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Euphorbia rimireptans (Euphorbiaceae, Articulofruticosae), a new species from the Skeleton Coast, Namibia

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Abstract

Euphorbia rimireptans, here described as a new species, is known only from the northern part of the Skeleton Coast (part of the Namib Desert) in the Kaokoveld Centre of Endemism, northwestern Namibia. These perennial shrublets grow on rocky outcrops of latite under harsh desert conditions. Diagnostic characters for *E. rimireptans* include the procumbent, sometimes pendant habit, the soft, rubber-like terete or slightly tapering branches that are curved or ± straight, frequently orientated in the same direction from the base, and the glabrous or sparsely hairy capsule, which releases verrucose ovoid seeds. A comparison of some of the more prominent morphological features to differentiate between *E. rimireptans* and its possible nearest relative, *E. giessii*, is provided.

Keywords: endemism, flora, Kaokoveld Centre of Endemism, latite, Namib Desert, taxonomy

Introduction

Euphorbia Linnaeus (1753: 450) subgen. *Chamaesyce* Rafinesque (1817: 119) sect. *Articulofruticosae* Bruyns in Bruyns *et al*. (2006: 416) represents a group of the southern African pencil-stemmed succulents and includes from 18 to 24 species (Bruyns *et al*. 2006, Bruyns 2012, Yang *et al*. 2012). These species express many similar characteristics and species limits have been difficult to define, especially when using molecular data. Interpretation of molecular data has been hampered by incomplete resolution of phylogenetic relationships in this group, based on the coding regions tested (Yang *et al*. 2012). Nevertheless, distinct morphological features exist that make it possible for the trained eye to distinguish the species from each other when using fresh material (Möller & Becker 2019). However, there is no doubt that the section *Articulofruticosae* is in need of a major taxonomic revision.

At present there are three recognized species of medium-sized (up to 1 m tall), shrubby succulent *Euphorbia* belonging to *Euphorbia* subgen. *Chamaesyce* sect. *Articulofruticosae* known from the Namib Desert, namely *Euphorbia chersina* Brown (1915: 274), *E. giessii* Leach (1982: 27), and *E. negromontana* Brown (1911: 557). *Euphorbia chersina* grows in the predominantly winter rainfall region of the southern Namib from Lüderitz southwards (Leach 1970), while *E. giessii* occurs in the coastal areas between the Kuiseb and Uniab Rivers (Leach 1982), although it has been observed as far north as the Engo River Valley by the authors (unpublished field observation). *Euphorbia negromontana* is known only from the Namibe Province in southwestern Angola, north of the Kunene River. In this contribution a new, fourth species of section *Articulofruticose*, namely *E. rimireptans,* is described from the Namib Desert.

During a scientific expedition to the northern sections of the Skeleton Coast National Park, Namibia, in May 2018, the authors found an unusual succulent *Euphorbia* on a hillock along the track between Ogams Fountain and Sarusas Mine, approximately 20.5 km east of Cape Fria. The existence of this *Euphorbia* had been mentioned previously by Jacobsen (1988), as a new small prostrate, partially pendent, *Euphorbia* species that he had found on a basaltic lava outcrop, overlooking circles of upright stones, presumably left there by earlier inhabitants of the region, but he did not give details of this locality. During a follow-up expedition to the area by the first two authors, to collect more

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material in February 2019, the population mentioned by Jacobsen (1988) was found, and an additional population was discovered close to Sechomib Poort, approximately 1 km south-east of Sechomib Fountain. During a subsequent visit to the National Herbarium of Namibia, the authors noted that M.A.N. Müller and B. Loutit collected a *Euphorbia*, described as a perennial prostate herb, from hillocks near the mouth of the Sechomib River on 27 April 1982. The plant on the herbarium sheet closely resembles *E. rimireptans* described here, and would thus constitute, to the best of our knowledge, the earliest herbarium collection of this species. A study of the *Euphorbia* holdings in WIND and PRE revealed no other collection of the new species (Herbarium acronyms follow Thiers 2019).

Live material of the new species and of *Euphorbia giessii*, its possible nearest relative, was studied in the field. Morphological characters in the following description were all determined from live specimens, and from fresh flowering material and ripe fruit.

FIGURE 1. Habit of *Euphorbia rimireptans*. A. Pendant. B. Procumbent, all branches orientated in one direction, showing grey base. C. Procumbent, branches intertwined. Photographs by W. Swanepoel.

Taxonomic treatment

Euphorbia rimireptans Swanepoel, R.W.Becker & Alma Möller *sp. nov.* (Figs.1 to 4)

Diagnosis:—Succulent shrublet up to 0.5 m in its greatest diam., similar to *E. giessii*, from which it differs in being procumbent, sometimes pendant (*vs*. erect, up to 0.8 m high); branches, shorter and thinner (up to 0.5 m long, 2.8–6.0 mm diam.), soft, rubber-like, terete or only slightly tapering [*vs*. longer and thicker (up to 0.8 m long, 4–12 mm

diam.), rigid, firm, tapering]; leaf lamina not panduriform, of uniform thickness, glabrous (*vs*. somewhat panduriform, thickened towards apex, densely hairy at base adaxially); bracts dissimilar to the leaves, hairy adaxially at base only, otherwise glabrous (*vs*. bracts similar to the leaves, hairy adaxially); gland shape mostly variable on each involucre, oblong, oblong-elliptic, elliptic, reniform, ovate or flabellate (*vs*. gland shape uniform on each involucre, oblong-elliptic, elliptic or sub-circular); staminate flowers with filaments glabrous, shorter (0.4–0.8 mm long), anther theca pale yellow [*vs*. filaments glabrous or with long hairs, longer (0.9–1.2 mm long), anther theca pale green]; capsule glabrous or sparsely hairy, rarely dotted, pedicel ± 0.6 mm diam. (*vs*. sparsely to densely hairy, seldom glabrous, conspicuously dotted, pedicel ± 1.1 mm diam.); seed verrucose.

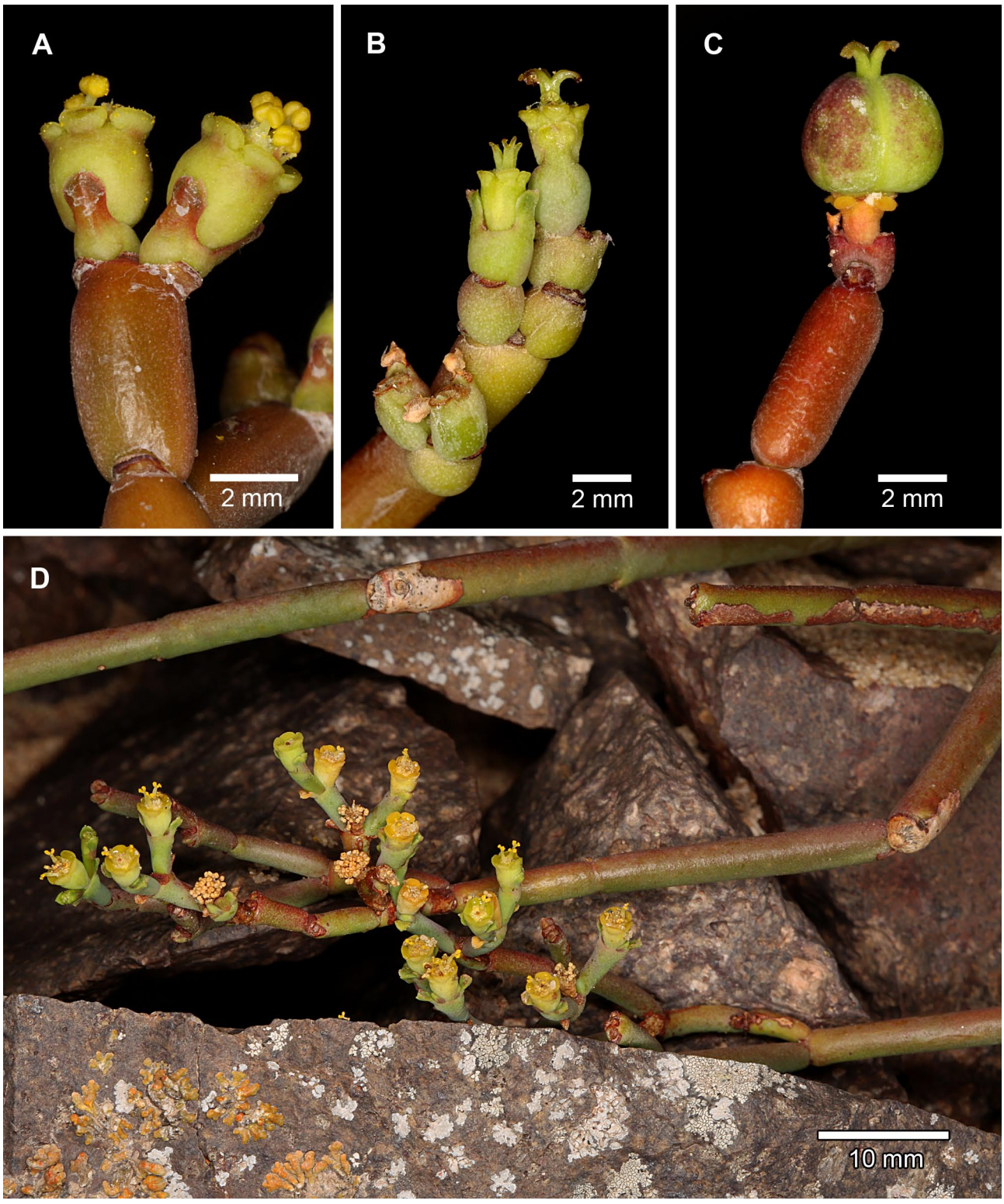

FIGURE 2. *Euphorbia rimireptans*. A. Staminate cyathia. B. Pistillate cyathia, in different stages of development. C. Capsule. D. Inflorescences, staminate plant. Photographs by W. Swanepoel.

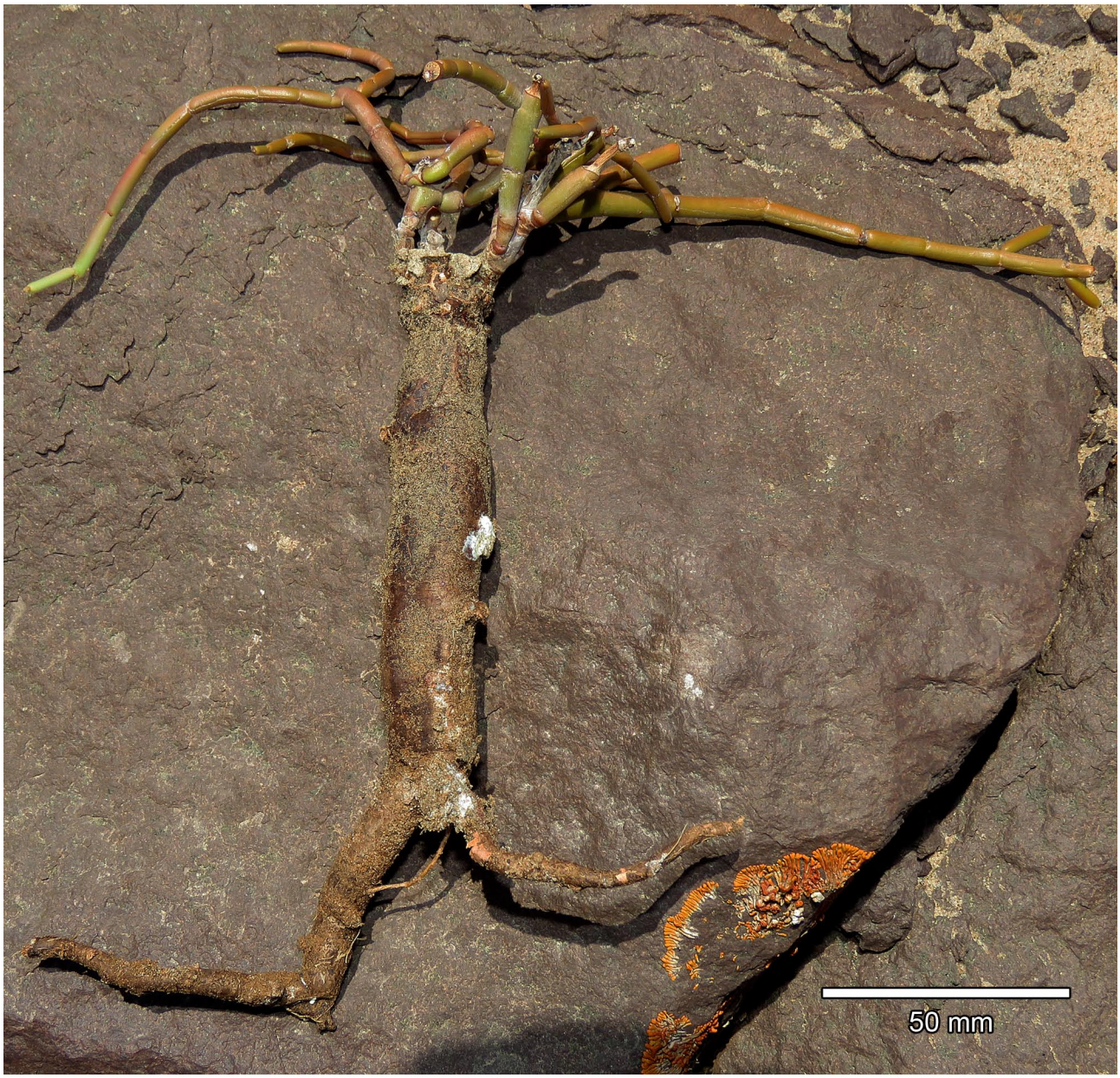

FIGURE 3. *Euphorbia rimireptans* plant that was pressed as the type specimen, showing subtuberous root. Photograph by W. Swanepoel.

Type:—NAMIBIA. Kunene Region: Skeleton Coast National Park, 198 m high koppie, 200 m west of track between Okau Fountain and Sarusas Mine, 20.5 km east of Cape Fria, northern side, facing west, below peak, 1812AC, 190 m, 21 February 2019, *Swanepoel & Becker 358* (holotype WIND!; isotypes PRE!, PRU!).

Succulent, unarmed, dioecious shrublet, branching from a grey-coloured base, procumbent, sometimes pendant, up to 0.5 m in greatest diam., with subtuberous, fleshy main root. *Branches* ± radiate, irregularly curved or ± straight, often all orientated in same direction from base, frequently intertwined, branchlets opposite and decussate or opposite and distichous, often lacking on side facing ground, branches and branchlets terete or slightly tapering, often few curved, articulated at base, indistinctly constricted at nodes, glabrous, glaucous on recent growth, different shades of green, yellow, orange, brown or maroon, sometimes glossy, inconspicuously minutely white-dotted, up to 0.5 m long, 2.8–6.0 mm diam. *Leaves* caducous, leaving a prominent crescentic brown scar, petiole 0.5–0.7 mm long, 0.7 mm diam., white sericeous adaxially, lamina fleshy, flat or conduplicate, spreading, green or when drying, orange to red, glabrous, lanceolate, elliptic, ovate or obovate, 2.1–3.2 × 1.8–2.5 mm, apex acute or obtuse, often dorsally apiculate, margin entire or sparingly denticulate, sometimes whitish pellucid. *Inflorescences* terminal dichasial cymes, bearing 2 or 3 cyathia, usually several times forked, cyme branches slightly decreasing in diam. as forking develops, usually erect or sub-erect facing away from ground, 1.3–30.0 mm long, l.6–2.6 mm diam. *Bracts* petiolate with apical part

ovate-acute or suborbicular, thickened towards apex, sub-conduplicate, dorsally apiculate, appearing ± panduriform, clasping involucre, erect or apical part sub-erect, sericeous adaxially at base, margin entire, crenulate or denticulate towards apex, in staminate cyathia 1.4–2.0 × 1.5–2.2 mm including petiole, smaller in pistillate cyathia, 1.2–1.5 × 0.9–1.4 mm including petiole. *Involucre* pale green to yellow-green, often maroon in places, glabrous outside except for strips of very short, whitish pellucid hairs opposite margins of bract bases, white hairy inside, partitions marked with longer hairs, particularly dense tuft at apex just below gland; involucres in staminate plants cupuliform, 2.1–2.7 mm long, 1.9–2.7 mm diam. including glands, pistil rudimentary, 1.6–2.3 mm long; involucres in pistillate plants obconical, smaller, 1.9–2.1 mm long, 1.6–1.8 mm diam. including glands, rudimentary anthers up to 0.2 mm long; *glands* 5, green, yellow-green or bright orange-yellow, often becoming orange or dark brown when becoming dry, shape variable even on a single involucre: transversely oblong, oblong-elliptic, elliptic, reniform, ovate or flabellate, semi-erect to spreading, transversely slightly concave adaxially, margins entire or with few irregular crenations, in staminate plants ± contiguous, 0.8–1.5 × 0.6–0.8 mm, in pistillate plants ± contiguous, later separate, smaller, 0.6–1.0 × 0.3–0.5 mm, nectar transparent, not forming globules; *lobes* 5, ± quadrate or somewhat flabellate, apex irregularly ciliate-fimbriate sometimes bi-lobed, densely sericous inside, glabrous outside, ± 0.5 × 0.5 mm. *Staminate flowers* ± 25, glabrous, well exerted from involucre with simple or branched plumose bracteoles 1.6–1.9 mm long; *pedicels* filiform, whitish, when fully developed 2.3–2.6 mm long; *filaments* terete or slightly tapering, pale green, 0.4–0.8 mm long; *anther thecae* pale yellow; *pollen* yellow. *Pistillate flowers* erect, included in involucre, glabrous; *pedicels* short, ± 0.5 mm long, 0.3 mm diam., subtended by plumose bracteoles similar to those in staminate plants but smaller, ± 1.2 mm long; *ovary* ovoid, glabrous or rarely with few slightly crisped, weak hairs, green, 0.7–0.9 mm long, 0.7–0.9 mm diam.; *ovule* ovoid, more or less filling the cell, ± 0.3 × 0.2 mm diam., suspended under obturator, margin irregularly denticulate; *styles* 3, united in a stout column for a third to half their length, sub-erect to ascending spreading, 0.7–1.2 mm long, apices shortly bifid, widely divergent, spreading, recurved. *Capsule* (2)3-locular, obtusely (2)3-lobed ovoid, apex and base slightly emarginate, green or in places maroon, rarely dotted, glabrous or rarely with few slightly crisped, weak hairs, 3.5–3.9 × 3.2–4.2 mm, held erect, exserted from involucre but base sometimes within, pedicel green or maroon, 1.2–1.4 long, 0.6–0.8 mm diam.; *seed* ± ovoid, obscurely 4-angled, apex sub-acute, base ± truncate, ashy or ashy-brown, obtusely rugose, verrucose, 2.2–2.5 × 1.5–1.6 × 1.3–1.6 mm.

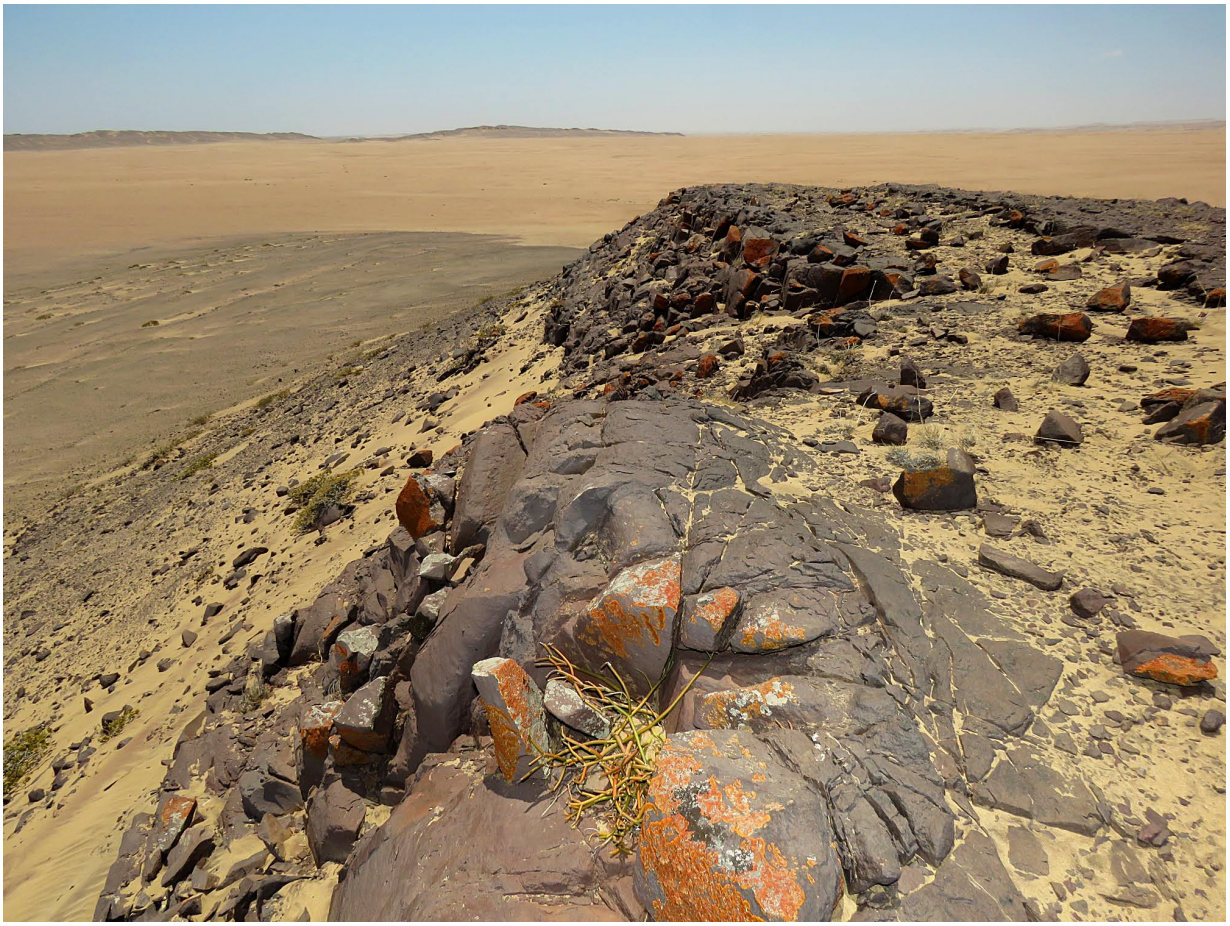

FIGURE 4. *Euphorbia rimireptans* plant (foreground, centre) in its natural habitat. Photograph by W. Swanepoel.

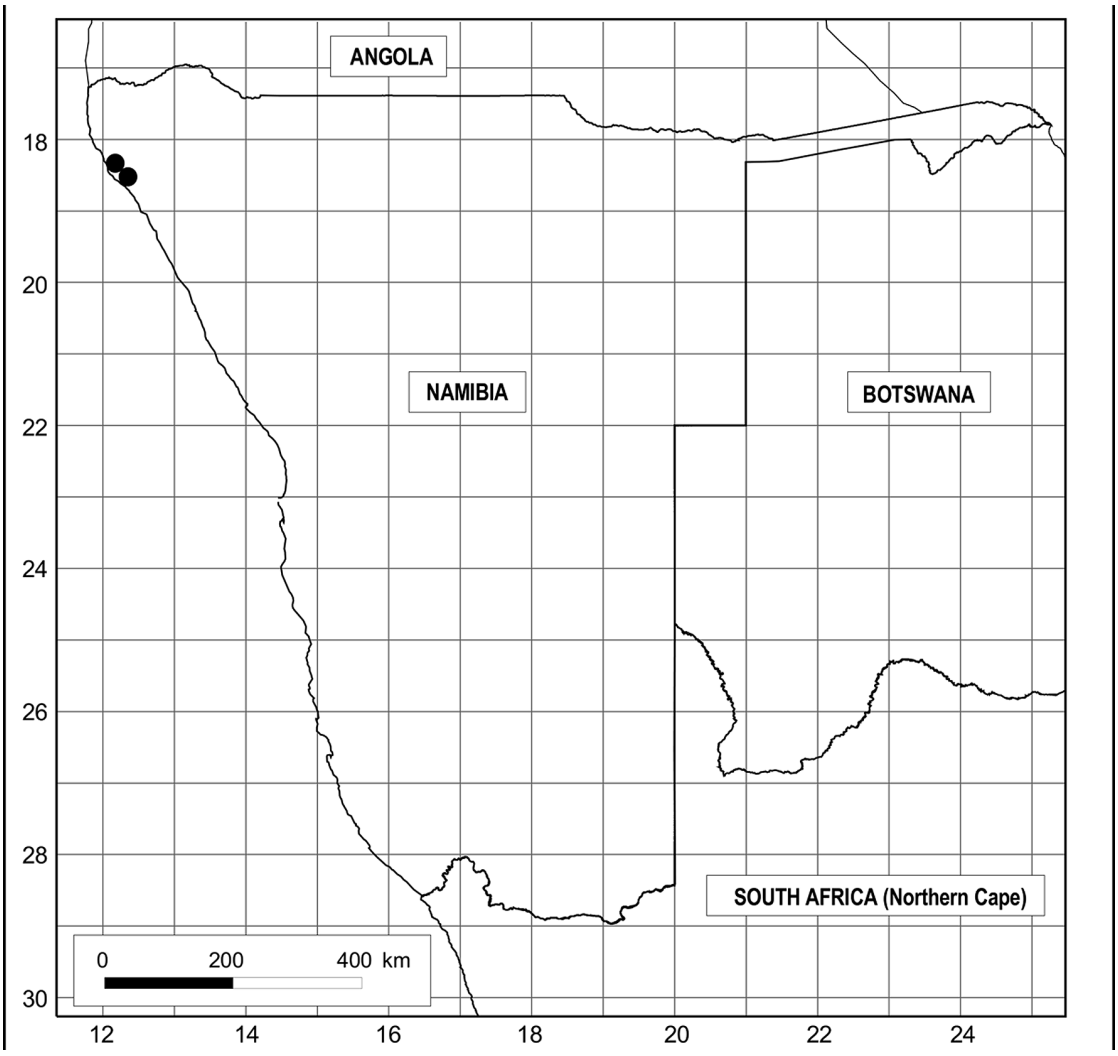

FIGURE 5. Known distribution (black dots) of *Euphorbia rimireptans*

Phenology:—Cyathia were recorded from February to July.

Distribution and habitat:—At present *Euphorbia rimireptans* is known from several localities in the Skeleton Coast National Park, Namibia, to the east and southeast of Cape Fria, all within a radius of 19 km (Fig. 5). This part of the Skeleton Coast National Park falls within the Namib Desert zone of the Kaokoveld Centre of Endemism, a biogeographical region known for its many restricted-range plants and animals, and extending from northwestern Namibia to southwestern Angola (Van Wyk & Smith 2001). *Euphorbia rimireptans* occurs 5–23 km from the coast at elevations of 60–225 m a.s.l. Average annual rainfall in the area is less than 50 mm, occurs in summer, and is highly erratic. The area also regularly receives fog from the ocean (Mendelsohn *et al*. 2002). The new species occurs in small, isolated colonies of about twenty plants each, occupying a very specific habitat. It is found on low ridges and outcrops of latite of the Sechomib and Sarusas Formations of the Etendeka Group of the Karoo Super Group (Guj *et al*. 2011), in areas of broken rock. Here it grows in fully exposed conditions in sand-filled rock fissures on level and low, ± vertical areas. Conditions in this habitat are extremely harsh, with low rainfall, high temperatures and strong winds [calm for only 14% of the time as measured at Möwe Bay to the south (Mendelsohn *et al*. 2002)]. In addition, plants have to withstand the abrasive effect of windblown sand. This is particularly evident in those growing on level areas and not being protected by surrounding rocks, which have glossy branches, a feature also observed in other plant species occupying the same habitat.

Conservation status:—Although rare and known from a relatively small area, *Euphorbia rimireptans* is probably not threatened at present, as it occurs in the Skeleton Coast National Park, a protected area. No signs of damage caused by animals or humans could be found on any of the *in situ* specimens examined. It should be considered as Vulnerable (VU D) due to the small known population size (IUCN 2012).

FIGURE 6. *Euphorbia giessii* plant at Lagunenberg, Namibia, showing characteristic erect, divaricate habit. Photograph by A. Möller.

Etymology:—The specific epithet is derived from Latin and refers to the habit of *Euphorbia rimireptans*: '*rimireptans'* = creeping from rock fissures.

Notes:—The nearest relative of *E. rimireptans* appears to be *E. giessii* (Fig. 6), a species from which it differs in habit, leaf, flower, and fruit characters. *Euphorbia rimireptans* occurs in the northern parts of the Skeleton Coast National Park in the vicinity of Cape Fria, between the Nadas and Khumib rivers, and *E. giessii* extends from the Engo River Valley south to the Ugab River, and beyond the Park boundaries to the Kuiseb River. The locality of *E. rimireptans* in the Nadas River Valley is only 4.8 km to the southwest of the closest known locality of *E. giessii*. Thus, based on the observations to date, it appears as if their distribution ranges could overlap. Interestingly, throughout the known ranges, except for one locality, *E. rimireptans* seems to occur to the west of *E. giessii*. Further fieldwork is needed to determine the exact ranges with more accuracy. Some of the more prominent morphological features to distinguish between the two species are provided in Table 1.

Euphorbia negromontana, from the coastal Namib in southwestern Angola, shares the presence of plumose bracteoles in the cyathia of pistillate plants with the new species and *E. giessii*. *Euphorbia rimireptans*, however, can be distinguished from *E. negromontana* by its procumbent or pendant habit (*vs*. pulvinate), branchlets of the inflorescences that are not particularly fragile (*vs*. fragile), and by its larger (3.5–3.9 × 3.2–4.2 mm) ovoid capsule, which is glabrous or rarely with a few crisped, weak hairs (*vs*. smaller, ± 2 mm diam., subglobose, pubescent) (Leach 1970).

On the label of the specimen *Müller & Loutit 2166* in WIND, it is indicated as being collected in quarter degree square 1812AD, at the hillocks near the mouth of the Sechomib River. This is incorrect since the mouth of this river is located in 1812CB, thus "1812AD" on the label should read "1812CB".

Additional specimens examined (paratypes):—NAMIBIA. Kunene Region: Skeleton Coast National Park, 198 m high koppie, 200 m west of track between Okau Fountain and Sarusas Mine, 20.5 km east of Cape Fria, northern side below peak, 1812AC, 190 m, 21 February 2019, *Swanepoel & Becker 359* (WIND!); Skeleton Coast National Park, rocky outcrop 50 m east of archeological site, 23 km east of Cape Fria, 1812AC, 190 m, 21 February 2019, *Swanepoel & Becker 360 & 361* (WIND!); Sechomib River, koppies near mouth of river, "ysterklip", 1812CB, 24 April 1982, *Müller & Loutit 2166* (WIND!); Skeleton Coast National Park, rocky ridge just south of Sechomib Poort,1 km east of Sechomib Fountain, 1812CB, 100 m, 21 February 2019, *Swanepoel & Becker 363* (WIND!).

TABLE 1. Prominent morphological differences between *Euphorbia rimireptans* and *E. giessii.*

	E. rimireptans	***E. giessii***
Habit	procumbent, sometimes pendant	erect, divaricate, up to 0.8 m long
Branches:		
Orientation	sparsely branched from base, ± straight or irregularly curved, often all orientated in same direction, frequently intertwined	densely branched and radiating from base, straight
Texture	soft, rubber-like	firm, rigid
Epidermis colour	different shades of green, yellow, orange, brown or maroon, sometimes glossy	green, grey-green or maroon-green
Shape	terete or slightly tapering	tapering
Size	up to 0.5 m long, 2.8–6.0 mm diam.	up to 0.8 m long, 4–12 mm diam.
Leaves:		
Shape	lanceolate, ovate, elliptic or obovate; apex acute or obtuse	ovate, elliptic or obovate, somewhat panduriform, thickened towards apex; apex acute
Indumentum	glabrous	densely hairy at base adaxially
Inflorescences:		
Bract shape	dissimilar to the leaves	similar to the leaves
Bract indumentum	hairy adaxially at base, otherwise glabrous	hairy adaxially
Involucre:		
Glands	shape mostly variable on each involucre: transversely oblong, oblong-elliptic, elliptic, reniform, ovate or flabellate, margins entire or with few irregular crenations; often becoming orange or dark brown when becoming dry; nectar transparent, not very copious, not forming globules	shape ± constant on single involucre: transversely oblong-elliptic, elliptic or subcircular, margins entire; often becoming purplish when dry; nectar very copious, brownish, forming large globules
Lobes	quadrate or somewhat flabellate, apex sometimes bi-lobed	± quadrate
Staminate flowers	filaments glabrous, 0.4–0.8 mm long; anther theca pale yellow	filaments glabrous or with scattered hairs, 0.9–1.2 mm long; anther theca pale green
Pistillate flowers	ovary glabrous or with few crisped, weak hairs; styles 0.7–1.2 mm long	ovary sparsely to densely covered with crisped, weak hairs; styles ± 0.8 mm long
Capsule	glabrous or sparsely hairy; rarely dotted; pedicel ± 0.6 mm diam.	sparsely to densely white-hairy, seldom glabrous; conspicuously dotted; pedicel ± 1.1 mm diam.
Seed	verrucose	rarely sparsely verrucose

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References

Brown, N.E. (1911) Euphorbiaceae. *In:* Thiselton-Dyer, W.T. (Ed.) *Flora of Tropical Africa* 6 Sect. 1. L. Reeve, Kent, pp. 441–1020. https://doi.org/10.5962/bhl.title.42

Brown, N.E. (1915) Euphorbiaceae. *In:* Thiselton-Dyer, W.T. (Ed.) *Flora Capensis* 5 Sect. 2.2. L. Reeve, London, pp. 216–375. https://doi.org/10.5962/bhl.title.821

Bruyns, P.V. (2012) Nomenclature and typification of southern African species of *Euphorbia*. *Bothalia* 42: 217–245. https://doi.org/10.4102/abc.v42i2.23

Bruyns, P.V., Mapya, R.J. & Hedderson, T. (2006) A new subgeneric classification for *Euphorbia* (Euphorbiaceae) in southern Africa based on ITS and *psbA-trnH* sequence data. *Taxon* 55: 397–420. https://doi.org/10.2307/25065587

Guj, P., Porada, H., Schalk, K., Hedberg, R., Goscombe, B., Milner, S., Kitt, S., Hoffman, P.F., Halverson, G.P., Richards, D.L. & Schreiber, U.M. (2011) *Geological Map of Namibia. Sheet 1812 Opuwo*. Geological Survey of Namibia, Windhoek.

IUCN (2012) *IUCN red list categories and criteria*: Version 3.1. Second edition. Gland, Switzerland and Cambridge U.K., iv + 32 pp.

Jacobsen, N.H.G. (1988) Euphorbias of the Skeleton Coast National Park: Namibia and adjacent areas. *Euphorbia Journal* 5: 59–67.

Leach, L.C. (1970) Euphorbiae Succulentae Angolenses III. *Boletim da Sociedade Broteriana* 2: 185–206.

Leach, L.C. (1982) A new species of *Euphorbia* from the Namib, South West Africa. *Dinteria* 16: 27–31.

Linnaeus, C. (1753) *Species Plantarum* 1. Impensis Laurentii Salvii, Stockholm, 560 pp.

Mendelsohn, J., Jarvis, A., Roberts, C. & Robertson, T. (2002) *Atlas of Namibia*. Philip, Cape Town, 200 pp.

Möller, A. & Becker, R.W. (2019) *A field guide to the succulent Euphorbias of southern Africa*. Briza Publishers, Pretoria, South Africa. [in press]

Rafinesque, C.S. (1817) Museum of Natural Sciences: second decade of undescribed American plants. *The American Monthly Magazine and Critical Review* 2: 119–120.

Thiers, B. (2019) *Index Herbariorum: A global directory of public herbaria and associated staff.* New York Botanical Garden's Virtual Herbarium. Available from http://sweetgum.nybg.org/ih/ (accessed July 2019)

Van Wyk, A.E. & Smith, G.F. (2001) *Regions of floristic endemism in southern Africa: a review with emphasis on succulents*. Umdaus Press, Hatfield, Pretoria, 199 pp.

Yang, Y., Riina, R., Morawetz, J.J., Haevernans, X.A. & Berry, P.E. (2012) Molecular phylogenetics and classification of *Euphorbia* subgenus *Chamaesyce* (Euphorbiaceae). *Taxon* 61: 764–789. https://doi.org/10.1002/tax.614005