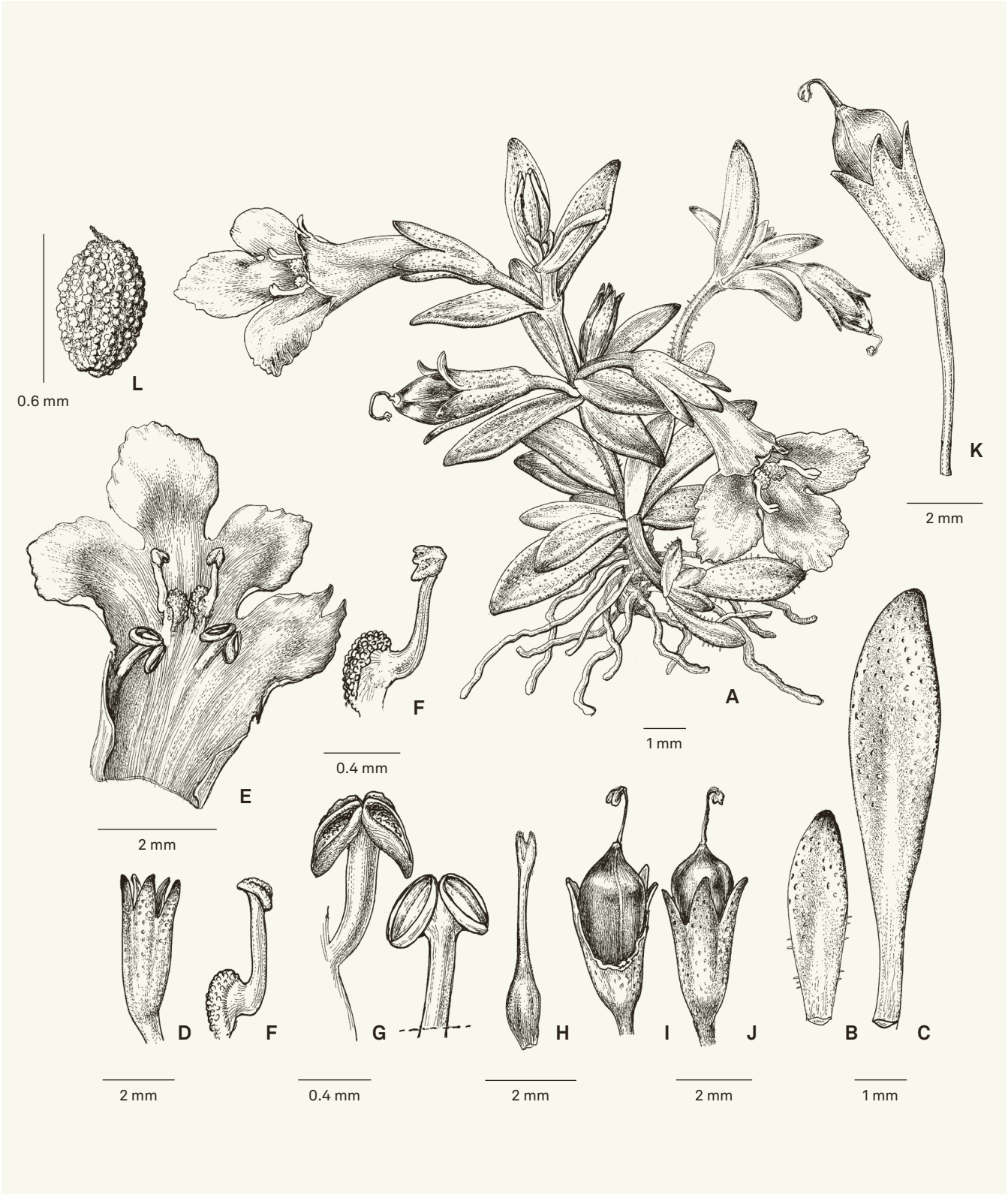

Fig. 1. – *Linderniella porembskii* Andriamiar. & Rabarim. **A.** Habit; **B.** Distal leaf; **C.** Basal leaf; **D.** Sepal; **E.** Corolla (open); **F.** Staminode; **G.** Stamens; **H.** Pistil; **I**–**K.** Fruits; **L.** Seed.
[*Rabarimanarivo et al. 741*, TAN] [Drawings: R.L. Andriamiarisoa]

Fig. 2. – *Linderniella porembskii* Andriamiar. & Rabarim. [*Rabarimanarivo et al. 741*] [Photo: S. Giebelmann]

some that advocate for urgent protection of this neglected habitat (Porembski et al., 2016). He also participated in the collection of the type in 2016.

Distribution and ecology. – Linderniella porembskii is known from three granitic inselbergs in central Madagascar, at mid-elevations of c. 1500–1700 m (Madagascar Catalogue, 2023). It is restricted to rock outcrops. The species appears to be a resurrection plant growing in mats dominated by monocotyledonous, small patch-forming on open rock and shallow depressions.

Conservation status. – Linderniella porembskii is known from three recent collections made between 2015 and 2016. These three collections represent two subpopulations occurring outside the protected area network and are highly threatened by ongoing degradation or destruction of its habitat due to fire, quarrying, grazing, trampling by people overharvesting other plants (medicinal, ornamental, useful plants), adjacent farming, and climate change (Porembski et al., 2016). The species has both an estimated Extent of Occurrence [EOO] and a minimum Area of Occupancy [AOO] of 12 km^2 falling within the limits for "Endangered" status under criterion B2. With respect to the most plausible threat of fire, the two known subpopulations represent two locations sensu IUCN (2012). In addition, it is inferred that the ongoing loss of its habitat induces a decline in its AOO, EOO, the extent and the quality of its habitat, the number of subpopulations, and the number of mature individuals. Based on available information, *L. porembskii* is preliminary assessed as "Endangered" [EN B1a b(i,ii,iii,iv,v)+2ab(i,ii,iii,iv,v)] according to IUCN Red List Categories and Criteria (IUCN, 2012).

Notes. – Linderniella porembskii resembles *L. horombensis* and *L. pygmaea* in general habit but it can be distinguished from both species by its dense and richly branched stems, which are decumbent to erect, by its glabrous calyx and its obovate-acuminate capsules (vs. erect, usually single stems arising from a basal rosette, pubescent calyx, and acuminate-attenuate capsules in *L. pygmaea* and *L. horombensis*). *Linderniella porembskii* and *L. horombensis* have foveate leaves and calyces, entire leaf margin, abaxial stamens and anthers reduced to staminodes. They can also be distinguished by the basal leaf size, pedicel length, and the plant pubescence of plants.

Specimens examined. – **Madagascar. Reg. Amoron'i Mania [Prov. Fianarantsoa]:** Ivato, Faliarivo Anjoman'Ankona, Bemanta, inselberg côté E de la route RN 35, à env. 13 km d'Ivato vers Ambatofinandrahana, 20°40'46"S 47°07'49"E, 1673 m, 14.XII.2015, fl., *Rabarimanarivo et al. 615* (MO, TAN); ibid. loco, inselberg côté gauche de la route RN 35, sur la route vers le camp de Bemanta, 20°40'33"S 47°07'28"E, 1582 m, 8.III.2016, fl., *Rabarimanarivo et al. 719* (MO, TAN).

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References

APD [African Plant Database] (2023). Conservatoire et Jardin botaniques de Genève and South African National Biodiversity Institute, Pretoria. [http://africanplantdatabase.ch]

Fischer, E. (1995). Revision of the Lindernieae (Scrophulariaceae) in Madagascar. 1. The genera Lindernia All. and Crepidorhopalon E. Fischer. *Bull. Mus. Natl. Hist. Nat., B, Adansonia* 17: 227–257.

Fischer, E., B. Schäferhoof & K.F. Müller (2013). The phylogeny of Linderniaceae – The new genus Linderniella, and new combinations within Bonnaya, Craterostigma, Lindernia, Micranthemum, Torenia and Vandellia. *Willdenowia* 43: 209–238. DOI: https://doi.org/10.3372/wi.43.43201

IUCN (2012). *IUCN Red List Categories and Criteria: Version 3.1.* Ed. 2. IUCN Species Survival Commission, IUCN, Gland and Cambridge.

Madagascar catalogue (2023). *Catalogue of the Plants of Madagascar*. Missouri Botanical Garden, St. Louis & Antananarivo. [http://www.tropicos.org/Project/Madagascar]

Porembski, S., F.A.O. Silviera, P.L. Fiedler, A. Watke, M. Rabarimanarivo, F. Kouame & S.D. Hopper (2016). Worldwide destruction of inselbergs and related rock outcrops threatens a unique ecosystem. *Biodivers & Conservation* 25: 2827–2830.

Rabarimanarivo, M.N., B. Ramandimbisoa, N. Rakotoarivelo, P.B. Phillipson, S. Andriambololonera, M.W. Callmander & S. Porembski (2019). The extraordinary botanical diversity of Malagasy inselbergs. *Candollea* 74: 65–83. DOI: https://doi.org/10.15553/c2019v741a8