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Research article

Sansevieria bangalalana sp. nov. (Asparagales, Asparagaceae), close to extinction in the wild, and five other narrowly endemic and threatened species of *Sansevieria* from Tanzania previously unknown to science

Michael BURKART [1,*], Kened Alfred KAVULA [2], Immaculate Kileo CONSTANTINE [3], Neduvoto Piniel MOLLEL [4], Luciana Naftal PINIELY [5], Robert Augustino SIKAWA [6] & Barry R. YINGER [7]

[1] Botanical Garden, University of Potsdam, Maulbeerallee 2, 14469 Potsdam, Germany.
[2,3,4,5] Tanzania Plant Health and Pesticides Authority, National Hebarium of Tanzania, PO Box 3024, Arusha, Tanzania.
[6,7] Tanzania Sansevieria Foundation, PO Box 278, Usa River, Arusha, Tanzania.

[*] Corresponding author: mburkart@uni-potsdam.de
[2] Email: kened.kavula@tphpa.go.tz
[3] Email: immaculate.constantine@tphpa.go.tz
[4] Email: neduvoto.mollel@tphpa.go.tz
[5] Email: luciana.piniely@tphpa.go.tz
[6,7] Email: tzsansevieria@gmail.com

Abstract. Six new species of *Sansevieria* are described from several regions of Tanzania, a country believed to harbour the highest diversity of *Sansevieria* species globally. Among these, *Sansevieria bangalalana* sp. nov. and *S. chlorantha* sp. nov. occur in the North Pare Mountains region in northeastern Tanzania. Our data indicates that both species are close to extinction now. They have only been found in two and one location, respectively. *Sansevieria bangalalana* has a unique combination of flower and leaf features that sets it apart from all other species in the genus. *Sansevieria embere* sp. nov. is solely occurring in a pocket of succulent vegetation within the city limits of Arusha, where our data indicates that it is critically endangered, too. This species and *S. chlorantha* have unbranched elongate inflorescences (subgenus *Sansevieria*), while *S. bangalalana* and the other three species have capitate inflorescences (subgenus *Capitulatus*). Of the latter, *S. muhaensis* sp. nov. was found in a restricted area close to the city limits of Kigoma in W Tanzania, where it is critically endangered as well according to our data. *Sansevieria rukwana* sp. nov. and *S. sumbawangana* sp. nov. occur in the wider Lake Rukwa Region of SW Tanzania. Their threat status is EN according to our data. The factors most threatening these plants altogether are construction works of roads and houses, and agricultural expansion.

Keywords. *Dracaena*, Dracaenoids, East Africa, species conservation, threat assessment.

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Introduction

East Africa, the cradle of humanity, is home to many species of animals, plants and other organisms, with high levels of endemics. Despite extensive efforts dedicated to floristic inventories (e.g., RBG Kew 1952–2012), relevant parts of the flora remain insufficiently explored. This is especially true for succulents and other plant groups that pose challenges for traditional botanical collection and herbarium preparation methods.

The genus *Sansevieria* Petagna (classified in either the family Ruscaceae M.Roem. or Asparagaceae Juss.) comprises leaf-succulent plants distinguished by their unique anatomy of water storage tissue, which confers exceptional resistance to desiccation, whether by environment or by a plant press (Virzo de Santo *et al.* 1982; Koller & Rost 1988; Schwerdtfeger 2009; Martin *et al.* 2019). Recent molecular phylogenetic work has proposed merging *Sansevieria* into *Dracaena* Vand., its closest relative (Takawira-Nyenya *et al.* 2018; van Kleinwee *et al.* 2022). While these phylogenetic analyses clearly support the monophyly of *Sansevieria*, they are inconclusive as to the architecture of the larger dracaenoid phylogenetic tree (Scharf & Burkart 2021). We therefore maintain *Sansevieria* as a genus of its own, both morphologically and phylogenetically well defined, in accordance with Brown (1914, 1915), Freiberg *et al.* (2020), and Newton (2020). *Sansevieria* currently comprises more than 100 taxa, with a significant proportion described within the past three decades (Newton 2020; Burkart *et al.* 2023). Most species occur in eastern Africa ranging from Zimbabwe and Mozambique to Somalia and Ethiopia (Webb & Newton 2017). Recent extensive studies in Tanzania revealed a rich diversity of taxa yet unknown to science or to the country (Webb & Yinger 2019; Yinger 2019, 2021; Burkart & Scharf 2021; Yinger & Sikawa 2021a, 2021b, 2021c, 2021d, 2021e, 2022a, 2022b, 2023a, 2023b, 2023c; Mollel *et al.* 2024). This paper contributes to the ongoing effort to put these new insights on taxonomically solid grounds.

This task is specifically urgent given the rapid and widespread land-use changes currently occurring across Tanzania, including a strong expansion of agriculture to former scrubland areas, extensive industrial, road and housing constructions, new mining projects, and other infrastructural developments (e.g., Msofe *et al.* 2019; Sumari *et al.* 2020). Unfortunately, an unusual high percentage of these activities pertains to *Sansevieria* habitats, while plants of this genus are rarely found within Tanzania's national parks and other protected areas, which generally lack habitats for species of *Sansevieria* (BRY and RAS pers. obs.). Therefore, we also include a preliminary threat assessment for the new species. Their conservation is urgently needed.

Material and methods

After their collection as living specimens, the plants studied were all cultivated in open ground beds at TSF on the slopes of Mt Meru, Arusha, Tanzania, at Seela Sing'isi village, elevation 1285 m. The soil is a fertile, finely textured, well-drained loam about 75 cm deep, over 10 m of volcanic grit. Temperatures range from 15 to 32°C, but the climate is mostly moderate and cool. Because of the frequent rains, the study plants were grown in screened wood frame houses covered with transparent plastic sheeting.

We do not give detailed information, including geographic coordinates, regarding the original wild sites of the plants. Rare and new species of *Sansevieria* are subject to enthusiast collecting, or professional collecting to sell living material to enthusiasts, both putting additional threat to the wild populations which we want to avoid. Figure 1 is designed accordingly.

Traits were recorded in as much detail as possible. The bracts on the inflorescence peduncle below the flower-bearing part are termed 'peduncle bracts', those within the flower-bearing part 'bracts of partial inflorescences'; inflorescence morphology and terminology is treated in accordance with Budweg (2016). Colours were partly recorded using the *RHS Colour Chart* (Royal Horticultural Society 2015). Leaf surface texture was generally studied using a hand lens (12×, Eschenbach, Germany) under natural or artificial sidelight, in one case supported by macro lens photography (Nikon D200, AF Micro Niccor 105 mm 1:2.8 D). Flowering shoots were completely harvested and taken to the NHT lab for detailed trait recording. Measures of vegetative parts, inflorescences and flowers are generally based on one single flowering shoot which subsequently was prepared to become the type. Peduncle diameter was measured between the 1st and the 2nd bract, leaf lamina thickness in the centre of the leaf. Traits that were recorded at the type location in the field#, on living plants of the same accession (ex typo) in the greenhouse†† or on the dried type specimen in the herbarium‡‡ are marked as indicated here.

Type specimens of all described species are deposited in the NHT; acronyms of herbaria follow Index Herbariorum (Thiers continuously updated). Living specimens ex typo are cultivated at TSF and POTSD.

We checked all *Sansevieria* specimens deposited in the herbaria B, NHT, and NMK, which hold rich collections from the study area and were accessible to us. No corresponding specimens were found.

All photographs were taken at TSF on cultivated plants by Elias Sikawa if not stated otherwise.

Assessments of threat status were conducted according to the latest version of the IUCN guidelines (IUCN Standards and Petitions Committee 2024).

Other repositories

NMK = National Museums of Kenya (= EA herbarium)
POTSD = Botanical Garden, University of Potsdam, Potsdam, Germany
TSF = Tanzania Sansevieria Foundation, Arusha, Tanzania

Other acronyms

BRY = Barry R. Yinger
MB = Michael Burkart
RAS = Robert Augustino Sikawa

Results

Class Equisetopsida C.Agardh
Subclass Magnoliidae Novák ex Takht.
Superorder Lilianae Takht.
Order Asparagales Bromhead

Family **Asparagaceae** Juss.

Sansevieria currently encompasses three subgenera, i.e., subgen. *Capitulatus* Mbugua ex L.E.Newton & R.H.Webb (14 spp.), subgen. *Paniculatus* Mbugua ex L.E.Newton & R.H.Webb (13 spp.), and subgen. *Sansevieria* (75 spp.). The classification is based on inflorescence architecture. However, molecular-based phylogenies (Takawira-Nyenya *et al.* 2018; van Kleinwee *et al.* 2022) do not fully support this taxonomic concept based on morphology.

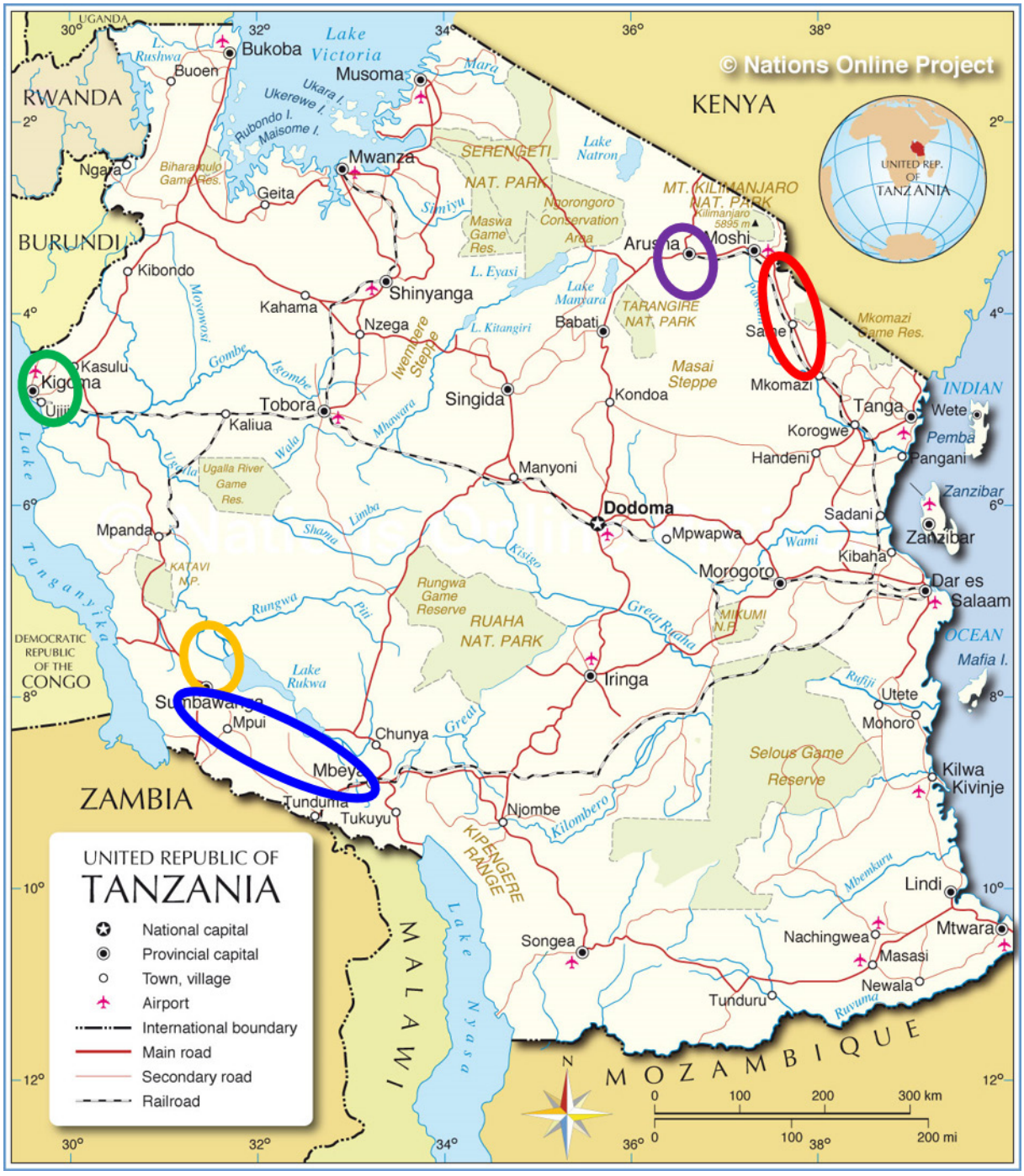

Fig. 1. Map of occurrences of the species of *Sansevieria* described in this paper. The map shows the main water bodies, cities, roads, railroads and national parks and the regions where the species have been found. Red = *S. bangalalana* Mollel, M.Burkart, Sikawa & Yinger sp. nov. and *S. chlorantha* M.Burkart, Kavula, Sikawa & Yinger sp. nov.; purple = *S. embere* Mollel, M.Burkart, Yinger & Sikawa sp. nov.; green = *S. muhaensis* M.Burkart, Yinger, Sikawa & Mollel sp. nov.; orange = *S. rukwana* M.Burkart, Piniely, Sikawa & Yinger sp. nov.; blue = *S. sumbawangana* M.Burkart, Constantine, Sikawa & Yinger sp. nov. The map basis was obtained from The Nations Online Project, https://www.nationsonline.org/oneworld/map/tanzania-political-map.htm.

Sansevieria bangalalana Mollel, M.Burkart, Sikawa & Yinger sp. nov.
urn:lsid:ipni.org:names:77370777-1
Figs 1–6

Diagnosis

Sansevieria bangalalana sp. nov. is the only species of *Sansevieria* known presently that has capitate inflorescences and long, straight, bifacial ('flat') but strongly inrolled leaves (Figs 2, 3A). The colouration of the flowers includes reddish brown, yellowish and greenish parts, which is also unique in the whole genus (Fig. 4B). The flower tubes are only 25 mm long, much shorter than in any other species of the subgenus *Capitulatus*, to which this species belongs according to its inflorescence type.

Etymology

Sansevieria bangalalana sp. nov. is named for Bangalala Ward, where this species was found.

Type material

TANZANIA • Kilimanjaro Region, Same District, foothills of the North Pare Mountains; 896 m a.s.l.; 14 Dec. 2021; *B. Yinger & R.A. Sikawa YS 1026*; on a strip of flat gently sloping land between a gravel

Fig. 2. *Sansevieria bangalalana* Mollel, M.Burkart, Sikawa & Yinger sp. nov. at the type location before its destruction. Note the stiff, straight, mostly upright leaves that resemble those of *S. fischeri* from some distance although they are bifacial ("flat") and strongly inrolled actually, not massive and terete (unifacial) like those of the latter. Photo: Barry R. Yinger.

road and a seasonal stream, probably inundated during the heaviest rains in season, growing together with extensive populations of *Sansevieria volkensii* Gürke, *S. fischeri* (Baker ex Dyer) Marais and scattered small trees, in an extremely arid area with a short rainy season; holotype: NHT [000001159].

Living specimens ex typo cultivated at TSF and POTSD.

Description

Rhizomatous herb, stemless, vegetative height ca 1 m, 1–2 leaves per shoot, forming loose clumps (Figs 2, 3B). Rhizome subterranean but close to soil surface (ca 0–10 cm), rhizome diameter ca 38 mm, inner cortex of mature rhizome†† light brown. Leaves upright, strongly folded longitudinally (Fig. 3A), very stiff, straight, blue green, slightly mottled, linear outline, to 1 m long or slightly longer, 60 mm wide, leaf base 73 mm wide, 19 mm thick, leaf adaxial surface forming a rounded to pentagonal channel from base to tip 7 mm deep at mid-leaf, adaxial surface slightly rough with light-dark pattern in transverse bands, margin pale orange (orange white 159 grp A), 1 mm long awn tip; leaf abaxial (= outer) surface with very numerous stomata sunk into the surface, with short to medium-long, nodose, straight to wavy, largely unconnected transverse ribs between them (Fig. 5). Inflorescence (Figs 3B, 4) on fully leaved shoot, capitate, axis 185 mm long overall, peduncle 93 mm long, 13 mm in diameter, grayed yellow, bearing 6 dry bracts ca 23 mm long, flower-bearing axis 92 mm long, flower-head 87 mm in diameter excluding anthers and styles, very dense with 3–4 flowers per partial inflorescence, bracts of partial inflorescences 7–15 mm long, 2–5 mm wide, herbaceous, lanceolate, without extrafloral nectaries. Flowers on pedicels ca 6 mm long, yellow green, without articulation; corolla tube light reddish brown, tip of buds green, proximal parts of lobes yellowish outside, bright white inside; overall flower length 36 mm, tube 25 mm long, lobes 11 mm long, 2 mm wide, diameter of closed flower shortly before anthesis 3 mm at the base, 2 mm at the narrowest point, 3 mm in the upper part, lobes strongly curling back at full anthesis (more

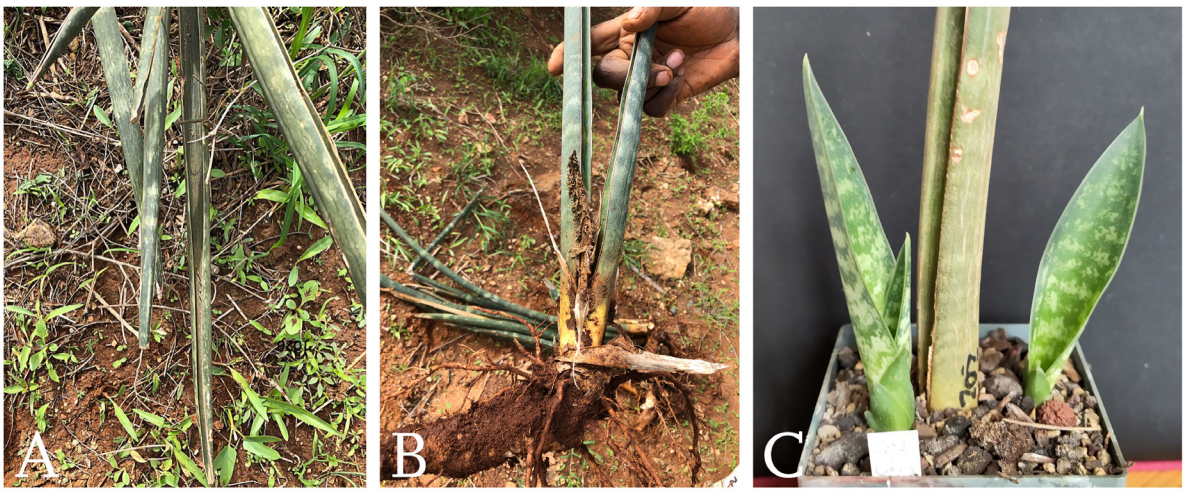

Fig. 3. Vegetative features of *Sansevieria bangalalana* Mollel, M.Burkart, Sikawa & Yinger sp. nov. **A–B**. Type population. **A**. Wild grown leaves. Their flat but strongly inrolled character is clearly discernible. **B**. Basal parts of a mature plant. The plant bears an old infructescence, the rhizome is also visible. Shoots with two leaves like in the picture are rarely seen. **C**. Youth form of *S. bangalalana* from a rooted leaf cutting cultivated in a private collection. Note the fresh green colour of the leaves, their clear, transversal-oriented mottling, their openly u-shaped transect and the almost unpatterned, green cataphylls at the base. In many species of *Sansevieria*, new shoots from leaf cuttings or seedlings, termed youth forms, are different from new shoots emerging from fully developed rhizomes. Photos: A–B by Barry R. Yinger; C by Michael Burkart.

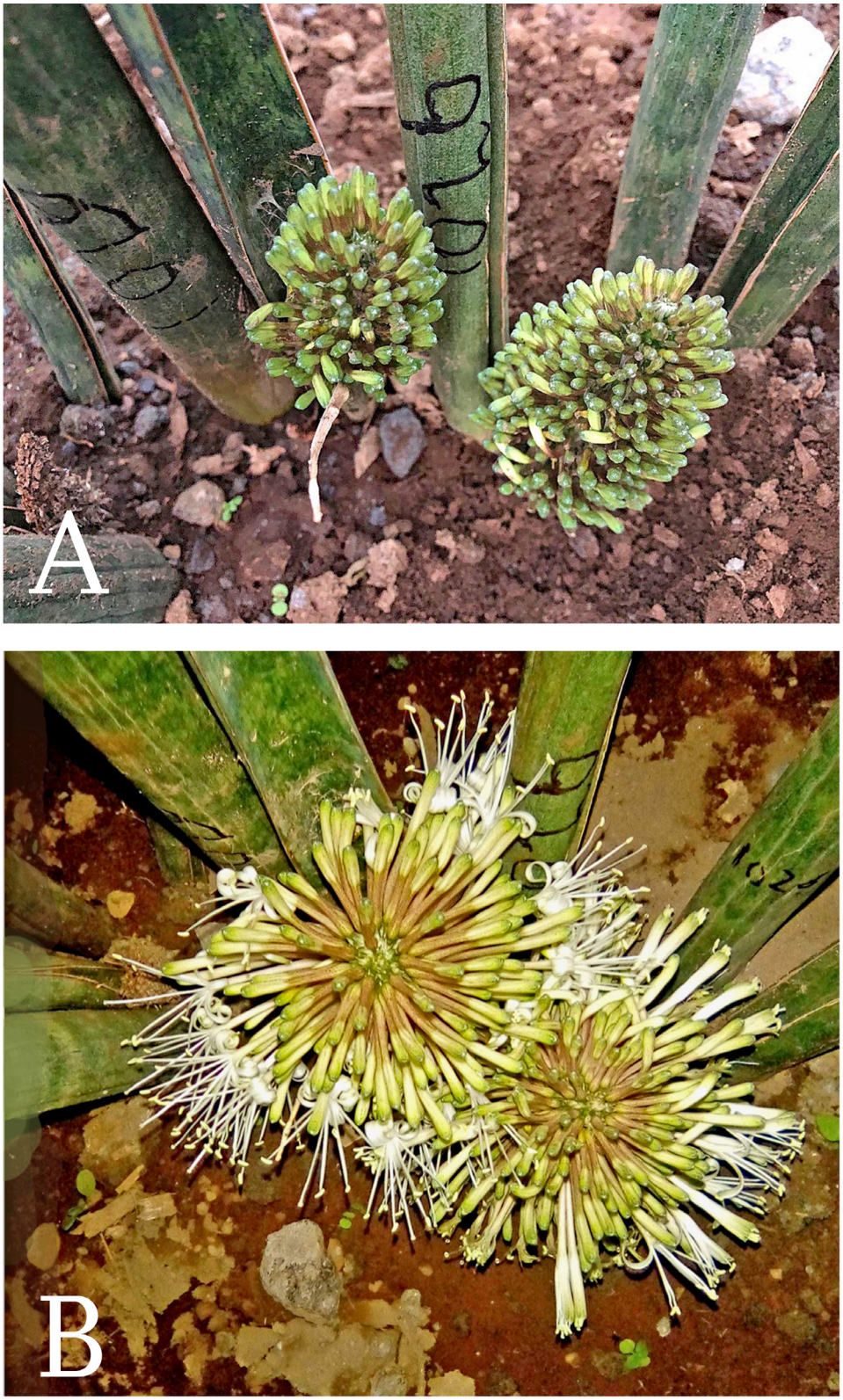

Fig. 4. *Sansevieria bangalalana* Mollel, M.Burkart, Sikawa & Yinger sp. nov. with flowers; holotype, NHT [000001159], in cultivation at a TSF greenhouse. **A**. Young inflorescences. Note the capitate but slightly elongate shape of the flowering part and the very short peduncle. **B**. Same plant in bloom. Note the characteristic colouration of the corolla. Photos: Barry R. Yinger.

than 360°); filaments white, 18 mm long, filiform, anthers 2–3 mm long; style straight, white, 47 mm long excluding ovary including stigma, 22 mm exserted from tube mouth, stigma translucent, 1 mm wide; ovary yellowish green, ovoid. Fruits and seeds unknown. Youth form (young shoots from leaf cutting) different from adult plant, leaf transect openly u-shaped, colouration fresh green with transversally oriented, whitish patterning; cataphylls similarly green but largely unpatterned (Fig. 3C).

Ecology and distribution

Sansevieria bangalalana sp. nov. was only found at the type location, on a strip of flat gently sloping land between a gravel road and a seasonal stream, probably inundated during the heaviest rains in season, growing in dry bushland with small trees and extensive colonies of *Sansevieria volkensii* Gürke and *S. fischeri* (Baker ex Dyer) Marais.

Taxonomic remarks

Sansevieria bangalalana sp. nov. is unique in the combination of several features. There is no other species of *Sansevieria* known presently that has capitate inflorescences and long, straight, bifacial ('flat') but strongly inrolled leaves. The leaf surface is outstanding and the colouration of the flowers is also unique, although difficult to describe, including reddish brown, yellowish and greenish parts. Figure 4 gives an appropriate impression. Last, the flower tubes are only 25 mm long, which is extremely short for a capitate-flowered species.

From a distance, however, *S. bangalalana* sp. nov. is hard to distinguish from *S. fischeri* and large forms of *S. volkensii* which both are encountered regularly in the same region.

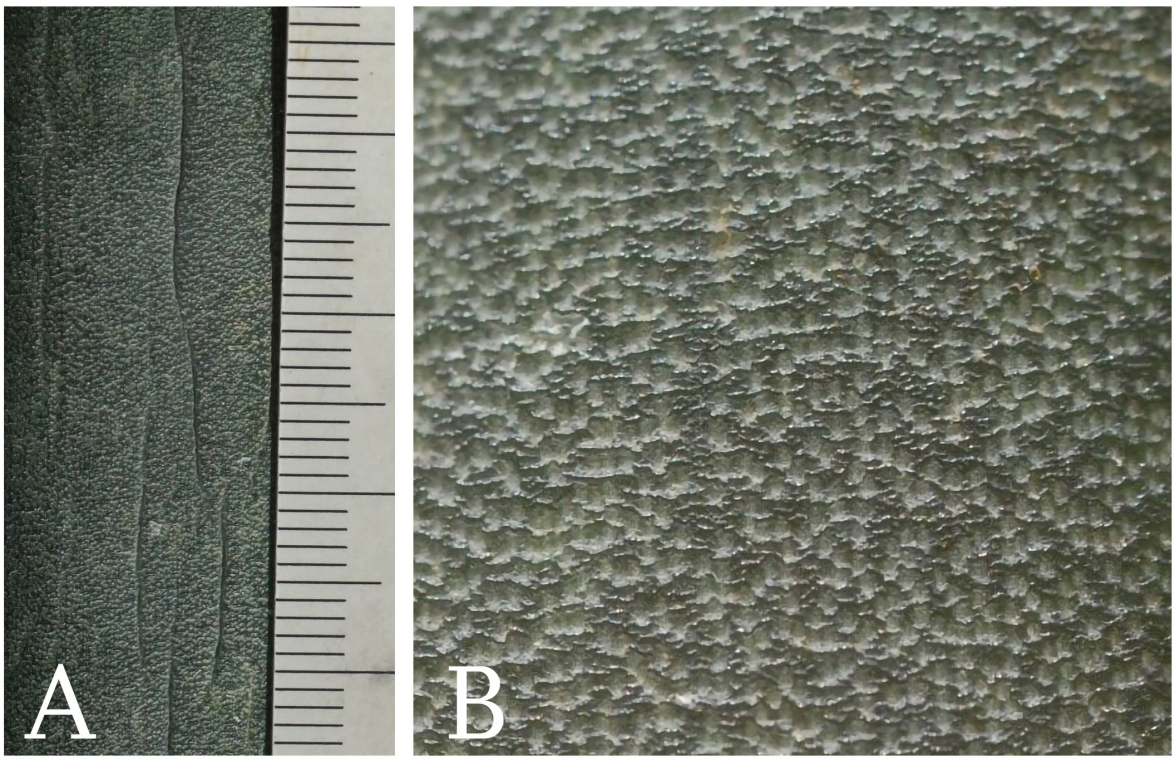

Fig. 5. A–B.Macrolens photographs of the abaxial leaf surface of *Sansevieria bangalalana* Mollel, M.Burkart, Sikawa & Yinger sp. nov. in cultivation at a TSF greenhouse. Note the very numerous stomata (whitish dots) and the nodose transverse ridges between them. The size of the surface in B is about 1 × 1 cm. Photos: Bernd Weber.

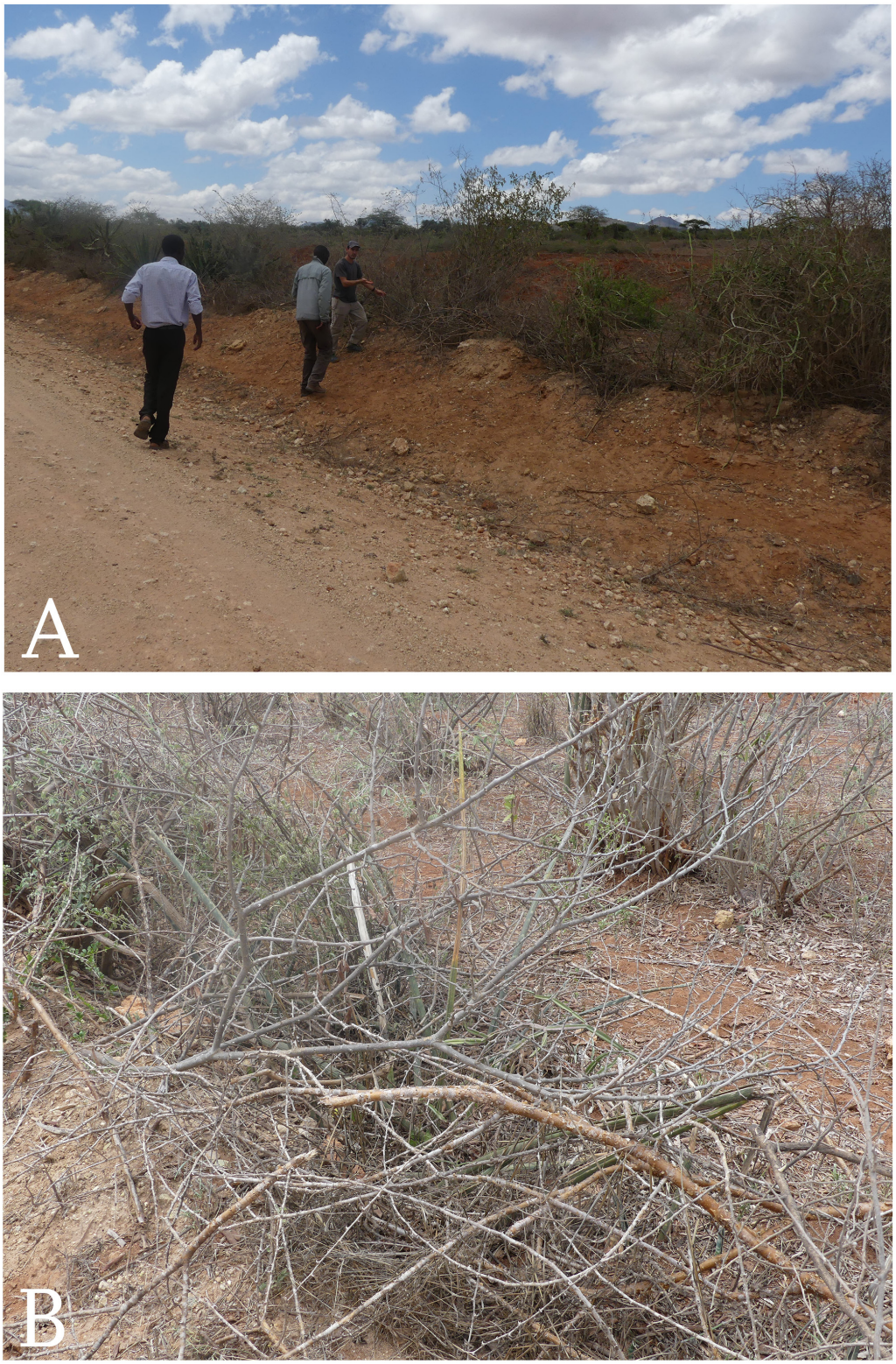

Fig. 6. Destroyed type site of *Sansevieria bangalalana* Mollel, M.Burkart, Sikawa & Yinger sp. nov. **A**. Search for *S. bangalalana*. Attendees of the 2nd Sansevieria Conference, Arusha, detect last remnants of the single population known on the road bank. **B**. Bulldozed remnants of *S. bangalalana* on the road bank among other plants. Photos: 27 Oct. 2023, Michael Burkart.

Tentative threat assessment

Critically endangered: CR B2ab(iii); C1+2(i); D.

Sansevieria bangalalana sp. nov. was first observed by us (RAS, BRY) on December 14, 2021, when a sterile living specimen was collected (*YS 1026*). At that time, a strip of flat land between the Bangalala Road and the foothills of the North Pare Mountains was covered with extensive colonies of *Sansevieria volkensii*, *S. fischeri*, and colonies of another taxon, probably *S. bangalalana*. This site is about 100 m wide and 3 km long. Because of the variability of *S. volkensii* and *S. fischeri*, it was not clear whether or not we were seeing something new. Only when *YS 1026* flowered at TSF in early March, 2022, it became clear that it is a unique new species.

On several visits to the site (October and November, 2023, and January, 2025) we found that almost the entire area possibly occupied by *S. bangalalana* sp. nov. had been cleared of all vegetation, its remnants burned, and the whole site scraped to bare soil. On October 27, 2023, we observed 22 leaves in a heavily stressed colony at roadside, mostly covered with soil (Fig. 6), of which only four survived to January, 2025, so regarding the morphology of *S. bangalalana* there were fewer than 4 shoots remaining on few square meters in a very unfavourable situation. On this last visit, a second colony of about 25 plants including one inflorescence was found in another location. There is now very little natural vegetation remaining anywhere between the main highway and the town of Bangalala, as most of it has been converted to agricultural land. There is virtually no chance that any other plants of *S. bangalalana* will remain there.

In conclusion, *S. bangalalana* sp. nov. is imminently threatened by extinction in the wild. IUCN threat category CR (critically endangered) applies under criteria B2 (AOO < 10 km²), C1 (less than 250 mature individuals and strong population decline), C2i (< 50 mature individuals in both subpopulations), and D (< 50 mature individuals overall). Additionally, we suppose that the probability of extinction in the wild within 10 years is > 50% (criterion E). Apart from the plants in cultivation at TSF, POTSD, and one other collection, only one small stand (ca 25 shoots) and the four leaves by the road and largely covered with piled soil are left. The present threat status according to our data is CR, close to EW.

Sansevieria chlorantha M.Burkart, Kavula, Sikawa & Yinger sp. nov.
urn:lsid:ipni.org:names:77370778-1
Figs 1, 7–9; Table 1

Diagnosis

Sansevieria chlorantha sp. nov. is characterised by its short but rather thick brownish rhizomes, its numerous, long, narrow, rather thick and clearly patterned leaves, its long inflorescence with medium-sized, greenish flowers, the colour extending to the style and filaments, its conspicuous, long-living bracts of the partial inflorescences, its styles that are distinctly longer than the filaments, and its grass-like flower odour. The greenish colouration of filaments and style, or parts of them, is very unusual in the genus.

Etymology

Sansevieria chlorantha sp. nov. was named for the largely green flower colour, including parts of the filaments and style.

Type material

TANZANIA • Kilimanjaro Region, remnant of natural vegetation within a village; 810 m a.s.l.; 17 Mar. 2020; *B. Yinger & R.A. Sikawa YS 0350*; holotype: NHT [000001155].

Living specimens ex typo cultivated at TSF and POTSD.

Description

Acaulescent herb, rhizomatous, stemless, vegetative height around 1 m, ca 6 leaves per shoot, longest leaf at intermediate position, forming dense stands (Fig. 7A). Rhizome to 150 mm long, rhizome diameter 35–50 mm, inner rhizome cortex brownish. Leaves dispersed in all directions, upright to spreading, very stiff, up to 1 m long or a little bit longer, to 62 mm wide, strap-like, without petiole but with a median ridge on the abaxial side, lamina u-shaped to somewhat v-shaped and thickened to 42 mm in central part††, slightly rough on the adaxial and clearly but finely rough on the abaxial surface, dull dark green, whitish dotted and transversely banded, darker colour covering ca 60–70% of leaf adaxial surface but only ca 50% of abaxial surface, pattern not fading with leaf age, margin red-brown and whitish, with ca 8 dark longitudinal lines from base to tip adaxially and ca 15 abaxially, leaf base to 63 mm wide, awn-like tip to 74 mm long, leathery. Inflorescence (Fig. 7) unbranched elongate, central on fully leaved shoot, up to 1.35 m long, peduncle to 0.5 m long, green, 14 mm in diameter between the two lowermost bracts, patterned with tiny dots and lines, with three peduncle bracts to 175 mm long and two hypsophylls (intermediate basal leaflets bigger than the bracts but much smaller than the leaves) below them, bracts light green with purple dots; flowering part 0.85 m long, flowers arranged densely to lax, subverticillately, 6 (5–7) flowers per partial inflorescence but fewer in the upper part, lower bracts of partial inflorescences to 55 mm long and 14 mm wide, central and upper ca13–17 mm long and 4–5 mm wide, triangular to lanceolate, not dry at anthesis. Flowers medium-sized, on articulate pedicels 9–12(14) mm long, basal part 6–9 mm, distal part‡‡ ca 3 mm, light green, corolla outside coloured light green as well, without longitudinal lines, wilting flowers not changing colour substantially, basal diameter ca 3 mm but only ca 2 mm on narrowest part, tubes ca 25 mm long, lobes ca 18 mm long and ca 2 mm wide, curling back at anthesis to 360°, filaments greenish, thread-like (not substantially flattened or widened), ca 16 mm long, anthers closed ca 4 mm long, opened ca 3 mm long, yellow green, style white to greenish, straight, ca 54 mm long above ovary, ca 31 mm exserted from flower throat (i.e., greatly exceeding the filaments), stigma ca 1 mm wide, translucent, ovary ovoid, yellow green; flowers open from evening to early morning; flower odour: fresh grass. Fruits# glossy and slightly warty when unripe, orange and almost smooth when ripe (Fig. 8A). Seeds# globular to elliptical, 5.5–7.3 mm long, 4.4–5.5(6.7) mm thick, yellowish or light brown (colour dimorphic), hilum lateral, large, circular to elliptical, diameter 3.5–5.3 mm, brighter than the light brown seed surface (Fig. 8B–C).

Ecology and distribution

Sansevieria chlorantha sp. nov. was found only once in a village occupying a strip of remaining natural vegetation on gently sloping land. Downslope, where there are soils suitable for field crops, the land is now entirely converted to agriculture. Until recently, these plants were growing in the shade of a strip of native trees remaining before the village expanded. Nearly all of these trees were removed when the road was widened. Upslope are extensive populations of *S. volkensii*. This is a very arid area with stiff infertile soil in the Kilimanjaro Province, North Pare Mountains region (Fig. 1).

Taxonomic remarks

Sansevieria chlorantha sp. nov. (subgenus *Sansevieria*) has similarities to *S. enchiridiofolia* R.H.Webb & L.E.Newton which also seems to have conspicuous, long-lasting, greenish bracts of partial inflorescences (see Webb & Newton 2019: fig. 7) and rather thick, narrow leaves of similar, dark green colouration and patterning. *Sansevieria enchiridiofolia*, however, is clearly different due to its mostly single-leaved shoots, sweetly-scented flowers that are white instead of greenish, and longer styles. It is also a rare species, occurring more to the north in Tanzania, north of Arusha, and possibly also in adjacent Kenya (Webb & Newton 2019; MB pers. obs.). Also, *S. lunatifolia* L.E.Newton from S Kenya has similarities in the leaf dimensions and cross-section (Newton 2015). However, it has rougher and thinner leaves and the flower traits are different including scent, colouration and filament length. This species is also rare.

Table 1. Comparison of *Sansevieria chlorantha* M.Burkart, Kavula, Sikawa & Yinger sp. nov. with similar species of the subgenus *Sansevieria*. The traits of the species compared are taken from the protologues (Brown 1915; Newton 2015; Webb & Newton 2018), either directly or in a few cases from the pictures within.

	S. raffillii	***S. rugosifolia***	***S. lunatifolia***	***S. enchiridiofolia***	***S. chlorantha* sp. nov.**
leaves per shoot	1–2	2 (1–4)	2–3	1 (2)	6
rhizome diameter [mm]	to 50	to 20	30	to 30	35–50
leaf length [mm]	600–1050	400 (350–500)	850–1300	650 (550–1000)	1000
leaf width [mm]	50–130	90 (70–110)	40–65	65 (60–90)	to 62
lamina transect	openly u-shaped	openly u-shaped	u-shaped	u-shaped to folded	u-shaped to somewhat v-shaped
max. lamina thickness in central part of leaf [mm]	(rather thin)	< 3	20	15	42
texture of leaf upper/adaxial side	smooth	rough to very rough	rough	slightly to very rough	slightly rough
texture of leaf under/abaxial side	smooth	very rough	rough	slightly to very rough	clearly but finely rough
leaf colour relationship	lighter colour prevailing	lighter colour prevailing	dark colour prevailing	50 : 50 or dark colour slightly prevailing	dark colour prevailing adaxial, 50 : 50 abaxial
inflorescence length [mm]	900–1200	550	1100	800	to 1350
peduncle diameter [mm]	13–17	20	to 25 at base	20	14
peduncle bracts length [mm]	51–141	80	to 130		to 175
flowers per partial inflorescence	to 5	5	to 7	5	6 (to 7)
flower odour		strong sweet scent	strongly sweet	strong sweet scent	fresh grass
pedicel basal part length [mm]	2.5–4		4–5		6–9
pedicel upper part length [mm]	1.3–2		1		3
corolla outside colour	greenish white, slightly glaucous	tube yellowish-white, lobes white	green to white	white	light green
length flower tube [mm]	26–29	35	18–23	27	25
length flower lobes [mm]	29–30	20	25	23	18
filaments colour		translucent	white	translucent	greenish
filament length [mm]		15	27		16
style colour		white		white	white to greenish
style exsertion [mm]		30		37	31
style length above ovary [mm]		45	45	70	54

The more frequent *S. rugosifolia* R.H.Webb & L.E.Newton has much shorter but wider leaves of different colouration and further differences in inflorescence and flower features. Table 1 gives an overview.

Sansevieria chlorantha sp. nov. was tentatively named *S. viridiflora* in Yinger & Sikawa (2023c).

Tentative threat assessment

Critically endangered: CR B2ab(v); C1; E.

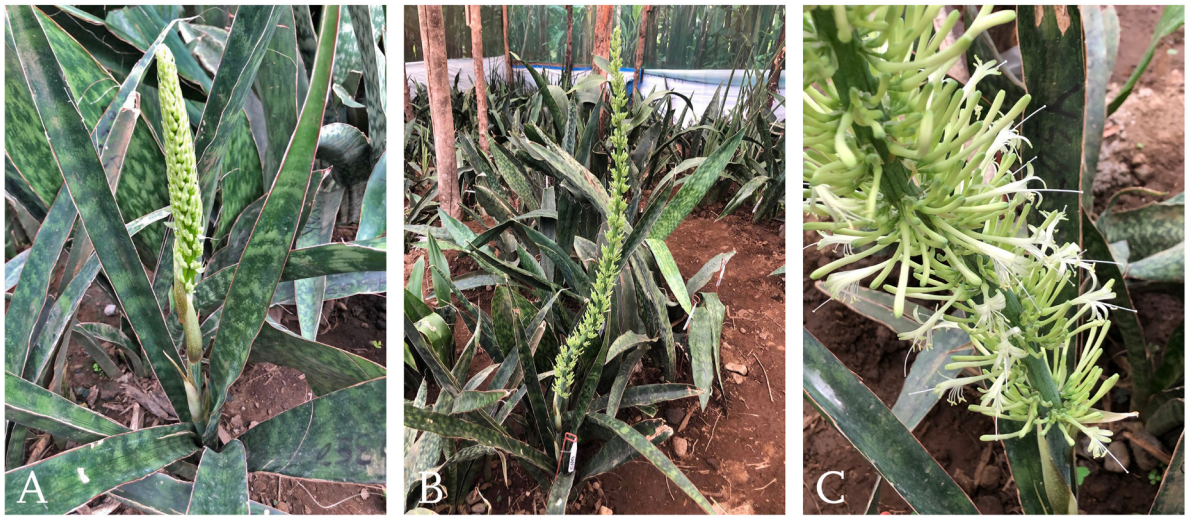

Fig. 7. *Sansevieria chlorantha* M.Burkart, Kavula, Sikawa & Yinger sp. nov. with flowers; holotype, NHT [000001155], in a TSF greenhouse. **A**. Inflorescence in early bud stage. The photo shows the conspicuous dimensions of the bracts of partial inflorescences and of the inflorescence as a whole. **B**. Same shoot some days before anthesis. This photo shows the impressive long inflorescence. **C**. Opened flowers wilting in the morning. The styles clearly exceed the filaments in length. Photos: Elias Sikawa.

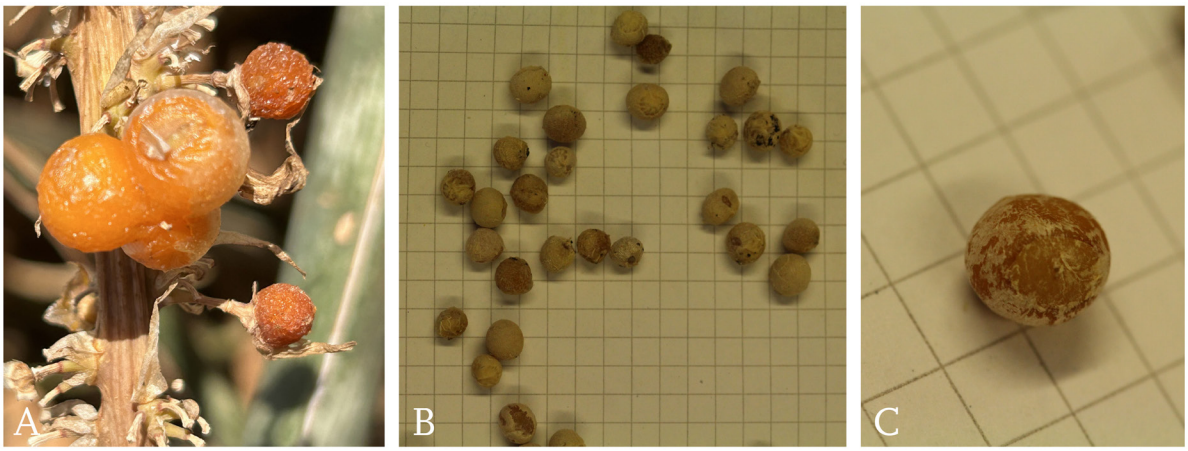

Fig. 8. Fruits and seeds of *Sansevieria chlorantha* M.Burkart, Kavula, Sikawa & Yinger sp. nov. **A**. Fruits at the type site, Oct. 2023. One ripe three-seeded fruit is seen in the foreground, two dried-up one-seeded fruits are to the right. **B–C**. Seeds extracted from fruits collected at the type location and photographed on a 5 mm grid. Note the two different colour morphs, the almost globular shape and the rather large hilum. Photos: A by Christiane Benthin; B–C by Sarah Leonhardt.

Fig. 9. Part of the only known wild population of *Sansevieria chlorantha* M.Burkart, Kavula, Sikawa & Yinger sp. nov., Kilimanjaro Region, Same District. **A**. Inspected by the puzzled first author, 5 Dec. 2021. **B**. Re-inspection in Oct. 2023. The first author is puzzled still but also concerned. Although not the full population is pictured, the massive reduction in population size is clearly seen. Photos by Christiane Benthin.

We only know one certain population of *S. chlorantha* sp. nov. which is at the type location. In March 2020, there were more than 200 shoots, but the population in September 2023 was only about 100 shoots, i.e., a reduction by 50% in less than 4 years and one generation (Fig. 9). Since then, it has further declined (last visit in January, 2025). According to IUCN criteria B2 (AOO < 10 km², only 1 location known and continuing decline observed in number of mature individuals) and C1 (population decline of more than 25% in 1 generation), we rate this species as Critically Endangered (CR) according to our data. As the location is in an intensely developed area where land is at a premium for housing and small businesses, extinction in the wild might happen soon (criterion E, probability of extinction in the wild > 50% within 3 generations).

Sansevieria embere Mollel, M.Burkart, Yinger & Sikawa sp. nov.
urn:lsid:ipni.org:names:77370779-1
Figs 1, 10–15; Table 2

Diagnosis

Sansevieria embere sp. nov. is characterised by its very long and dense, spear-like inflorescence, with 7 large sterile bracts on the peduncle, extraordinarily long-tubed flowers in partial inflorescences of only up to 3 flowers which have straight styles and anther and style exsertion of rather similar length.

Etymology

'Embere' is a maasai word for a spear, recalling the form of the inflorescence. The place where *S. embere* sp. nov. was found would have been the home of Maasai.

Type material

TANZANIA • City of Arusha, Arumeru, Manyara Estate; 1448 m a.s.l.; 24 Aug. 2020; *B. Yinger & R.A. Sikawa YS 0641*; holotype: NHT [000001156].

Living specimens ex typo cultivated at TSF and POTSD.

Description

Acaulescent herb, rhizomatous, vegetative height ca 1 m, 2 cataphylls and 2–4 leaves per shoot, pointing to all directions, longest leaf at intermediate position (neither outermost nor innermost) on individual shoots (Fig. 10); fresh cataphylls purple, mottled. Rhizome subterranean but close to soil surface (ca 0–10 cm), runners to 0.2 m long, rhizome diameter ca 30–50 mm, colour of inner rhizome cortex light ochre, fresh rhizome outside view yellowish, older light brown, young cortex very thin (ca 0.2 mm), thicker when old (ca 1 mm). Leaves upright to spreading, stiff, up to 1 m long or slightly longer, 94–120(142) mm wide, central lamina 5 mm thick, flat to slightly u-shaped, lanceolate, clearly narrowed to the base but without petiole, abaxial side with insignificant central ridge, leaf base ca 50–70 mm wide and 10 mm thick, margin red-brown and whitish, often somewhat undulate, distal part narrowed to a leathery tip 2–8 mm long; adaxial surface smooth, medium to blackish green in older leaves but with bluish bloom when young, with more than 20 dark longitudinal lines from base to tip, somewhat insignificantly patterned with lighter green dots and bands in zig zag patterns, strongly glossy in cultivation but much less so in the wild (Fig. 11); abaxial surface with punctiform elevations in a rather loose pattern, thereby finely though clearly rough to the touch, dull to silky glossy with up to 40 dark green continuous or interrupted longitudinal lines, much more clearly patterned than adaxial side; patterning of the leaves fading with age but still visible in old leaves. Inflorescence (Fig. 12) of very conspicuous length, elongate thyrsoid, terminal on fully leaved shoot, axis 1172 mm long overall, peduncle 446 mm long, 15 mm in diameter, yellowish at the base to dark green upwards, patterned with tiny dots and lines, bearing 7 dry bracts to 281 mm long, flowering part 726 mm long, flowering inflorescence 73 mm in diameter excluding

Table 2. Comparison of *Sansevieria embere* Mollel, M.Burkart, Yinger & Sikawa sp. nov. with similar species of the subgenus *Sansevieria*. The traits of the species compared are taken from the protologues (Brown 1915; La Croix 2004; Forrest 2014). Additional information regarding *S. pedicellata* was taken from Rulkens & Baptista (2009, Mount Zembe plant).

	S. raffillii	***S. pedicellata***	***S. newtoniana***	***S. embere* sp. nov.**
leaves per shoot	1–2	2–6(15)	2–6(9)	2–4
rhizome diameter [mm]	to 50	over 50	40–50	30–50
leaf length [mm]	600–1050	600–1400	860–1700	1000
leaf width [mm]	50–130	60–130	80–100(110)	94–120(to 142)
lamina transect	openly u-shaped	flat	rather flat	flat to slightly u-shaped
max. lamina thickness in central part of leaf [mm]	(rather thin)	thin	2	5
texture leaf upper/adaxial side	smooth	smooth?	smooth	smooth, strongly glossy in cultivation
texture leaf under/abaxial side	smooth	smooth?	slightly rough	finely rough from loose punctiform elevations, dull to silky glossy
leaf patterning	distinctly patterned, lighter colour prevailing	dark green with inconspicuous pattern	mid-green with inconspicuous pattern	distinctly patterned, dark colour prevailing
inflorescence length [mm]	900–1200	700–1300	460–860(1240)	1172
peduncle diameter [mm]	13–17	4	12	15
peduncle bracts length [mm]	51–141	40–60	65–110	281
flowers per partial inflorescence	to 5	4–6	to 6	(1)3–5(8)††
pedicel basal part length [mm]	2.5–4	(6–10)15–18	ca 7–9	5
pedicel upper part length [mm]	1.3–2	1–2	ca 0	0
corolla outside colour	greenish white, slightly glaucous	whitish	green at base, white above	yellowish to greenish
length flower tube [mm]	26–29	80–90	45–48	64
length flower lobes [mm]	29–30	17–20	25–27	31
filament length [mm]			45	47
style colour		white?		white
style exsertion [mm]			exceeding filaments	equal to filaments
style length above ovary [mm]			to 80	110

anthers and styles, dense, 1–3 flowers per partial inflorescence at the lower part, 3– 5(8)†† at the median and 1–2 at the upper part; bracts of partial inflorescences 12–21 mm long, 2–4 mm wide, herbaceous (not dry during anthesis), lanceolate, without extrafloral nectaries. Flowers on dark green, sometimes purple pedicels 5 mm long, articulated close to the receptaculum, corolla outside coloured yellowish to greenish, tube 67 mm long, lobes 31 mm long, 2 mm wide, overall flower length 98 mm, diameter of closed flower‡‡ shortly before anthesis 3.5 mm at the base, 1–1.4 mm at the narrowest point, 3 mm in the upper part; lobes strongly curling back at full anthesis (Fig. 12B); anthers yellowish to greenish, anthers ca 4 mm long, filaments filiform, 47 mm long, styles straight, 110 mm long above ovary, 47 mm exserted from tube mouth; ovary light green to yellowish, cylindric, apex truncate. Flowers opening in the evening, wilting in the afternoon. Fruits# small to medium-sized, surface glossy when unripe, covered with numerous rather large whitish dots, slightly rugose and orange when ripe, in all stages with several but small verrucae (Fig. 13). Seeds (Fig. 14) elliptical, 6–7.3 mm long, 5.7–6.7 mm thick, light brown,

Fig. 10. *Sansevieria embere* Mollel, M.Burkart, Yinger & Sikawa sp. nov. at the type location, Manyara Estate, Arusha, with numerous inflorescences after anthesis. The shoots are forming a very dense stand. It is not quite clear whether this population is natural or planted; if planted, most likely from plants formerly growing nearby. Photo by Barry R. Yinger.

with dull surface, hilum apical, elliptical, rather large, ca 5.3 mm diameter, brighter than the seed. Youth form (seedlings) slightly different from adult plant, leaf colouration lighter green with transversally oriented, whitish patterning (Fig. 15).

Phenology

The flowers open in the evening as in most species of *Sansevieria*, but last until the following afternoon, i.e., uncommonly long.

Ecology and distribution

Sansevieria embere sp. nov. has so far been found only in a pocket of succulent vegetation in Arusha City within extensive coffee plantations (Figs 1, 10). It is likely that this species was restricted to the area now occupied by the city and its once-vast coffee plantations, which are monocultures of coffee and *Grevillea robusta* A.Cunn. ex R.Br. This area is not especially arid, with long rainy seasons and occasional rains off-season. The soil is fertile and well-drained.

Taxonomic remarks

Seeds were studied from fruits collected from ca 45 individual infructescences all over the population at the type location with one fruit per shoot.

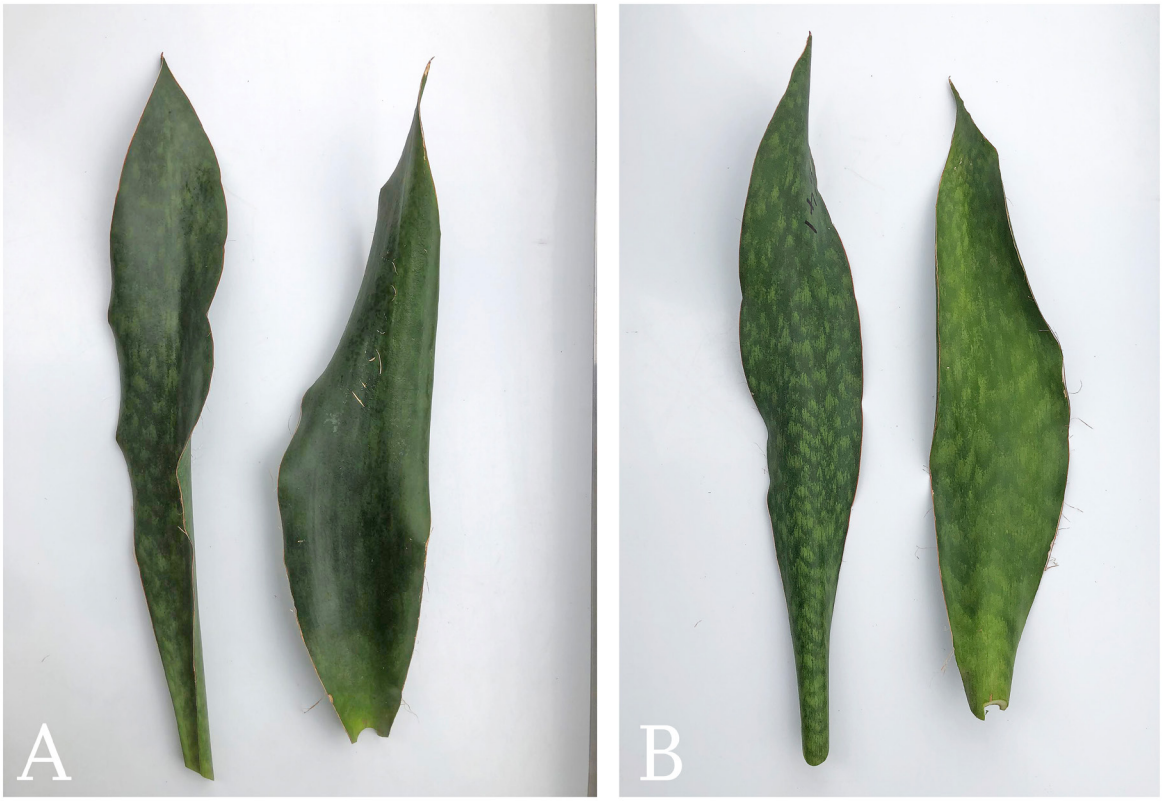

Fig. 11. Two leaves of *Sansevieria embere* Mollel, M.Burkart, Yinger & Sikawa sp. nov. ex typo from cultivation in a TSF greenhouse. **A**. Adaxial side, **B**. Abaxial side. Note the margin undulation, the dark colour, the strong gloss of the adaxial surface, much stronger than in the population at Manyara Estate (Fig. 10), and the clearer colour pattern of the abaxial surface. Photos by Barry R. Yinger.

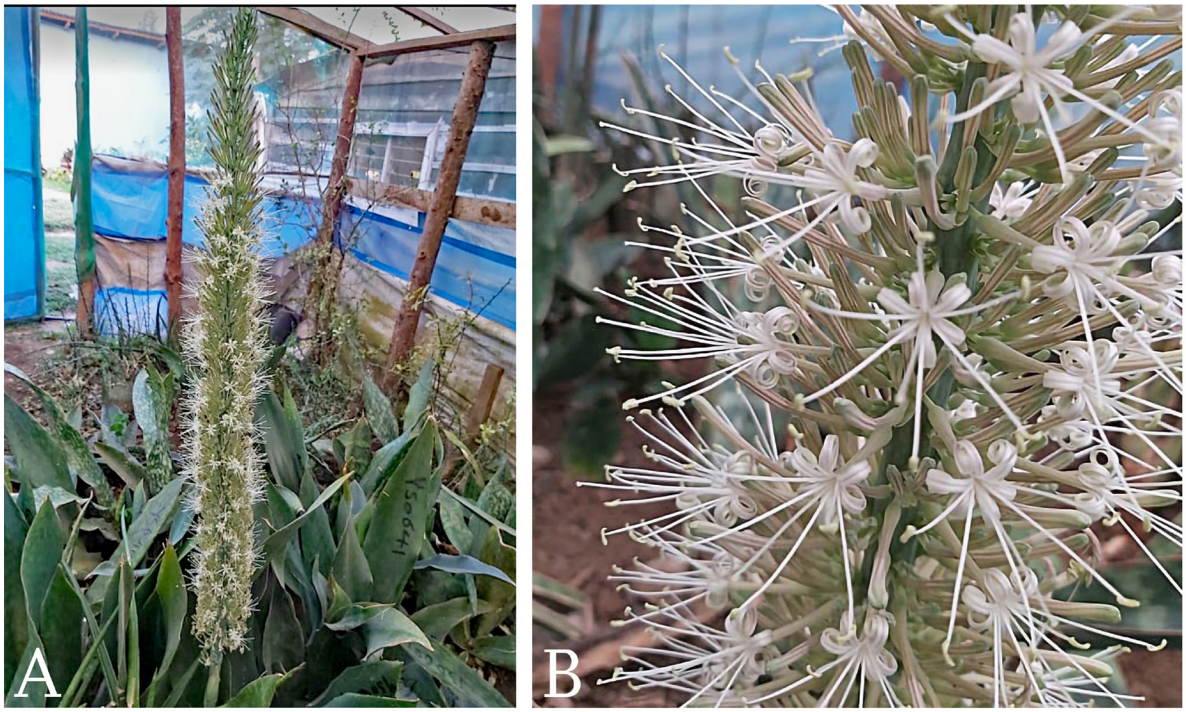

Fig. 12. The impressive inflorescence of *Sansevieria embere* Mollel, M.Burkart, Yinger & Sikawa sp. nov., holotype before harvesting (NHT [000001156]). **A**. Note the extraordinary long and slender, elegant 'gestalt'. **B**. Close-up of a part of the inflorescence. Note the large, long-tubed flowers. The styles are straight, the corolla lobes strongly curled back. Note also the striation of the corolla outside including tube and lobes, adding to the elegance of this species. Photos: A by Barry R. Yinger; B by Elias Sikawa.

Fig. 13. Fruits of *Sansevieria embere* Mollel, M.Burkart, Yinger & Sikawa sp. nov. at the type location, Manyara Estate, Arusha. **A**. Inflorescence after anthesis. Some flowers seem to have been pollinated successfully and start to develop fruits (lower part of the picture), while many others already dropped, leaving the basal part of their pedicel. **B**. One green and several ripe fruits. Note the glossy surface and the numerous large whitish dots of the unripe fruit. **C**. Ripe fruits. Note the small verrucae on the slighty rugose surface. The vast majority of the numerous fruits in the population were one-seeded. Photos: A by Barry R. Yinger, Aug. 2020; B–C by Michael Burkart, Oct. 2023.

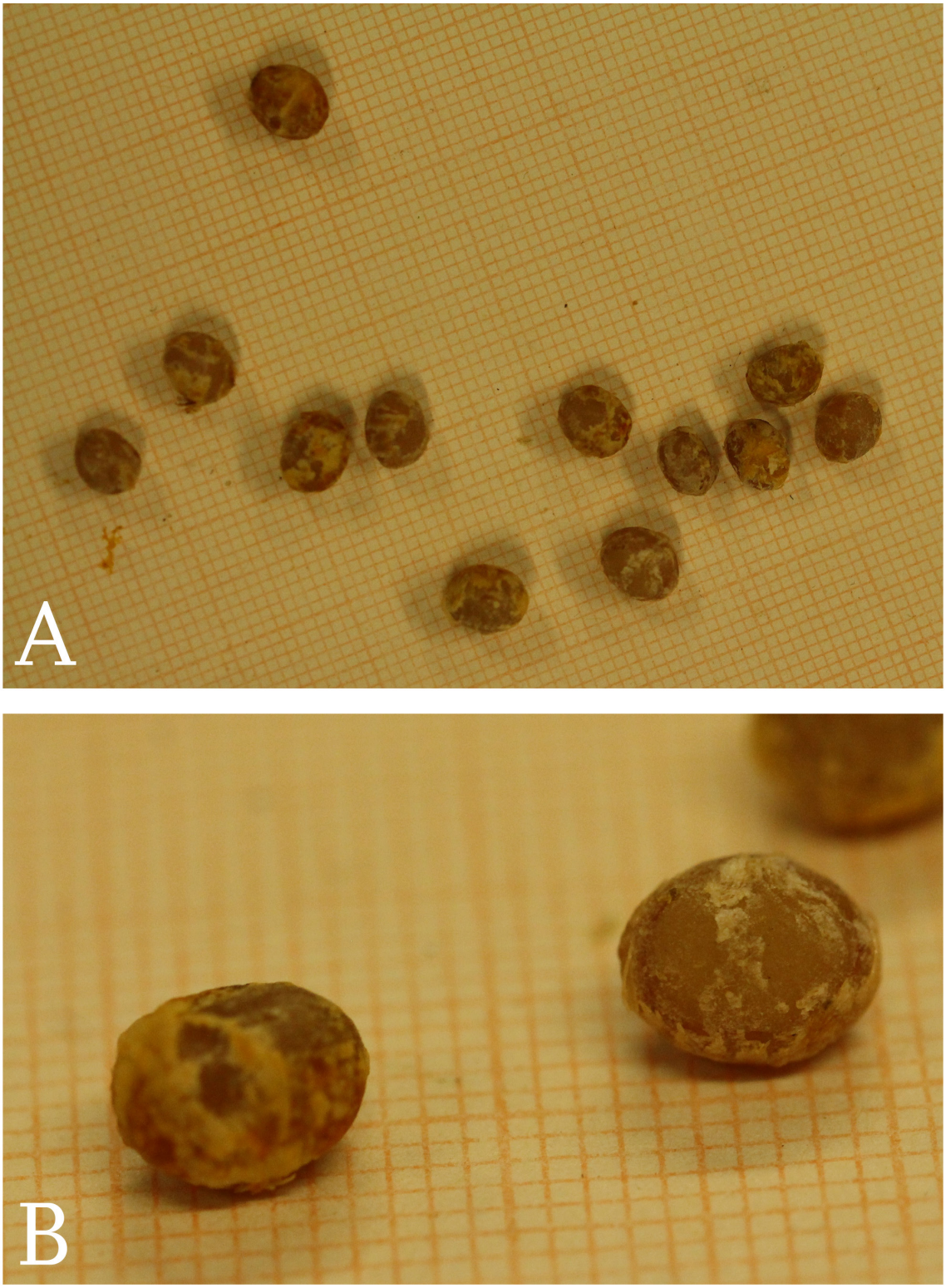

Fig. 14. Seeds of *Sansevieria embere* Mollel, M.Burkart, Yinger & Sikawa sp. nov. collected at the type location, Manyara Estate, Arusha, photographed on a 1 mm grid in artificial, yellowish light. Note the elliptical form, the light brown colour and the lighter-coloured hilum which is almost as big as the seed diameter. Parts of the seeds are still covered with endocarp fibres which are difficult to remove totally. Photos be Sarah Leonhardt.

This iconic species in the subgenus *Sansevieria* is similar to *S. raffillii* N.E.Br. in overall size, leaf dimensions and posture, inflorescence size, and greenish flower colouration. It differs from this species, however, in having more leaves per shoot, darker leaf colour, leaves that are finely rough rather than smooth on the abaxial side, much longer peduncle bracts, and fewer flowers per partial inflorescence. Also, the pedicel relationships are different. Most striking, however, is the difference in flower tube length. Actually, *S. embere* sp. nov. is the species with the longest flower tube among all red-bordered flat-leaved species of *Sansevieria* with the exception of *S. pedicellata* la Croix, a plant from the border region of Mozambique and Zimbabwe, which is clearly different in many features (Rulkens & Baptista 2009; la Croix 2010; Table 2). The next in flower size in this group, *S. newtoniana* T.G.Forrest occurring in Uganda and adjacent N of Tanzania (Forrest 2014; Yinger & Sikawa 2021e), is different from *S. embere* in leaf colouration and stiffness as well as in inflorescence and flower features. An overview is given in Table 2.

Several accessions similar to *YS 0641* have been identified in the TSF living collection. None of these, however, has flower tubes longer than 30 mm, and several differ in other traits as well. They belong to other species, therefore, some of which possibly are undescribed yet.

Tentative threat assessment

Critically endangered: CR E.

Fig. 15. Seedlings of *Sansevieria embere* Mollel, M.Burkart, Yinger & Sikawa sp. nov. representing the youth form. Note the transversal-oriented mottling, different from the dots of adult leaves (Fig. 11). The primary leaves already have the red-brown and whitish margin. Photo by Michael Burkart, POTSD.

Residual fragments of *Sansevieria* populations are not uncommon in and around Arusha, but there does not seem to be another one of this species. At least, we could not find any during numerous excursions. It appears that the survival of this particular colony is intentional although no one lives nearby.

There is only this single population known, with very limited spatial extent (less than 10 m × 100 m) and limited although conspicuous size, and without any legal conservation status, on privately-owned but publicly accessible land. We suppose that the probability of this single population to become extinguished is > 50% in 3 generations as it occurs within the Arusha City limits (IUCN criterion E), classifying it as CR according to our data.

Sansevieria muhaensis M.Burkart, Yinger, Sikawa & Mollel sp. nov.
urn:lsid:ipni.org:names:77370780-1
Figs 1, 16–19, Table 3

Diagnosis

Sansevieria muhaensis sp. nov. is characterised by its undulate leaf margins (Fig. 16), its very long, greenish bracts of partial inflorescences in the flowering head (Fig. 17) and the dark red colouration of the inner rhizome cortex. It is somewhat similar to *S. kirkii* Baker which also has a median ridge on the leaf abaxial side and similar flower dimensions. In *S. kirkii*, however, the abaxial leaf ridge is more pronounced and bears several lateral furrows from base to leaf tip which are completely lacking in *S. muhaensis*. Also, *S. muhaensis* has longer runners and a dark red rather than dark brown colouration of the inner rhizome cortex which is characteristic of *S. kirkii*. Further, the outside corolla pattern of *S. kirkii* is reddish to dark red, not grey as in *S. muhaensis*. An overview is given in Table 3.

Etymology

Sansevieria muhaensis sp. nov. is named for the Muha, the tribe associated with the area where this species was found.

Type material

TANZANIA • Kigoma Region, near the limits of Kigoma City; 803 m a.s.l.; 3 Mar. 2020; *B. Yinger & R.A. Sikawa YS 0279*; on termite mounds in sun; holotype: NHT [000001160].

Living specimens ex typo cultivated at TSF and POTSD.

Description

Acaulescent herb, rhizomatous, stemless, vegetative height†† ca 720 mm, 2 green cataphylls and 3–6 leaves per shoot forming a regular rosette (Figs 16, 18), longest leaf at intermediate position (neither outermost nor innermost) on individual shoots. Rhizome to 250 mm long, diameter ca 36–46 mm, inner cortex colour†† deep red. Leaves up to 900 mm long or slightly longer, to 85 mm wide, lingulate-lanceolate, without petiole, moderately falcate to slightly twisted, with a median ridge on the abaxial side and more or less undulate margins (more so in wild-growing plants, Fig. 16), openly u-shaped and thickened, both surfaces smooth with silk gloss, patterned with cloudy blotches anywhere and cloudy transverse bands on some leaves, mostly in their middle and lower parts, the lighter colour covering ca 50% on both surfaces but appears stronger on the abaxial side, strongest on new leaves, with a few dark longitudinal lines on the adaxial side only which do not extend to the leaf tip, lamina central thickness ca 16 mm; leaf base ca 85 mm wide, ca 26 mm thick, margin lined reddish-brown and whitish, awn-like tip to 38 mm long, brown, stiff and almost sharp on new leaves, leathery and flexible on old leaves. Inflorescence terminal on fully-leaved shoot, capitate (Fig. 18C), ca 350 mm long overall, peduncle ca 290 mm long, 18 mm in diameter, medium green with purplish flecks or spots all over but white-pinkish at the base,

Table 3 (continued on next page). Comparison of *Sansevieria sumbawangana* M.Burkart, Constantine, Sikawa & Yinger sp. nov., *S. rukwana* M.Burkart, Piniely, Sikawa & Yinger sp. nov. and *S. muhaensis* M.Burkart, Yinger, Sikawa & Mollel sp. nov. with similar species of the subgenus *Capitulatus* Mbugua ex L.E.Newton & R.H.Webb. The traits of the species compared are taken from Newton (2020) if not stated otherwise: † = from TSF; ‡ = from Brown (1915); § = from the protologue (Webb & Newton 2018); | = from POTSD. ¶ = style length including ovary.

	S. sinus-simiorum	***S. bhitalae***	***S. kirkii***	***S. sumbawangana* sp. nov.**	***S. rukwana* sp. nov.**	***S. muhaensis* sp. nov.**
leaves per shoot	8–10 (?)	1(2–3)	1–3 / 2–88	2–5	2–3	3–6
rhizome diameter [mm]	50	50§	20–42|	70	30	36–46
inner colour of rhizome cortex		ochre‡‡	dark brown|	brownish orange	dark reddish orange	deep red
leaf posture	erect to slightly recurved	erect	ascending-spreading to recurved‡	upright to spreading	spreading to almost horizontal	spreading
leaf length [mm]	to 1000	750 (400–900); 1000–2000††	750–2750	1000	810	900
leaf width [mm]	60	50–70	60–90(to 120|)	210	110	85
max. lamina thickness in central part of leaf [mm]	50	(massive)	8–14‡	20	6	16
pseudo-petiole	missing	missing|	existing‡	missing	missing	missing
lamina transect	massively u-shaped	massively u-shaped|	concave or flattish‡	openly u-shaped to almost flat	flat but u-shaped	openly u-shaped, thickened
leaf margin	rather straight	rather straight|	very wavy‡	somewhat wavy	sinuate	undulate
median ridge on leaf abaxial side	(massive)	(massive)	strong|	missing	missing	existing
leaf colour pattern	inconspicuous to present	yellow-green mottling from prominent to very faint	mottled or transversely banded	almost missing	adaxial cloudy, abaxial transverse bands	cloudy blotches and transverse bands
state of flowering shoot		often lateral, bearing only cataphylls and bracts†	fully-leaved	fully-leaved	fully-leaved	fully-leaved
peduncle length (base to lowermost pedicel) [mm]	290	ca 300	to ca 500	300	163	290
peduncle diameter [mm]	15	15	13‡ / 15|	20	20	18
peduncle bracts	6	"3 pairs"§	5–6‡	7	4	8
peduncle bracts length [mm]	32–35	30 / 60 ("Superclone")§	50–77‡	to 78	46–114	to 116

Table 3 (continued). Comparison of *Sansevieria sumbawangana* M.Burkart, Constantine, Sikawa & Yinger sp. nov., *S. rukwana* M.Burkart, Piniely, Sikawa & Yinger sp. nov. and *S. muhaensis* M.Burkart, Yinger, Sikawa & Mollel sp. nov. with similar species of the subgenus *Capitulatus* Mbugua ex L.E.Newton & R.H.Webb. The traits of the species compared are taken from Newton (2020) if not stated otherwise: † = from TSF; ‡ = from Brown (1915); § = from the protologue (Webb & Newton 2018); | = from POTSD. ¶ = style length including ovary.

	S. sinus-simiorum	***S. bhitalae***	***S. kirkii***	***S. sumbawangana* sp. nov.**	***S. rukwana* sp. nov.**	***S. muhaensis* sp. nov.**
flowers per partial inflorescence		2–3/4–6 ("Superclone ")§	2–4‡	2–3	2–3	4
length of bract of partial infl. [mm]	4–8	to 16/to 30 ("Superclone")§	25–38	25–30	17–23	33–42
width of bract of partial infl. [mm]	2–4	to 5	8.5–19	7–14	7–12	5–9
shape of bract of partial infl.		broadly ovate	ovate or oblong-ovate, acute or subobtuse	lanceolate-elliptic	lanceolate-elliptic	lanceolate, rather shortly tapering to a short sharp point
pedicel length [mm]	6 (to 16?)		6.4–10.5	10	10	9
corolla outside colour	white tinged with green	tube white to lilac with purple blush, lobes white with a pink stripe§	tube pale, purplish or dull pink, lobes white tinged with green‡	yellow green	greenish white	greyish, greenish tip
length flower tube [mm]	82–97	75	114–127(to 137|)	90	100	117
length flower lobes [mm]	19–21	28	32–45	32	33	36
style length above ovary [mm]	126¶	100	162|	115	123	155

patterned with tiny dots and lines, with 8 peduncle bracts to 116 mm long but without hypsophylls, the lowermost with elongate tips, the upper only short-tipped, bases always shell-like, pale greenish with a few to many small dark dots when young, enveloping the flower-head in its first developmental stages,

Fig. 16. *Sansevieria muhaensis* M.Burkart, Yinger, Sikawa & Mollel sp. nov. in the wild. *YS 0279*, from which the holotype NHT [000001160] was harvested, was collected from this population. Note the clearly but heterogeneously patterned, lingulate-lanceolate leaves with undulate margins. Photo by Barry R. Yinger.

but dry at anthesis; flower-bearing part ca 60 mm long, with 4 flowers per partial inflorescence throughout the inflorescence; bracts of partial inflorescences 42–33 mm long, 9–5 mm wide, with 8–3 nerves, pale green when young but dry at anthesis, lanceolate, rather shortly tapering to a short sharp point, without nectaries. Flowers with aromatic odour; pedicels inarticulate, ca 9 mm long, light green; corolla outside coloured greyish before anthesis with greenish tips, with short greyish longitudinal lines on the basal part of the lobes in bud stage, wilting yellowish; tube ca 117 mm long, lobes ca 36 mm long, ca 3 mm wide,

Fig. 17. Developing inflorescence of *Sansevieria muhaensis* M.Burkart, Yinger, Sikawa & Mollel sp. nov. *YS 0279* in the TSF greenhouse showing the bracts of the partial inflorescences. Note their lanceolate shape and light green colouration. Photo by Elias Sikawa.

curling back at anthesis to 360°; filaments whitish-yellowish, ca 32 mm long, thread-like, open anthers ca 5 mm long, yellowish; style white, straight, ca 155 mm long above ovary, exserted ca 39 mm, stigma translucent-yellowish, ca 1 mm in diameter, ovary ovoid, light green. Fruits and seeds are unknown to us.

Ecology and distribution

Sansevieria muhaensis sp. nov. *YS 0279* was collected in the NE part of Kigoma City in Kigoma Region, near the city limits (Figs 1, 16). There are a number of collections from this area that are probably the same species as *YS 0279*, but they have not flowered yet. Based on several extended visits to the

Fig. 18. *Sansevieria muhaensis* M.Burkart, Yinger, Sikawa & Mollel sp. nov. *YS 0279* (type plant NHT [000001160]) in bloom. **A**. The first flowers are stretching. Note the short, greyish longitudinal lines on the basal part of the lobes and their greenish tips. **B**. Diurnal view of the same inflorescence, showing wilted flowers from several nights among closed buds. **C**. Same inflorescence in early bloom. The greyish colour is still present. **D**. Two opening flowers. The straight styles bear translucent yellowish stigmas already slightly exceeding the filaments. The lobes are not fully rolled back yet. The longitudinal lines on the outer side of the corollas are only visible on the closed buds. Photos by Elias Sikawa.

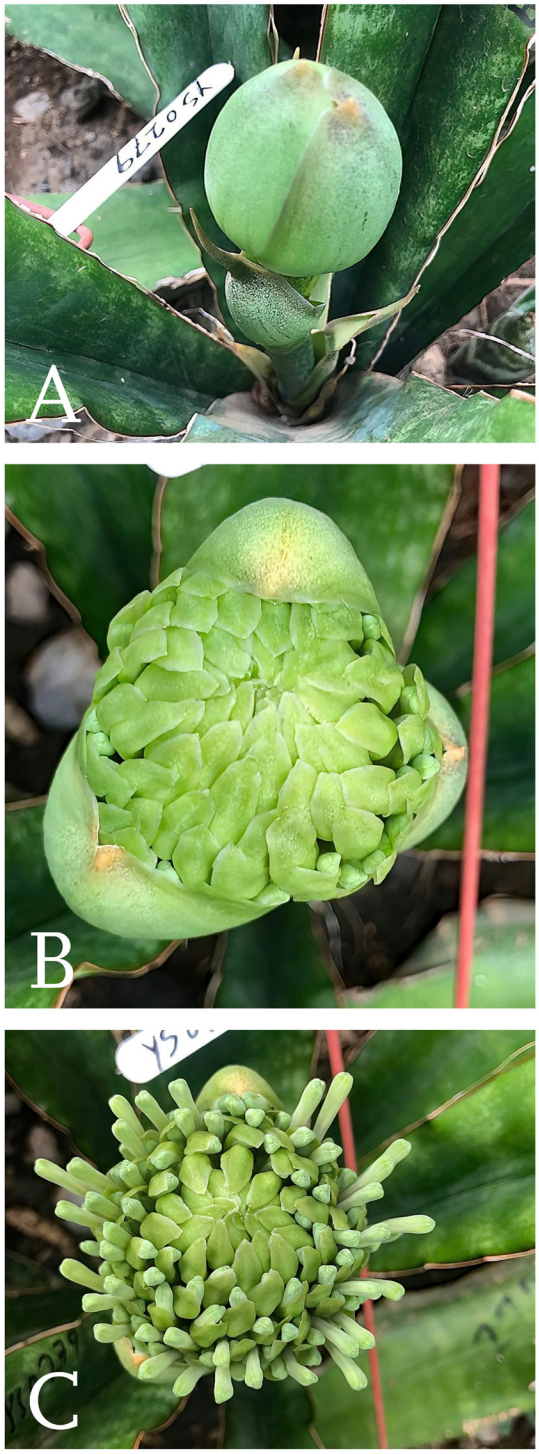

Fig. 19. Developing inflorescence of *Sansevieria muhaensis* M.Burkart, Yinger, Sikawa & Mollel sp. nov. *YS 0279* (type plant NHT [000001160]). **A**. 'Drumstick' stage. Note the horn-like tips of the lower bracts and their beautiful pattern of dark spots, and the almost globose shape of the flower-bearing part that is still clad in the upper peduncle bracts. **B**. Some days later, the lanceolate, light green bracts of the partial inflorescences appear between the shell-like upper peduncle bracts. **C**. Flower buds emerging between the bracts of the partial inflorescences. The light green colouration is still prevalent, unlike the greyish colouration as in Fig. 18A–C. Photos by Elias Sikawa.

region, RAS and BRY guess that *S. muhaensis* was common in the area based on what can still be seen where fragments of nature persist. *YS 0279* was found on termite mounds on school grounds. The other collections which are likely to be the same species all were also found growing on termite mounds. The plants remaining are growing in sun or light shade, but it is likely that all were originally growing in moderate to heavy shade of a closed canopy forest. This area is not particularly arid with a short dry season during the coolest part of the year.

Taxonomic remarks

The flower-head of *S. muhaensis* sp. nov. (subgenus *Capitulatus*) is completely clad in peduncle bracts when young, giving it a drumstick appearance (Fig. 19A). During its further development, the long, lanceolate bracts of the partial inflorescences appear (Fig. 19B–C), and afterwards the flower buds emerge from behind them. Up to this stage, the inflorescence is greenish coloured (Fig. 19C). The stretching flower buds then show a greyish colouration on their tubes, lengthening to short longitudinal lines on the basal part of the lobes (Fig. 18A). The greyish colouration of the flower outsides is maintained during anthesis (Fig. 18B–C).

The superficially similar *Sansevieria kirkii* occurs regularly in coastal lowlands of the Indian Ocean in Tanzania and southern Kenya including the offshore islands. Although there are also numerous records from many other areas in tropical Africa that have been suggested to be *S. kirkii*, we are not aware of any true confirmation of its taxonomic identity. In any case, the altitude of the *S. muhaensis* type location is ca 800 m, markedly higher than coastal lowlands. Details of the morphological differences are given above in the diagnosis and in Table 3.

Tentative threat assessment

Critically endangered: CR E.

Fig. 20. *Sansevieria sumbawangana* M.Burkart, Constantine, Sikawa & Yinger sp. nov. Leaves of accession *YS 0930* (paratype plant NHT [000001158]). **A**. Plant in cultivation at TSF among other plants. Note the specific leaf outline with the widest part above the middle, the impressive leaf width, and the dark green colour, almost free of patterning. **B**. Single leaf in the herbarium, paratype NHT [000001158]. Photos: A by Barry R. Yinger; B (scan) by Luciana Naftal Piniely.

The limits of Kigoma City are either fully developed with houses, or soon will be. There is a lot of construction going on, and the whole area is platted for housing. Although Kigoma and nearby areas have now been intensively surveyed, this species was not found anywhere else. It is likely that some plants of *S. muhaensis* sp. nov. might persist for a while in neglected corners here and there, but the future of this species is most probably to be extinct in the wild in less than 3 generations (IUCN criterion E).

A rating of CR most accurately describes this situation according to our data.

Sansevieria sumbawangana M.Burkart, Constantine, Sikawa & Yinger sp. nov.
urn:lsid:ipni.org:names:77370781-1
Figs 1, 20–24, Table 3

Diagnosis

This capitate *Sansevieria* is characterised by its peculiar leaf form (Fig. 20), the extraordinary leaf width, the massive rhizome of up to 70 mm diameter, the almost uniform, very dark colouration of the flat leaves, and the protrusions on the fruits. The width relationship of the perianth lobes is also uncommon – in most species of *Sansevieria*, the outer lobes are a little bit narrower than the inner or of the same width, not wider as in *S. sumbawangana* sp. nov.

Fig. 21. *Sansevieria sumbawangana* M.Burkart, Constantine, Sikawa & Yinger sp. nov. with young flower heads; *YS 0317*, holotype plant, NHT [000001154]. The large, wide bracts of partial inflorescences are visible among the flower buds. Note also the wavy fissures on the adaxial surface of the leaves. Photo by Elias Sikawa.

Etymology

Sansevieria sumbawangana sp. nov. is named for Sumbawanga Town, where this species was found for the first time.

Type material

Type

TANZANIA • Rukwa Region, Sumbawanga, Malangali Ward; 1850 m a.s.l.; 5 Mar. 2020; *B. Yinger & R.A. Sikawa YS 0317*; holotype: NHT [000001154].

Living specimens ex holotypo cultivated at TSF and POTSD.

Paratype

TANZANIA • Mbeya Region, Mbozi District; 1612 m a.s.l.; 20 Oct 2021; *B. Yinger & R.A. Sikawa YS 0930*; NHT [000001158].

Living specimens ex paratypo cultivated at TSF.

Description

Plant rhizomatous, stemless, vegetative height 416 mm, 2–5 leaves per shoot†† (Fig. 20A). Rhizome subterranean but close to soil surface, runners short, to 100 mm long††, rhizome diameter 70 mm, inner rhizome cortex brownish orange 165B. Leaves (Fig. 20) dispersed in all directions, upright to spreading, very stiff, to 1 m long and to 210 mm wide††, lanceolate, widest part above the middle, distal part rather shortly narrowed to a leathery 20–25 mm long tip, basal part without petiole, openly u-shaped to almost flat, central lamina ca 20 mm thick††, almost uniformly dark green, adaxial surface smooth, abaxial surface very smooth, both with many (ca 25) longitudinal, wavy fissures from base to tip (Fig. 21), leaf edges somewhat wavy, narrowly red-brown and whitish. Inflorescence (Figs 21–22) capitate, terminal from a fully leaved shoot; axis 385 mm long overall; peduncle 300 mm long, 20 mm in diameter, green

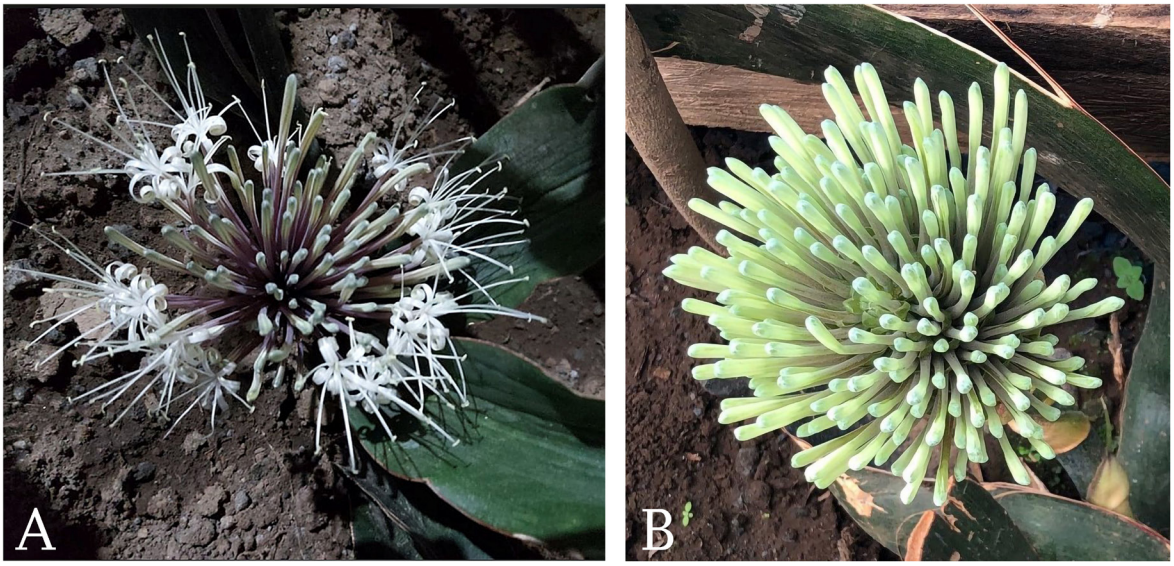

Fig. 22. Flower head of *Sansevieria sumbawangana* M.Burkart, Constantine, Sikawa & Yinger sp. nov.; YS *0317*, holotype plant, NHT [000001154]. **A**. First flowers have opened. Note the longitudinal striation of the corollas. **B**. Some days before first anthesis. The yellowish green colour of the corolla outer side is clearly visible. Photos by Elias Sikawa.

Fig. 23. Green, unripe berries of *Sansevieria sumbawangana* M.Burkart, Constantine, Sikawa & Yinger sp. nov. at the holotype location, Rukwa Region, Tanzania. The conspicuous protrusions on the distal fruit parts are clearly visible. Photo by Barry R. Yinger.

with lighter tiny dots and lines, bearing 7 bracts to 78 mm long; some bracts dry, the fresh ones coloured greyish purple; flowering part 85 mm long, flowering head 236 mm in diameter excluding anthers and styles, very dense, 2–3 flowers per partial inflorescence; bracts of partial inflorescences 25–30 × 7–14 mm, herbaceous, lanceolate-elliptic, one- to five- but mostly three-nerved, no extrafloral nectar seen on them. Flowers large, longitudinally striate, on inarticulate, green pedicels 10 mm long, corolla outside coloured yellow green with brown dots on the tube, lobes coloured white inside, tube 90 mm long, lobes 32 mm long, overall flower length 122 mm, tube 3 mm wide at the narrowest point, 4 mm across the ovary, 5 mm across the distal part of closed flowers shortly before anthesis, inner lobes 3 mm, outer lobes 4 mm wide, all strongly curling back at anthesis, closed anthers 5 mm long, open anthers 4 mm long, filaments thread-like (not flattened), 36 mm long, style straight, 115 mm long excluding ovary, 38 mm exsert, i.e., 2 mm exceeding the filaments. Flowers opening at dusk, wilting in the morning, self sterile. Fruits (only seen unripe#, Fig. 23) rugose and with protrusions at their distal ends. Seeds unknown.

Ecology and distribution

There are presently two locations only where this species has been collected, including the type location. These are in the Rukwa and Mbeya regions, respectively, both in SW of Tanzania (Fig. 1). The site of *YS 0930* was on rocky slopes and in ravines under a largely closed canopy of trees and shrubs, which would completely shade the plants during the rainy season, but at the time of the visit at the height of the dry season let in plenty of light (Fig. 24). *YS 0317* was collected in a strongly conversed area on a

Fig. 24. The population of *Sansevieria sumbawangana* M.Burkart, Constantine, Sikawa & Yinger sp. nov., paratype location from where *YS 0930* was collected. The picture was taken at the peak of the dry season on 6 Dec. 2021, Mbeya Region, Mbozi District, Tanzania. In the wet season those plants would be under dense shade. Photo by Barry R. Yinger.

termite mound beside a recently built house (Yinger & Sikawa 2023c: fig. 19). Both sites are at rather high elevations, 1850 resp. 1612 m.

Taxonomic remarks

We are not aware of any species in the subgenus *Capitulatus*, to which this species clearly belongs, that appears to be closely related to *S. sumbawangana* sp. nov. A comparison with *S. kirkii*, *S. bhitalae* R.H.Webb & L.E.Newton and *S. sinus-simiorum* Chahin., the only other species of the subgenus *Capitulatus* that are similar in overall size, is given in Table 3.

The bracts of partial inflorescences of capitate Sansevierias often have several nerves (e.g., *S. kirkii*, *S. fischeri*, *S. bhitalae*), as is the case in *S. sumbawangana* sp. nov. Species from the other subgenera mostly have single-nerved bracts (but see, e.g., *S. rosulata* T.G.Forrest; Forrest 2017).

Tentative threat assessment

Endangered: EN D.

The type location of this species is in an area that has been almost completely converted to agriculture and housing estates. There is almost no natural vegetation remaining in the area, although quite a few termite mounds remained. The plants there were persisting beside a termite mound close to several houses. Although we searched the surrounding area, we did not see any other plants of this species. There are three plants remaining at the type location.

We saw more plants in an area that is mostly undisturbed, on rocky slopes and in ravines within the drainage of Lake Rukwa (collected under *YS 0930*). Although it is risky to do a field identification without flowers, we believe that we have seen at least two more colonies in the vicinity of Lake Rukwa, comprising at least 200 plants. Although this area is not formally protected, it does not seem to be immediately threatened. The location and topography make it an unlikely site for farming or housing.

Regarding these circumstances, the appropriate category of threat for *S. sumbawangana* sp. nov. is EN (IUCN criterion D, <250 mature individuals) according to our data.

Parts of the side of the lake opposite where we found our collection are already within a reserve that might become part of an expanded national park. Its vegetation is quite different from the west side; there was only *S. bhitalae* s. lat. found.

In the TSF living collection there are several plants from other locations which, based on their foliage, might belong to this species, but they have not flowered yet. This option can lead to a reduction in the threat status of *S. sumbawangana* sp. nov.

Sansevieria rukwana M.Burkart, Piniely, Sikawa & Yinger sp. nov.
urn:lsid:ipni.org:names:77370782-1
Figs 1, 25–27, Table 3

Diagnosis

Sansevieria rukwana sp. nov. seems to be similar to *S. kirkii*, but the leaves in *S. rukwana* are shorter and wider, lacking a pseudo-petiole as well as a strong ridge on the abaxial side but showing a silky gloss on both sides, characters different from that in *S. kirkii*. Also, the rhizome inner cortex is orange instead of brown as in *S. kirkii*, the peduncle, the bracts of the partial inflorescences and the styles all are shorter, and the flower odour is different in *S. rukwana*. The capitate but slightly elongate inflorescence (or its remnants, Fig. 25B) is typical for *S. rukwana* and indicates that it belongs to the subgenus *Capitulatus*.

Fig. 25. *Sansevieria rukwana* M.Burkart, Piniely, Sikawa & Yinger sp. nov. in nature, the population where *YS 0925* was collected from. **A**. The plant shows the typical habit of members of the *S. kirkii* group with very short runners resulting in dense clumps of shoots. **B**. Old infructescence. Note its capitate but slightly elongate shape. The colour pattern of the leaf abaxial surface is clearly visible. During dry seasons, the leaves may be strongly inrolled, as seen in the picture. Photos by Barry R. Yinger.

Fig. 26. *Sansevieria rukwana* M.Burkart, Piniely, Sikawa & Yinger sp. nov.; holotype plant *YS 0925* (NHT [000001157]) in the TSF greenhouse with developing inflorescence. Pattern and gloss of leaf adaxial surface are clearly visible. Photo by Elias Sikawa.

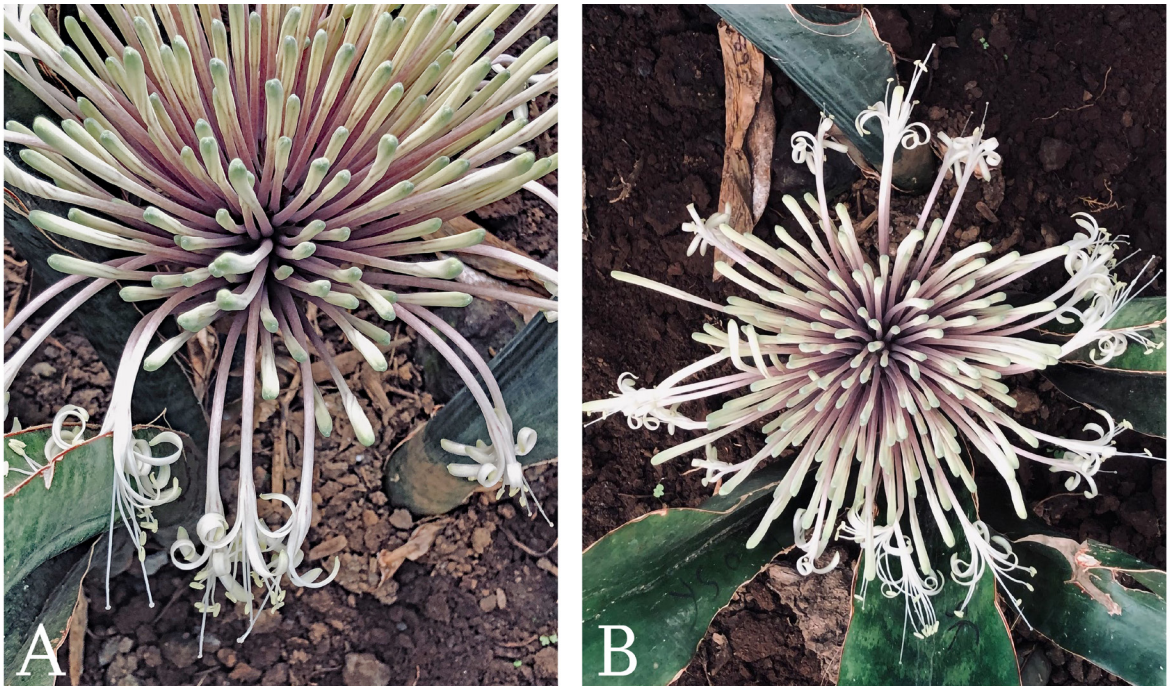

Fig. 27. *Sansevieria rukwana* M.Burkart, Piniely, Sikawa & Yinger sp. nov.; holotype plant *YS 0925* (NHT [000001157]) in early bloom. **A**. The open flowers begin to wilt in the morning. The pinkish lines on the flower tubes and lobes are clearly visible on the buds. **B**. The same inflorescence seen from above. Photos by Elias Sikawa.

Etymology

Sansevieria rukwana sp. nov. is named for Rukwa Region where this species is found.

Type material

TANZANIA • Rukwa Region; 1039 m a.s.l.; 19 Oct. 2021; B. *Yinger & R.A. Sikawa YS 0925*; holotype: NHT [000001157].

Living specimens ex typo cultivated at TSF and POTSD.

Description

Acaulescent herb, rhizomatous, vegetative height to 1600 mm††, to 620 mm#, 2–3 leaves per shoot. Rhizome belowground, ca 30 mm in diameter, forming short runners, colour of inner cortex dark reddish orange 172B. Leaves (Figs 25A, 26) pointing to all directions, upright to spreading to almost horizontal, stiff but twistable, to 1600 mm long, to 110 mm wide, oblanceolate, slightly twisted, petiole missing, leaf base ca 21 mm wide, central lamina thickness 6 mm, basal thickness 16 mm, flat but u-shaped in cross-section, without a pronounced ridge on the abaxial side, surface very smooth on the adaxial side, smooth on the abaxial side, both sides with silk gloss†† and a heavy, conspicuous glaucous bloom; colour pattern distinct on the adaxial side, cloudy, without dark longitudinal lines, pattern less prominent on the abaxial side, forming transverse bands, lighter and darker parts 50 : 50, with up to 9 dark longitudinal lines, colour pattern in older leaves weaker than in young ones; margin sinuate, red-brown and whitish; leaf tip leathery, to 29 mm long. Inflorescence (Figs 26–27) terminal on fully leaved shoots, capitate, 223 mm long; peduncle 163 mm long, 20 mm thick, patterned with small dots and lines, dark greyish reddish brown 200A, with 4 bracts; peduncle bracts 46–114 mm long, dry at anthesis, light olive 152B; flower-bearing part of axis 60 mm long, flowering head 135 mm in diameter excluding anthers and styles, dense, 2–3 flowers per partial inflorescence, less in the uppermost part, 201 flowers counted on one head; bracts of partial inflorescences 17–23 mm long, 7–12 mm wide, herbaceous (not dry), lanceolate-elliptic, with up to 5 nerves, without extrafloral nectaries; pedicels inarticulate, 10 mm long, light olive 152A, wilted flowers not dropping. Flowers with flowery but astringent odour, greenish white 155C outside, wilted greyish yellow green 148C, with some pinkish striation most prominent on young buds (Fig. 27A), 133 mm long overall; tube 100 mm long; lobes 33 mm long, inner lobes 4 mm wide, outer lobes 3 mm wide, strongly to intermediately curled back at anthesis; filaments greenish white 155C, 31 mm long, thread-like; anthers 4 mm long, strong yellow green 144C; style white, straight, 123 mm long above ovary, 45 mm exsert from tube mouth; stigma 1.5 mm wide, white; ovary ovoid with truncate apex, strong yellow green 144C; infructescence capitate but slightly elongate#. Fruits and seeds unknown.

Ecology and distribution

This species was collected only once in an area of steep wooded ravines and rocky slopes above streams within the Lake Rukwa drainage area. Although much of this area is still intact forest, the location of this collection was in a partially disturbed area where tree cover was mostly removed.

Taxonomic remarks

Sansevieria rukwana sp. nov. is superficially similar to *S. kirkii*. An overview of the differences is given in the diagnosis above and also in Table 3. *Sansevieria kirkii* is relatively widespread in Indian Ocean coastal lowlands, far away from the small and restricted W Tanzanian realm of *S. rukwana*. Although many records exist from a wide geographical scene that claim to be *S. kirkii*, they lack true confirmation of their taxonomic identity. Moreover, the proper taxonomy of *S. kirkii* var. *kirkii* and var. *pulchra* N.E.Br. is still unresolved (Newton 2020; MB and U. Scharf, pers. obs.).

Tentative threat assessment

Endangered: EN D.

We found what we are certain is this species only once in a mostly undisturbed area. The colony that we saw is about 150 plants. This area is very difficult to navigate and there are vast areas of similar topography there. We saw a number of other plants of *Sansevieria* there, but nothing with the distinctive infructescence remnant of *S. rukwana* sp. nov. (Fig. 25B). This area was under no obvious immediate threat because of its steep rocky topography, but recently, a mine for iron ore has been proposed very close to the type location; in two days of surveying this area, no other colonies were seen. Based strictly on what we have observed, its threat status is EN (criterion D, <250 mature individuals), although the situation might change drastically if mining begins.

Discussion

Additionally to providing detailed holotype information, we also indicate the institutions currently maintaining living plants of the type accessions. In *Sansevieria*, living plants are extremely helpful for reliable species identifications (Brown 1915; Pfennig 1981; la Croix 2005; Burkart & Scharf 2021). We therefore recommend to include such information in all future species descriptions of this genus. The *Sansevieria* collection at POTSD is designed to serve as a repository for living ex typo plants.

Subgenus *Sansevieria*

Sansevieria chlorantha sp. nov. can be compared to several morphologically similar species, including *S. raffillii* N.E.Br., *S. enchiridiofolia* R.H.Webb & L.E.Newton, *S. rugosifolia* R.H.Webb & L.E.Newton and *S. lunatifolia* L.E.Newton (Table 1). These species share several key traits and also occur in the Kenyan-Tanzanian border region. They all have a light-brown rhizome cortex, more or less lanceolate, patterned, rigid to very stiff leaves largely without a petiole and with a reddish-brown and whitish, rather straight margin; all are medium sized to large and have more or less dense inflorescences. Nevertheless, numerous distinguishing features are evident (Table 1), most notably the number of leaves per shoot, the lamina thickness, the inflorescence length and the flower odour and colouration.

Sansevieria embere sp. nov., though somewhat similar to the group above, differs in its extraordinary flower size. However, its comparison with the other large-flowered species of the subgenus *Sansevieria*, *S. pedicellata* la Croix and *S. newtoniana* T.G.Forrest, shows many clear differences in floral as well as in vegetative traits (Table 2). Overall, *S. embere* is a plant adapted to drought, as its leaf features indicate, whereas *S. pedicellata* and *S. newtoniana* seem to prefer more mesic sites with rainfall throughout most of the year, which is mirrored in their leaf features. Also, the geographic distances to the next known occurrences of these species are substantial.

Subgenus *Capitulatus*

The four newly described species within the subgenus *Capitulatus* are each clearly distinct from all other known members of the group. This applies most clearly to *S. bangalalana* sp. nov. It is the only capitulate species known that has flat but inrolled or folded leaves, and it has a much shorter corolla tube than all others within the subgenus. Additionally, it has a unique corolla colouration not known before in the entire genus *Sansevieria*. As a consequence, there is no species with which it could be meaningfully compared.

Sansevieria sumbawangana sp. nov., *S. rukwana* sp. nov. and *S. muhaensis* sp. nov. might be compared with other large members of the subgenus that have more or less flat leaves, i.e., *S. kirkii* Baker, *S. bhitalae* R.H.Webb & L.E.Newton and *S. sinus-simiorum* Chahin. (Table 3). More flat-leaved species of *Capitulatus* occur south of the Tanzanian border but are distinctly smaller with leaves only around 0.5 m long or slightly longer, not around 1 m as in our cases. *Sansevieria bhitalae* and *S. sinus-simiorum* are easily

distinguished from all three new species under discussion here by their massive, erect leaves; they also have somewhat smaller flowers. *Sansevieria kirkii* is the only known species with similar leaves, but they possess a distinct abaxial ridge very characteristic for *S. kirkii* which is completely lacking both in *S. sumbawangana* and *S. rukwana*; it is also present in the leaves of *S. muhaensis*, although in a much weaker condition than in *S. kirkii*. *Sansevieria muhaensis*, however, has a dark red colouration of its inner rhizome cortex, unlike *S. kirkii* in which it is dark brown, and is also different in runner length, dimensions of the bracts of partial inflorescences, flower colour, and several leaf details. *Sansevieria sumbawangana* and *S. rukwana* have their rhizome cortex orange-coloured. *Sansevieria sumbawangana* further has much wider leaves than any other member of the subgenus *Capitulatus*. Further comparative details are provided in Table 3.

In recent decades, the importance of molecular approaches such as DNA barcoding and next-generation sequencing as tools in plant taxonomy has strongly increased (Soltis *et al.* 2012; Christensen & Olsen 2023). Their use in the genus *Sansevieria* has given clear indications of cryptic species (such as within *S. parva* N.E.Br., *S. dooneri* N.E.Br., and *S. gracilis* N.E.Br. in van Kleinwee *et al.* 2022) which should be investigated further. On the other hand, molecular approaches cannot develop their full power without a fundamental, morphology-based species concept, and their results are clearly affected by existing taxonomic uncertainty (De Queiroz 2007; Su *et al.* 2020; Rouhan & Gaudeul 2021). Molecular and morphological approaches are therefore best applied together in order to complement each other (Rouhan & Gaudeul 2021; Zaman *et al.* 2025). We hope that the species described here, together with their next relatives, can be studied with molecular genetic methods soon. In view of the severe threat to which the majority of the new species described here are exposed, immediate conservation measures are needed. On the one hand, this includes securing their remaining limited habitats, which is the task of the Tanzanian Ministry of Natural Resources. On the other hand, these species must be protected ex situ as a reinsurance, with their remaining genetic diversity (Fišer *et al.* 2021; Lauterbach *et al.* 2021). We hope that it will be possible to create and secure the necessary space in the TSF in the near future. The NHT has the mandate to maintain a botanical garden and therefore can also be a potential safeguard for these species in ex-situ conservation.

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