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# *Streptocarpus peltatus* (Gesneriaceae), a Distinctive New Species from Southeastern Madagascar

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**ABSTRACT.** *Streptocarpus peltatus* Randrian., Phillipson, Lowry & Mich. Möller (Gesneriaceae) is described as a new species from southeastern Madagascar. It differs from other Malagasy members of the genus by its distinctly peltate leaves that are glabrous on both surfaces and by the absence of staminodes. It is only known from a small area of mid-elevation humid forest on the eastern slopes of the Vohimena Range in southeastern Madagascar. An illustration and color images are provided along with a distribution map and a risk of extinction assessment following the IUCN Red List categories and criteria, which indicates a status of Critically Endangered.

**Key words:** Anosy Region, Gesneriaceae, IUCN Red List, Madagascar, *Streptocarpus*.

The genus *Streptocarpus* Lindl. (Gesneriaceae), described in 1828, was defined on the basis of its spirally twisted fruits. Over the last several decades, with the discovery and description of additional species, it has grown to around 140 species distributed in southern and tropical Africa, Madagascar, and the Comoro Islands (Hilliard & Burtt, 1971; Weber, 2004). Humbert (1971) treated the genus for the *Flore de Madagascar et des Comores*, recognizing 41 species, 39 endemic to Madagascar and two also present in the Comoros. However, several recent studies have led to a re-definition of *Streptocarpus*, which now includes species with non-twisted fruits and thus encompasses all Afro-Malagasy members of Gesneriaceae (Darbyshire, 2006; Christenhusz, 2012; Nishii et al., 2015), including members previously placed in two small Malagasy genera, *Colpogyne* B. L. Burtt and *Hovanella* A. Weber & B. L.

Burtt, as well as taxa assigned to a number of small African genera, most notably *Saintpaulia* H. Wendl. A recent molecular phylogenetic study (Nishii et al., 2015) also proposed a new infrageneric classification for the expanded *Streptocarpus* in which two subgenera are recognized: subgenus *Streptocarpus* and subgenus *Streptocarpella* Fritsch, subdivided into five and seven sections, respectively. In their study, Nishii et al. (2015) list a total of 176 species, 118 in subgenus *Streptocarpus*, 49 in subgenus *Streptocarpella*, and nine unplaced. Both subgenera are present in Madagascar, and five of the 12 sections are represented there, each of which is endemic to Madagascar or to Madagascar and the Comoros, as follows:

- *Streptocarpus* subg. *Streptocarpus* (26 spp. in Madagascar plus the Comoros)
  - section *Lignostreptocarpus* Mich. Möller & Bellstedt (7 spp. in Madagascar)
  - section *Colpogyne* (B. L. Burtt) Mich. Möller & Bellstedt (5 spp. in Madagascar)
  - section *Plantaginei* Mich. Möller & Bellstedt (14 spp. in Madagascar, one of which is present in the Comoros)
- *Streptocarpus* subg. *Streptocarpella* (16 spp. in Madagascar plus the Comoros)
  - section *Parasaintpaulia* Mich. Möller & Nishii (3 spp. in Madagascar)
  - section *Hova* (C. B. Clarke) Mich. Möller & Nishii (13 spp. in Madagascar, one of which is present in the Comoros)

Nishii et al. (2015) recognized a total of 42 Malagasy species of *Streptocarpus*, 37 of which were also recognized

by Humbert (1971) and one regarded by him to be a doubtful species, along with one species described subsequently by MacMaster et al. (2005), two resulting from new combinations made by Christenhusz (2012), and one that was originally described by Humbert (1967) but later reduced to synonymy within *Colpogyne* (Humbert, 1971). The four remaining species recognized by Humbert (1971) could not be placed in the most recent infrageneric classification proposed by Nishii et al. (2015) due either to a lack of molecular data or their placement in an unresolved clade (polytomy) in the most parsimonious phylogenetic tree presented in that study.

Botanists from the Missouri Botanical Garden (MO), in collaboration with colleagues from several partner institutions, have conducted an extensive program of botanical exploration and inventory work in Madagascar over the last three decades that has led to the discovery of hundreds of plant species new to science. Much of this effort has focused on areas that were unexplored botanically or whose flora was poorly known. One such area, the Vohimena Range, located in southeastern Madagascar in the Anosy Region, has been the target of a series of expeditions, starting in 2005, which have revealed an exceptional level of botanical richness and distinctiveness. To date, dozens of new species have been discovered, mostly endemic, 26 of which have already been described, including no less than three species in each of the genera *Dypsisis* Noronha ex Mart. (Arecaceae) (Dransfield & Rakotoarinivo, 2012), *Ivodea* Capuron (Rutaceae) (Rabarimanarivo et al., 2015), and *Noronhia* Stadtm. ex Thouars (Oleaceae) (Hong-Wa, 2016), along with two new, locally endemic genera that were also collected for the first time as part of this effort, *Bemangidia* L. Gaut. (Sapotaceae) (Gautier et al., 2013) and *Lowryanthus* Pruski (Asteraceae) (Pruski, 2014).

In April 2015, a large part of the Vohimena Range was incorporated into Madagascar's protected area network as the Tsitongambarika Forest Reserve (Réserve de Ressources Naturelles de la Forêt Naturelle de Tsitongambarika), which encompasses an area of just under 600 km<sup>2</sup> and whose flora is documented by more than 3500 collections made to date in various parts of the reserve. Examination of material collected during a recent inventory project funded by the National Geographic Society revealed yet another intriguing plant from the Vohimena Range, a very distinctive, peltate-leaved *Streptocarpus* (Gesneriaceae) that did not match any previously described species, but which could be matched with a few other recent, unidentified collections from the area. Careful comparison with the available material of the genus at the main herbaria with holdings of gesneriads from Madagascar (E, MO, P, and S) confirmed that it represents a new species, which we describe below.

*Streptocarpus* is well known in horticulture because of the ornamental value of some species, and selected forms and hybrids involving several African members of the genus have been developed as decorative house plants. Cultivars derived from species with twisted fruits are commonly known in English as Cape primroses, whereas those derived from species previously placed in *Saintpaulia* are referred to as African violets.

***Streptocarpus peltatus*** Randrian., Phillipson, Lowry & Mich. Möller, sp. nov. TYPE: Madagascar. Toliara Prov.: Anosy Region, Commune Iabakoho, fokontany Antsotso, forêt de la chaîne montagneuse de Vohimena, forêt d'Ivohibe, 24°33'48"S, 47°12'17"E, 441 m, 28 Jan. 2015, *Razanatsima et al.* 1378 (holotype, MO-6748855!; isotypes, MO-6748856!, P!, TAN!).

*Diagnosis.* *Streptocarpus peltatus* Randrian., Phillipson, Lowry & Mich. Möller differs from all other Malagasy taxa in the genus by the combination of peltate leaves that are glabrous on both surfaces and the absence of staminodes.

Rosulate perennial herb; rhizome short, densely villous. Leaves apparently opposite, succulent in vivo, distinctly peltate, broadly ovate to suborbicular, 3–8 × 2.5–5.7 cm, glabrous on both surfaces, base rounded to subtruncate, margins ciliate with partially tangled, unbranched uniseriate trichomes, apex rounded to obtuse, venation obscure above, purple-red beneath, drying brown, midvein ca. 1.5–3 mm wide at point of insertion of the petiole, tapering to < 0.5 mm at apex, slightly raised on adaxial surface when dry, flat beneath, tertiary veins obscure. Petiole purple-red, succulent in vivo, inserted ca. 2–14 mm from base of the blade, 2.5–10.5 cm, glabrescent to sparsely villous with uniseriate trichomes. Inflorescences 1 to 8, borne in leaf axils, 4–10(–15) cm at anthesis, to 20 cm in fruit, cymose, often dichasial, branched to 1 to 3 times, each branch terminating in 1 or 2 flowers and 1 or 2 next order branches, axes slender, glabrous, each bearing 4 to 30 flowers or fruits. Flowers small, ca. 4–5 mm, pedicel ca. 1 mm, glabrous or with scattered uniseriate indument; calyx 5-lobed, connate at the base, the lobes 3 × 1 mm, lanceolate, apex acuminate, slightly thickened, glabrous or with scattered uniseriate, sometimes glandular trichomes outside, glabrous inside, veins 3, extending from base to apex; corolla sympetalous, zygomorphic, 5-lobed, white, glabrous, ca. 4–5 mm, tube ca. 2.5–3 mm, lobes ca. 2 × 2 mm, rounded; stamens 2, face to face, not cohering, staminodes absent; filaments 1 mm, attached to base of corolla, glabrous; anthers introrse, dorsally attached, discoid, ca. 1 mm diam., yellow, glabrous, with longitudinal dehiscence; disk slightly cupuliform, slightly crenulate, glabrous; style ca.

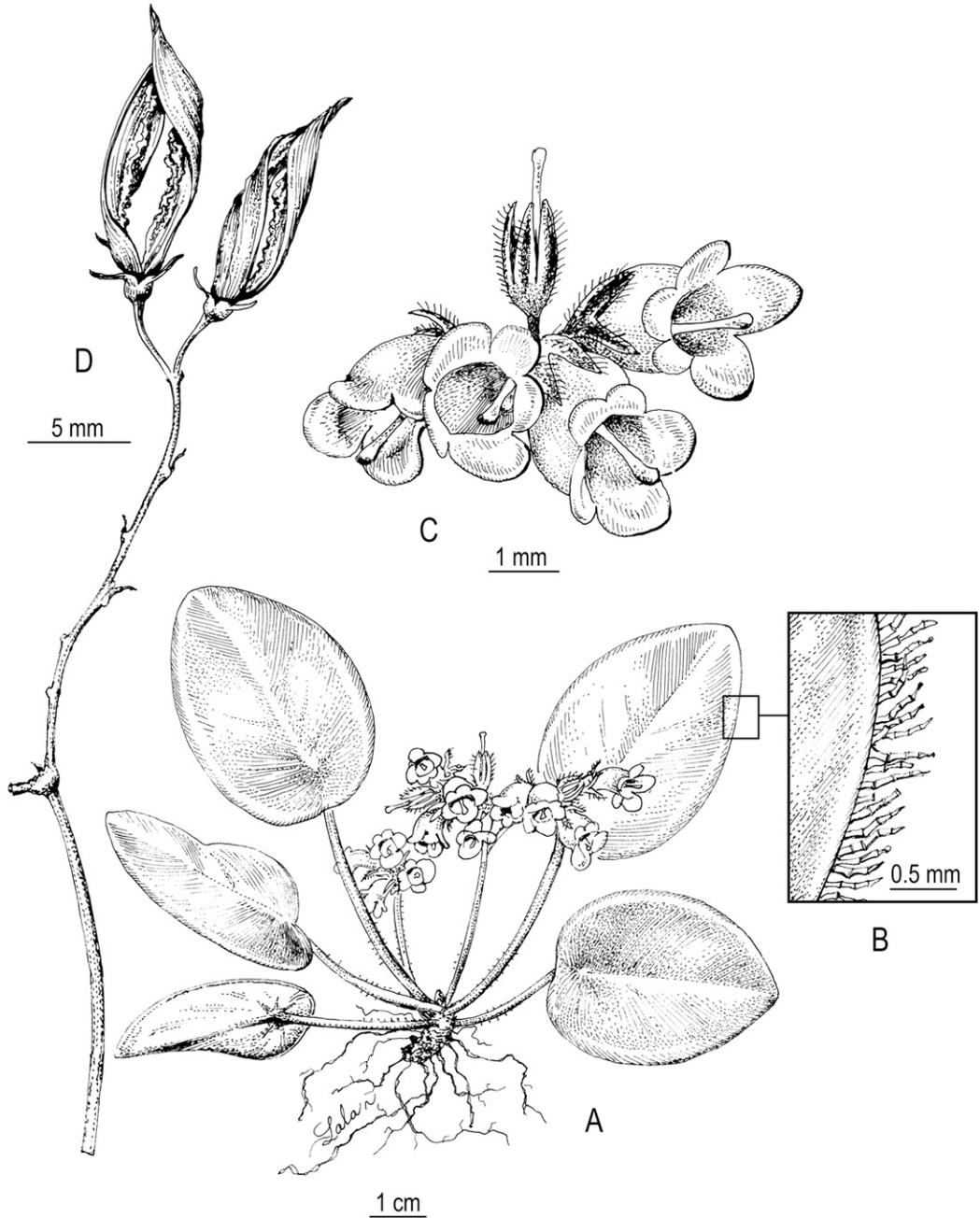


Figure 1. Illustration of *Streptocarpus peltatus* Randrian., Phillipson, Lowry & Mich. Möller. —A. Plant in flower. —B. Detail of leaf margin. —C. Inflorescence. —D. Infructescence. A–C based on Razanatsima *et al.* 1378 (TAN); D based on Razakamalala *et al.* 2582 (TAN). Drawn by Roger Lala Andriamiarisoa.

2–3 mm, straight, glabrous; stigma globose-capitate; ovary conical,  $1.5 \times 1$  mm, glabrous. Fruits capsular, brown, developing twisted to 1 turn prior to dehiscence, partially untwisting after dehiscence,  $10\text{--}20 \times 1.5\text{--}2$  mm, elongate, glabrous, the calyx and style

persistent, pedicel 4–10 mm; seeds not seen. Figures 1, 2.

*Phenology.* *Streptocarpus peltatus* has been collected in flower in January and in fruit in April and December.



Figure 2. Photographs of *Streptocarpus peltatus* Randrian., Phillipson, Lowry & Mich. Möller. —A. Field assistant Anselme Atalahy collecting *S. peltatus* from a population growing on an exposed rock. —B. Habit with leaves, inflorescence, and roots. A, B from Razafimandimbison et al. 1537 (E, MO, P, S, TAN). Photos by Sylvain Razafimandimbison.

**Distribution and habitat.** Our new species is only known from a very small area in the northeastern part of the Vohimena Range, within the Tsitongambarika Forest Reserve (Fig. 3), where it has been collected on six occasions growing on rock outcrops in dense, humid forest between 120 and 660 m.s.m. Although no detailed ecological studies have been undertaken, *Streptocarpus peltatus* appears to be restricted to shaded granite outcrops and is likely to occur in places where a particular combination of light intensity and moisture prevails, such as near-vertical, moss-covered rocky habitat in the understory of forests (Fig. 2), as is the case for many species of *Streptocarpus*.

**IUCN Red List category.** Based on the available collections, which all fall within a single  $2 \times 2$  km grid cell, the extent of occurrence (EEO) and area of occurrence (AOO) of *Streptocarpus peltatus* are estimated at less than 4 km<sup>2</sup>, and within its AOO it appears to be restricted to specific habitats. Although the entire population is believed to lie within the Tsitongambarika Forest Reserve, many parts of the protected area are still subjected to human pressure, especially those located near its boundaries, including the sector where *S. peltatus* has been recorded, which is located only about 4 km from RN 12a, the main road running north along the east coast from Tolagnaro (Fig. 3). The population represents a single location (sensu IUCN, 2012, 2017) with respect to the main threat, forest clearing for agriculture and grazing, which would alter the local moisture and shade regime, thereby impacting the specialized habitat of *S. peltatus*, resulting in projected continuing decline in both habitat quality and the

number of mature individuals. We therefore assign *S. peltatus* a conservation status of Critically Endangered [CR B1ab(iii,v)+2ab(iii,v)].

**Etymology.** The epithet given to this species refers to its characteristic peltate leaves, a feature that is rare in *Streptocarpus*, hitherto recorded only in one species in Madagascar (*S. mandrerensis* Humbert) and one in Africa (*S. teitensis* (B. L. Burtt) Christenh.).

**Notes.** *Streptocarpus peltatus* is one of only two members of the genus in Madagascar with peltate leaves, along with *S. mandrerensis* (Humbert, 1971). The new species is distinguished by its thick, leathery leaves, which are glabrous on both surfaces (vs. sparsely strigulose on the abaxial surface and strigose on the adaxial surface in *S. mandrerensis*). Three other Malagasy species, *S. tanala* Humbert, *S. glabrifolius* Humbert, and *S. papangae* Humbert, appear to have leaves that are glabrous on both surfaces at some stage of their development, but they can be easily distinguished from *S. peltatus* by their caulescent (vs. rosulate) habit. Four other members of the genus have been recorded from the Tsitongambarika Forest Reserve (*S. campanulatus* B. L. Burtt, *S. glabrifolius*, *S. mandrerensis*, and *S. muscosus* C. B. Clarke), and a number of as yet unidentified specimens from the area may represent additional undescribed species. Southeastern Madagascar is an important center of diversity for *Streptocarpus*, with no less than nine species (including *S. peltatus*) that are endemic to this part of the country, most of which are strictly endemic to the Anosy Region, along with three other, more widespread species (*S. beampingaratrensis*

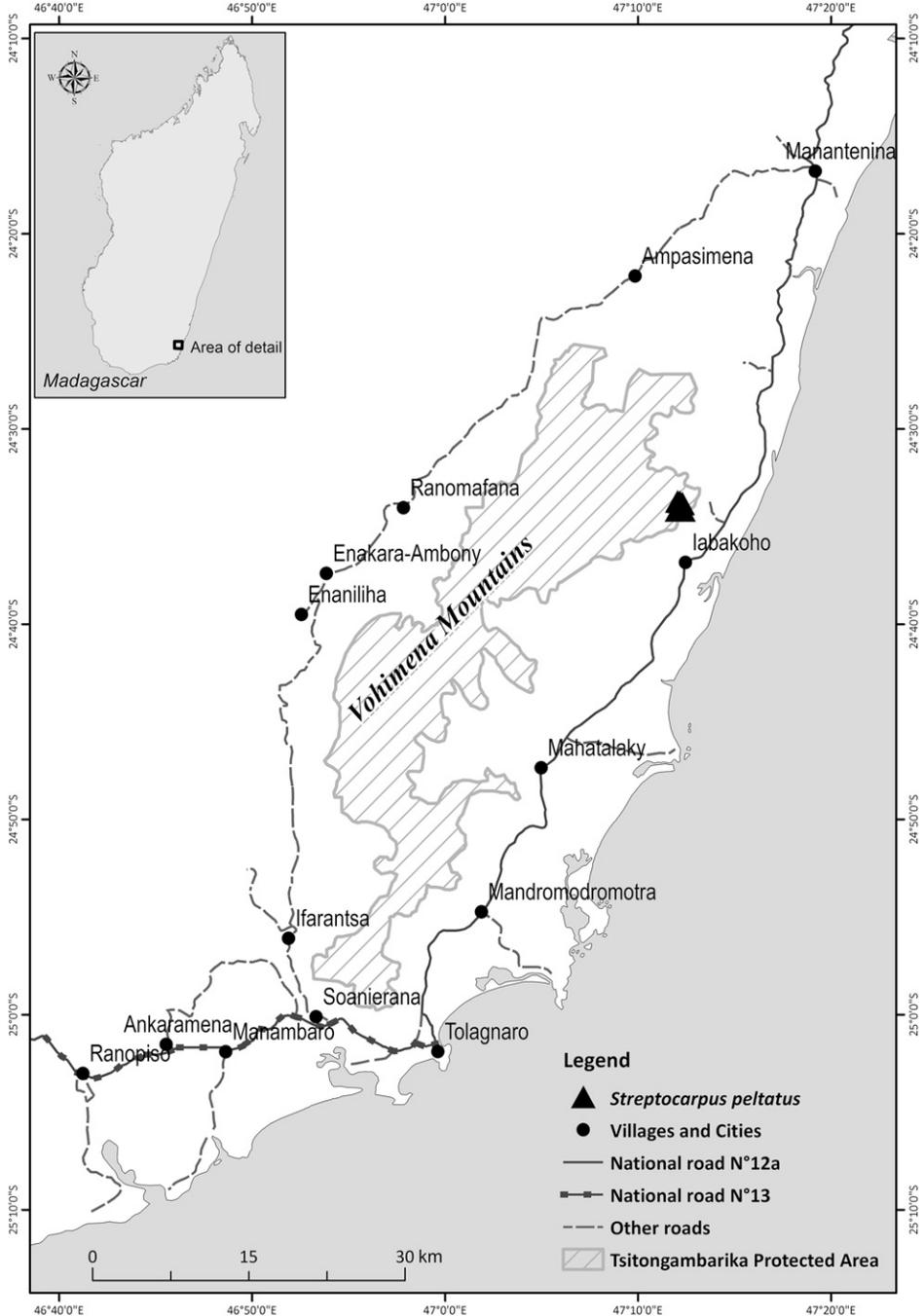


Figure 3. Geographic distribution of *Streptocarpus peltatus* Randrian., Phillipson, Lowry & Mich. Möller in southeast Madagascar.

Humbert, *S. prostratus* (Humbert) B. L. Burt, and *S. vestitus* (Baker) Christenh.).

*Paratypes.* MADAGASCAR. **Toliara Prov.:** Anosy Region, Tolagnaro, Iabokoho, Antsofso, TCK 37, forêt de

Bemangidy, 24°34'10"S, 47°12'01"E, 641 m, *Randriatafika 900* (MO, P, TAN, TEF); Fort-Dauphin, Iaboko [Iabokoho], Antsofso, Forêt Ivohibe, 24°33'43"S, 47°12'09"E, 440 m, 2 Dec. 2005, *Razakamalala et al. 2582* (MO, TAN); Tolagnaro, Iaboko [Iabokoho], Antsofso Avaratra, 24°33'42"S, 47°12'02"E, 662 m, 11 Dec. 2007, *Razakamalala et al. 3991* (MO, TAN);

Tolagnaro, Iabakoho [Iabokoho], Ivohibe-Bemangidy forest, 24°34'10"S, 47°12'21"E, 121 m, 26 Apr. 2016, *Razafimandimbison et al.* 1526 (MO, P, S, TAN); Tolagnaro, Iabakoho [Iabokoho], Ivohibe-Bemangidy forest, 24°33'50"S, 47°12'17"E, 443 m, 26 Apr. 2016, *Razafimandimbison et al.* 1537 (E, MO, P, S, TAN).

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