

ONLINE APPENDIX 1

TABLE 1: Fifty lost or threatened bryophytes in sub-Saharan Africa and the East African islands, which served as candidates for the IUCN SSC Bryophyte Specialist Group Top 10 list of bryophytes in Africa that are at highest risk of extinction, arranged alphabetically by genus.

Name and taxonomy	Distribution and habitat	Threat and global or regional threat category as far as assigned†	Sources
<p>1. <i>Actinodontium streptopogoneum</i> Broth. in <i>Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie</i> 24: 260 (1897).</p> <p>Pilotrichaceae. The only species of <i>Actinodontium</i> present in Africa. Its relationship to American and Asian species needs investigation.</p>	<p>Cameroon and Bioko.</p> <p>Epiphytic on tree trunks and twigs in forest, up to 1300 m a.s.l.</p>	<p>For more than a century (since 1890), the species was known only from two sites around Mt Cameroon, which are now intensively cultivated. It was rediscovered in Africa on Bioko in 2002, where it grew on solitary trees in a pasture land. The trees at this site are heavily used (e.g. for firewood). The species is thus likely to be highly threatened. The Guinean Forests of West Africa biodiversity hotspot is one of the most critically fragmented habitats in the world.</p>	<p>Müller and Pócs (2007); Critical Ecosystem Partnership Fund (2016).</p>
<p>2. <i>Anacamptodon marginatus</i> (Dixon) W.R.Buck in <i>Journal of the Hattori Botanical Laboratory</i> 47: 52 (1980).</p> <p>Amblystegiaceae. Originally described as <i>Hypnofabronia marginata</i>, the species was later transferred to</p>	<p>Endemic to Zimbabwe. Collected by the explorer Thomas Bains on Hartley Hill, Zimbo (Chimbo) River, S. African Goldfields.</p> <p>Epiphytic on trees in the</p>	<p>Only known from a single collection made in 1870. The habitat is under threat from artisanal mining, cultivation and overgrazing by livestock. Zimbabwe is bryologically poorly known and this area has probably</p>	<p>Dixon and Wager (1929); Buck (1980); Van Rooy (2011); Anonymous (2017).</p>

Anacamptodon. The wiry stems and distant leaves with a strong and variable border, single costa and small, quadrate alar cells are distinctive.

Savanna Biome, 230 m a.s.l.

not been searched for bryophytes since the original collection.

3. ***Andreaea camerunensis***

P.W.Richards in *Transactions of the British Bryological Society* 2: 66 (1952).

Andreaeaceae. The species differs from the closely related *A. firma* Müll.Hal. in the broader leaves, broader, cucullate leaf apices, shorter and wider basal cells, less incrassate and slightly longer upper laminal cells.

Endemic to Cameroon: 'Cameroon Mountain, Vefondi Peak'.

On tall, pillar-like lava blocks in grassland at 3170 m a.s.l.

Only known from a single gathering made in 1948. Mount Cameroon is an active volcano and the most recent eruptions were in February 2012. The habitat is threatened by lava flows. Tropical rain forest loss and fragmentation, ecosystem degradation and limited local capacity for conservation are the major threats in the Guinean Forests of West Africa biodiversity hotspot.

Richards (1952); CEPF (2016).

4. ***Archidium andersonianum***

Snider in *The Bryologist* 78: 158 (1975), fig. 26–36, 39.

Archidiaceae. This small but conspicuous species is similar in habit to *A. capense* and *A. muellerianum*. It differs in the deltoid innovation leaves with costa ending in a strong hair-point and the larger, broadly oblong-ovate perichaetial leaves with narrower costae.

Endemic to the Western Cape Province of South Africa where it was collected on the Stellenbosch flats by Almborn in 1966.

On sandy or gravelly soil in the Fynbos Biome.

This species is represented by a single collection from the Cape Floristic Region, a global biodiversity hotspot. The vegetation of the Cape lowlands has been highly impacted by agriculture and urban development and alien plant species have invaded most of the remaining natural habitats. It is highly threatened.

Snider (1975); Magill (1981); Rebelo et al. (2006); CEPF (2016).

5. ***Bazzania konratiana*** Gyarmati in *Cryptogamie, Bryologie* 38(2):

Endemic to Madagascar: Toamasina Prov., Mananara

Only known from two localities in the Mananara Nord Biosphere

CEPF (2016); IUCN (2017a); Wigginton (2018); Sass-

<p>120 (2017), fig. 1–8.</p> <p>Lepidoziaceae. The species can be separated from the Seychelles endemic <i>B. approximata</i> Onr. by the larger plants, thick-walled leaf cells with large, bulging trigones and the proportion of hyaline and chlorophyllose cells in the underleaves.</p>	<p>Nord Biosphere Reserve and National Park.</p> <p>Corticolous in lowland rainforest with tree ferns, palms and <i>Pandanus</i> ssp., on E and NW slopes, 250–300 m a.s.l.</p>	<p>Reserve where it was collected in 1998. The remaining habitat in this biosphere reserve is threatened by illegal exploitation of forest resources. Of the 15 species of <i>Bazzania</i> recognised in Africa, 11 are restricted to the Madagascar and the Indian Ocean Islands biodiversity hotspot and six are endemic to the island of Madagascar.</p>	<p>Gyarmati (2017).</p>
<p>6. <i>Bruchia eckloniana</i> Müll.Hal. in <i>Synopsis Muscorum Frondosorum omnium hucusque Cognitorum</i> 1: 19 (1848).</p> <p>Bruchiaceae. The small calyptra, plane, entire leaf margins and papillose to vermiculate spores will identify the species.</p>	<p>Collected by Ecklon in the Cape (probably around Cape Town), without a precise locality ('Prom. Bon. Spei'), between 1823 and 1848.</p> <p>On soil in the Fynbos Biome.</p>	<p>Only known from the original locality in the Fynbos and Renosterveld vegetation of the Cape Floristic Region biodiversity hotspot, which is threatened by urban development, agriculture and invasive alien plant species. The Fynbos Biome is critically endangered.</p>	<p>Magill (1981); Rebelo et al. (2006); CEPF (2016).</p>
<p>7. <i>Bryopteris gaudichaudii</i> Gottsche in <i>Annales des Sciences Naturelles; Botanique</i>, sér. 4 8: 340 (1857).</p> <p>Lejeuneaceae. Molecular evidence shows <i>B. gaudichaudii</i> as one of the major clades in the genus.</p>	<p>Madagascar and Réunion.</p> <p>Coastal ericaceous heath and montane rainforest.</p>	<p>Found only once since 1900 (in 1996) on Réunion and known from only two localities on Madagascar, about 75 km apart. Cultivation, livestock grazing and deforestation have devastated habitats, especially in the lowlands, throughout the Madagascar and the Indian Ocean Islands biodiversity hotspot. Despite recent exhaustive searches</p>	<p>Hartmann et al. (2006); Wigginton (2018); Ah-Peng et al. (2012); CEPF (2016); IUCN (2017a).</p>

on Réunion, this species could not be found and it is probably extinct on the island, as a result of the disappearance of its habitat. There is concern about the recent marked increase in illegal logging in the remaining forests of Madagascar. The species is facing an extremely high risk of worldwide extinction in the immediate future.

Critically Endangered globally: B1+2c (ver 2.3) (IUCN 2017b).

Regionally extinct on Réunion: (Ah-Peng et al. 2012)

8. *Caudalejeunea grolleana*
Gradst. in *Acta Botanica Neerlandica* 23: 334 (1974), pl. 1.

Lejeuneaceae. Within *Caudalejeunea* it constitutes a separate, monotypic subgenus. Tiny epiphytic plants, growing in small, dull green mats.

Endemic to Madagascar where it is known from Nossi-Bé island and Antsohy Forest.

On bark of stems and dead wood in undisturbed lowland rainforest.

Only known from two localities in the Madagascar and the Indian Ocean Islands biodiversity hotspot and not collected since 1973. The remaining lowland rain forests of Madagascar are threatened with destruction.

Green and Sussman (1990); Gradstein (2001a), CEPF (2016).

Endangered globally: B1+2cd (ver 2.3) (IUCN 2017b).

9. *Cheilolejeunea ulugurica*
Malombe, Eb.Fisch. et Pócs in *Acta Biologica Plantarum Agriensis* 1: 24 (2010).

Lejeuneaceae. Distinguished by the

Endemic to Tanzania, Uluguru Mts, N side of Bondwa peak.

Ramicolous on stems of ericaceous shrubs at the edge of montane forest, 1650–1800

Only known from a single collection despite intensive bryological exploration in the Eastern Arc Mountains, which forms part of the Eastern

Malombe, Fischer and Pócs (2010); CEPF (2016); Wigginton (2018).

<p>obovate-spathulate lobe with a lobule occupying $\frac{2}{3}$ to $\frac{3}{4}$ its length with a strongly incurved keel apex and forming a very narrow sinus with the postical lobe margin. Possibly conspecific with <i>C. chenii</i> R.L.Zhu et M.L.So from China.</p>	<p>m a.s.l.</p>	<p>Afromontane biodiversity hotspot. Like vascular plants, any rare or endemic bryophyte found in the Ulugurus at altitudes lower than 1800 m is under serious threat from encroachment of habitat and deforestation. This species may be Critically Endangered.</p>
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<p>10. <i>Cololejeunea bosseriana</i> Tixier in <i>Bulletin Trimestriel de l'Académie Malgache</i> 55: 235 (1977)[1979], fig. 39.</p>	<p>Endemic to Réunion, Forêt de Bébour. Epiphyll on ferns in humid forest at 1300 m a.s.l.</p>	<p>Known only from the type locality in the Madagascar and the Indian Ocean Islands biodiversity hotspot and last collected by Bosser in 1972.</p>	<p>Ah-Peng et al. (2012); CEPF (2016); Söderström et al. (2016).</p>
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Lejeuneaceae. According to the World checklist of hornworts and liverworts (Söderström et al. 2016), the species is not well known.

Critically Endangered on Réunion: [B2ab(iii)] (Ah-Peng et al. 2012).

<p>11. <i>Cololejeunea decemplicata</i> (Steph.) Tixier in <i>Bulletin Trimestriel de l'Académie Malgache</i> 55: 213 (1977)[1979].</p>	<p>Madagascar and Réunion (three localities). Corticolous on trees like <i>Acacia</i> sp., in forest.</p>	<p>Urbanisation, agriculture and invasive alien species have resulted in the degradation and fragmentation of natural habitats throughout the Madagascar and the Indian Ocean Islands biodiversity hotspot. On the Plaine des Cafres of Réunion, the known natural habitats of the species have been replaced by agriculture.</p>	<p>Ah-Peng et al. (2012); CEPF (2016); Söderström et al. (2016).</p>
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Lejeuneaceae. The species is not well known (Söderström et al. 2016).

Critically Endangered on Réunion [B1b(iii)] (Ah-Peng et al. 2012) and

most likely on Madagascar as well.

12. *Cololejeunea jonesii* Pócs in *Acta Botanica Academiae Scientiarum Hungaricae* 21: 361 (1975), fig. 35–43.

Lejeuneaceae. The number of cells in the discoid gemmae is much higher than in related species. The species will also be distinguished by the presence of claviform styles and the biserial ventral merophytes.

Kimboza Forest Reserve in Tanzania and Ngangao Forest in the Taita Hills of Kenya.

Epiphyllous in lowland rain forest (300 m a.s.l.) and montane tropical forest (2149 m a.s.l.).

Only known from two localities in the Eastern Afromontane biodiversity hotspot. The type locality in Tanzania is in a lowland rainforest of the Kimboza Forest Reserve at the eastern foothills of the Uluguru Mountains, seriously encroached by illegal ruby mining and log felling. Recently recorded in Ngangao Forest, a forest fragment in the Taita Hills of Kenya, where only one specimen was found despite comprehensive collection of bryophytes. The species should be ranked as ‘Endangered’ because of few collections, rarity and fragmented or threatened forests.

Pócs (1975); Malombe et al. (2016); CEPF (2016).

13. *Cololejeunea nosykombae* A.Szabó & Pócs in *Journal of Bryology* 38(4): 302 (2016).

Lejeuneaceae. The species differs from other species in the genus mainly by its swallow-tail shaped perianth. Two varieties are recognised: *C. nosykombae* var. *laevis* A.Szabó & Pócs as well as the typical variety.

Endemic to the volcanic Nosy Komba island of Madagascar.

Epiphyllous in a submontane rainforest fragment, mostly on *Marattia* fern leaflets, but also on the fern *Tectaria* sp. and a broadleaved shrub, at an altitude of 570–580 m a.s.l. Associated with other epiphyllous Lejeuneaceae.

The locality falls within the Madagascar and the Indian Ocean Islands biodiversity hotspot. The species is known only from a 150 m × 50 m area in a forest remnant surrounded by cultivation. It is considered to be ‘critically endangered’ because of its tiny population size and very small area of occurrence in a habitat under

Szabó and Pócs (2016); CEPF (2016).

			severe threat.
<p>14. <i>Cololejeunea takamakae</i> Tixier in <i>Bryophytorum Bibliotheca</i> 27: 319 (1985), fig. 73.</p> <p>Lejeuneaceae. There are doubts about the taxonomy of the species and it is possibly conspecific with <i>C. angustiflora</i> (Steph.) Mizut., which is known also from Malaysia, Borneo, China, Taiwan and the Philippines.</p>	<p>Endemic to Réunion.</p> <p>Epiphyll at ±1000 m a.s.l.</p>	<p>Less than five localities, threatened with habitat degradation. A very restricted endemic in the Madagascar and the Indian Ocean Islands biodiversity hotspot.</p> <p>Critically Endangered on Réunion: [B1b(iii)] (Ah-Peng et al. 2012).</p>	<p>Ah-Peng et al. (2012); Söderström et al. (2016); CEPF (2016).</p>
<p>15. <i>Colura heimii</i> Jovet-Ast in <i>Revue Bryologique et Lichénologique</i> 22: 275 (1953).</p> <p>Lejeuneaceae. This is a recognised species and currently accepted in the World checklist of hornworts and liverworts (Söderström et al. 2016).</p>	<p>Comoros, Madagascar, Mauritius and Réunion.</p> <p>On Réunion it grows on twigs in lowland and upland forests.</p>	<p>Urbanisation, agriculture and invasive alien species have resulted in the degradation and fragmentation of natural habitats throughout the Madagascar and the Indian Ocean Islands biodiversity hotspot. On Réunion the habitat is also threatened by lava flows.</p> <p>Critically Endangered on Réunion [B2b(iii)] (Ah-Peng et al. 2012) and most likely throughout the region.</p>	<p>Wigginton (2018); Ah-Peng et al. (2012); Söderström et al. (2016); CEPF (2016).</p>
<p>16. <i>Cryptomitrium oreades</i> Perold in <i>Bothalia</i> 24: 149 (1994), fig. 1–2.</p> <p>Aytoniaceae. The genus is only represented by one species in Africa, which differs from the other two species in the genus mainly by the</p>	<p>Endemic to the Oxbow area of Lesotho.</p> <p>On soil over rock under basalt boulders, in seepage areas in the high altitude Drakensberg alti-montane grasslands, at ±2550 m a.s.l.</p>	<p>Only known from two localities, ±5 km apart. Heavy grazing pressure by livestock (carrying capacity is exceeded by up to 300%) is a serious threat to the Drakensberg alti-montane grassland and woodland. It alters the ecosystem and makes the existing</p>	<p>Perold (1994, 1999); Olson and Dinerstein (2002).</p>

lateral position of the stalk.

habitats vulnerable to encroachment by Karoo vegetation.

17. *Cygnicollum immersum* Fife & Magill in *The Bryologist* 85: 99 (1982), fig. 1–19.

Endemic to the Northern Cape Province of South Africa and only known from the type locality on the upper slopes of Vanrhyns Pass.

This monotypic genus has only been collected once (in 1977) and recent efforts to re-collect it were unsuccessful. However, the plants are very small (stems up to 1 mm long) and can easily be overlooked. The Vanrhynsdorp Shale Renosterveld vegetation is classified as least threatened, but overgrazing by livestock, cultivation and alien invasive species are major threats in the surrounding Succulent Karoo biodiversity hotspot. This particular locality is threatened by roadworks in the Vanrhyns Pass.

Magill (1987); Rebelo et al. (2006); Goffinet (2013); CEPF (2016).

Funariaceae. This distinct, monotypic genus is recognised by its size (very small), bulbiform habit and completely enclosed, pendent, cleistocarpic capsule.

It grew on sandy soil in small open areas amongst shrub at ± 800 m a.s.l.

18. *Drepanolejeunea helenae* Pócs in *Cryptogamie: Bryologie, Lichénologie* 18: 198 (1997), pl. 1–4.

Endemic to Réunion. On the bark of *Psidium cattleyanum* Sabine and epiphyllous in remnants of tropical rainforest, ± 500 –750 m a.s.l.

Known from only two localities, where the type specimens were collected in 1994 and 1995. Habitat destruction is the main threat to this very restricted endemic of the Madagascar and the Indian Ocean Islands biodiversity hotspot.

Pócs (1997); Ah-Peng et al. (2012); CEPF (2016).

Lejeuneaceae. The species differs from *D. ankasica* E.W.Jones in the many ocelli in the leaf lobe and the presence of ocelli in the perianth, amongst other characters.

Critically Endangered on Réunion: [B2ab(iii)] (Ah-Peng et al. 2012).

19. *Entosthodon heddersonii* N.Wilding in *Phytotaxa* 312(1):

Endemic to Tanzania. Recently described from the

The species is known only from the type specimen collected in 1988.

Frontier.ac.uk (2014); CEPF

<p>103–110 (2017).</p> <p>Funariaceae. The narrowly oblong-obovate, aristate leaves, bordered and toothed in the upper $\frac{2}{3}$ and the zygomorphic, peristomate capsules will differentiate <i>E. heddersonii</i> from other species in the genus.</p>	<p>Lukwangule plateau in the Uluguru Mountains.</p> <p>Collected at an elevation of ± 2360 m a.s.l. along a rocky, peaty stream bank on the eastern edge of the Lukwangule Plateau.</p>	<p>The main threats to this part of the Eastern Afromontane biodiversity hotspot are annual fires on the Lukwangule plateau that may change the ecology of the afromontane grassland and spread into the forest, firewood collection, encroachment into the reserves and spread of the invasive <i>Rubus</i> sp.</p>	<p>(2016); Wilding (2017).</p>
<p>20. <i>Ephemerum diversifolium</i> Mitt., Harvey in <i>Thesaurus Capensis</i> 1: 63 (1859), pl. 100, fig. A.</p> <p>Ephemeraceae. A very distinct species with highly differentiated perichaetial leaves.</p>	<p>Endemic to the Eastern Cape Province of South Africa: Uitenhage, Zwartkop's River.</p> <p>On soil in shrublands.</p>	<p>Only known from the type locality where it was collected during the first half of the 19th century by Zeyher. The plants are minute, making it difficult to find. Cultivation, invasive alien plants, urbanisation, pollution and mining activities are responsible for ongoing loss and degradation of habitat along the Swartkops River between Port Elizabeth and Uitenhage. The Albany Alluvial Vegetation is endangered and falls within the Maputaland–Pondoland–Albany biodiversity hotspot.</p>	<p>Magill (1987); Mucina et al. (2006a), CEPF (2016).</p>
<p>21. <i>Fissidens capriensis</i> Magill in <i>Flora of Southern Africa, Bryophyta</i> 1: 45 (1981), fig. 9: 1–7.</p> <p>Fissidentaceae. The corticolous</p>	<p>Endemic to Namibia. Collected by Hans Vahrmeijer in the Caprivi strip, Kongola area, Kwando swamps.</p> <p>In gallery forest, on lower</p>	<p>Only known from the type locality where it was found in 1980. Although the Kwando swamps are relatively undisturbed and the area under-explored, agriculture is encroaching on the habitat in the</p>	<p>Magill (1981); Van Rooy and Phephu (2016).</p>

substrate, well-defined limbidia, large leaf cells and distinct costa distinguish the species.	trunk of <i>Boscia</i> sp.	Kongola area.	
<p>22. <i>Fossombronia nyikaensis</i> Perold in <i>Bothalia</i> 31(1): 48 (2001).</p> <p>Fossombroniaceae. The ornamentation on the distal face of the spore is distinctive.</p>	<p>Endemic to the Nyika Plateau in northern Malawi.</p> <p>The species was found in grassland, on soil in a rock overhang, at 2227 m a.s.l.</p>	<p>Only known from specimens collected at the type locality in 2000. Although the locality is protected in the Nyika National Park, the native habitats on the plateau are threatened by wildfires that fragment the forests, and invasive alien plants such as pine trees and the Himalayan raspberry. The Nyika Plateau is part of the Eastern Afromontane biodiversity hotspot.</p>	<p>Perold (2001a), The Nyika Vwaza (UK) Trust (2016); CEPF (2016).</p>
<p>23. <i>Geocalyx orientalis</i> Besch. et Spruce in <i>Bulletin de la Société Botanique de France</i> 36(suppl.): 189 (1890).</p> <p>Geocalycaceae. According to the World checklist of hornworts and liverworts (Söderström et al. 2016), the species is not well known.</p>	<p>Endemic to Réunion: Cirque de Cilaos area.</p> <p>On soil and rotten wood in montane forest, 1300–1500 m a.s.l.</p>	<p>Only known from one locality on the island. The area of occupancy is <4 km². Major threats are habitat destruction and urbanisation in the populated Cirque de Cilaos area. The locality falls within the Madagascar and the Indian Ocean Islands biodiversity hotspot.</p> <p>Critically Endangered on Réunion: [B2ab(iii)] (Ah-Peng et al. (2012).</p>	<p>Ah-Peng et al. (2012); Söderström et al. 2016, CEPF (2016).</p>
<p>24. <i>Gymnostomum lingulatum</i> Rehmann ex Sim in <i>Transactions of the Royal Society of South</i></p>	<p>Endemic to the Limpopo Province of South Africa where it was collected ‘in</p>	<p>Only known from the type locality and not collected since 1879/80. The remaining indigenous forests</p>	<p>Dixon and Gepp (1923); Magill (1981); Mucina et al.</p>

<p><i>Africa</i> 15: 260 (1926).</p> <p>Pottiaceae. The lanceolate to triangular, unistratose leaves with entire margins and low, simple, scattered leaf cell papillae distinguish the species from others in southern Africa.</p>	<p>mont. Lechlaba ad Houtbosch' by Antoni Rehmman and distributed as no. 437 in his <i>Musci Austro-Africani cont. exsiccatae</i>. A specimen that resembles this species was collected near Dwesa in the Eastern Cape Province in 1985.</p>	<p>and grassland in the Woodbush-Haenertsburg area are threatened by afforestation, cultivation, invasive alien plants, bush encroachment, overgrazing by livestock and urban development. The Woodbush Granite Grassland is critically endangered.</p>	<p>(2006).</p>
<p>25. <i>Haplolejeunea sticta</i> Grolle in <i>Journal of the Hattori Botanical Laboratory</i> 39: 205 (1975), fig. 1–2.</p> <p>Lejeuneaceae. According to the World checklist of hornworts and liverworts (Söderström et al. 2016), the species is not well known.</p>	<p>It probably grew on rock or soil in grassland, at ±1400 m a.s.l.</p> <p>Réunion and Madagascar.</p> <p>On Réunion it grows on rotten wood in lowlands, between 175 and 700 m a.s.l.</p>	<p>The species is restricted to the Madagascar and the Indian Ocean Islands biodiversity hotspot. On Réunion, the species is known only from two localities in threatened lowland habitats. Deforestation and forest degradation are major threats to lowland habitats in Madagascar.</p> <p>Critically Endangered on Réunion [B2ab(iii)] (Ah-Peng et al. 2012) and probably on Madagascar as well.</p>	<p>Ah-Peng et al. (2012); Söderström et al. (2016); CEPF (2016).</p>
<p>26. <i>Heteroscyphus spectabilis</i> (Steph.) Schiffn. in <i>Oesterreichische Botanische Zeitschrift</i> 60: 172 (1910).</p> <p>Lophocoleaceae. The large trigones of</p>	<p>São Tomé and Príncipe, Cameroon.</p> <p>On tree bark in forest. On São Tomé and Príncipe it was found at elevations of 500 and</p>	<p>For more than 100 years this rare species was only known from São Tomé and Cameroon. On São Tomé it was collected by Moller in 1885 and in Cameroon the records date back to two specimens</p>	<p>Wigginton (2004); Sérgio and Garcia (2011); Pócs, Müller and Shevock (2015); CEPF (2016).</p>

the leaf cells distinguish this species from others in West Africa.

1150 m a.s.l.

collected by Dusén in the 1890s. It has recently (in 2012 and 2013) been found on the island of Príncipe by Shevock. Forest cover on São Tomé and Príncipe remains substantial, but growing population pressure in the rest of the Guinean Forests of West Africa biodiversity hotspot and the resulting demand for forested land is a serious threat to the remaining habitats.

27. *Lejeunea gradsteiniana* Pócs in *Acta Biologica Plantarum Agriensis* 1: 55 (2010)[2011]. Nom. nov. pro *Ceratolejeunea aberrans* Steph. in *Species Hepaticarum* 6: 399 (1923).

Lejeuneaceae. Previously *Cladolejeunea aberrans* (Steph.) Zwickel. The only African species in the '*Lejeunea eckloniana*' group with horned perianth keels.

Endemic to the Usambara Mountains of Tanzania. Epiphyllous on large *Trichomanes* sp. in dense, wet, tropical rain forest, 900–1000 m a.s.l. Associated with other rare and endemic liverworts.

Known from only two localities, 6 km apart, in the Kwamkoro Forest Reserve of East Usambara, where it was collected in 1911 and 1982. The habitat is declining because of deforestation, intercropping and the introduction of alien trees in the forest canopy. The reserve falls within the Eastern Afromontane biodiversity hotspot.

Endangered globally: B1+2cd (ver 2.3) (as *Cladolejeunea aberrans*) (IUCN 2017b).

Pócs (2011); CEPF (2016).

28. *Leucoloma crosbyi* La Farge-Engl. in *Novon* 2: 119 (1992).

Dicranaceae. The species is characterised by its robust habit, narrow, opaque juxtacostal bands

Endemic to northern Madagascar: Diego Suarez, Parc National de Montagne d'Ambre.

Corticolous and ramicolous in

Only known from a couple of specimens collected about 5 km apart by Marshall and Carol Crosby in 1972. Madagascar is the centre of diversity and endemism for

La Farge-England (1992, 1998); Jenkins et al. (2011); CEPF (2016).

tapering to basal region, costal-laminal transition zone with 2–9 multi- to bistratose rows, interior cells forming broad scarious region, narrow hyaline margin and longitudinally thick-walled alar cells.

rainforest, 900–1200 m a.s.l.

Leucoloma and the genus represents about 5% of the moss flora of the Madagascar and the Indian Ocean Islands biodiversity hotspot. The habitat in Parc National de Montagne d'Ambre is under threat from encroachment as a result of charcoal extraction, cattle grazing, slash-and-burn agriculture, and rosewood collection.

29. *Leucoperichaetium eremophilum* Magill in *Flora of Southern Africa, Bryophyta* 1: 273 (1981), fig. 81: 1–18.

Grimmiaceae. The species is unique within the family because of the stark contrast between the small, bistratose vegetative leaves and the large, hair-pointed and colourless perichaetial leaves.

Endemic to Witputz in southern Namibia, where it was collected in 1978.

The plants grew on fine sand over a quartzite outcrop in dwarf succulent shrublands, ±1000 m a.s.l. The locality is situated on the Namib escarpment, a transition zone between the Namib Desert and the central plateau. It is an arid, winter rainfall area.

This monotypic genus is only known from a single locality in the Succulent Karoo biodiversity hotspot. The locality is threatened by mining activities which are expanding and take precedence over all other land uses in Namibia, in protected areas as well as private land.

Vulnerable globally: D2 (ver 2.3) (IUCN 2017b).

Magill (1981); Van Rooy (2004); Legal Assistance Centre of Namibia (2009); CEPF (2016).

30. *Lopholejeunea minima* Vanden Berghen in *Bulletin du Jardin Botanique National de Belgique* 54: 437 (1984), fig. 21.

Lejeuneaceae. Vanden Berghen (1984) provided a key to African species of

Endemic to Réunion.

Epiphytic on tree trunks and fern fronds in lowland forest, 100–220 m a.s.l.

The species was known from two localities that were destroyed during the 2007 volcanic eruption and the species has not been observed since. It is restricted to the Madagascar and the Indian Ocean

Vanden Berghen (1984); Ah-Peng et al. (2012); Söderström et al. (2016); CEPF (2016).

Lopholejeunea, but according to the World checklist of hornworts and liverworts (Söderström et al. 2016), the species is not well known.

Islands biodiversity hotspot.

Critically Endangered on Réunion: [B2ab(iii)] (Ah-Peng et al. (2012).

<p>31. <i>Lopholejeunea multilacera</i> Steph. in <i>Botanical Gazette</i> 15: 285 (1890).</p> <p>Lejeuneaceae. Vanden Berghen (1984) provided a key to African species of <i>Lopholejeunea</i>, but the broader taxonomic relationships of <i>L. multilacera</i> are uncertain.</p>	<p>Madagascar, Mauritius and Réunion.</p> <p>On Réunion it is corticolous in forest, 800–1350 m a.s.l.</p>	<p>On Réunion the species is only known from two localities. The habitat is threatened with destruction and degradation throughout the Madagascar and the Indian Ocean Islands biodiversity hotspot.</p> <p>Critically Endangered on Réunion [B2ab(iii)] (Ah-Peng et al. 2012), but most likely on Madagascar and Mauritius as well.</p>	<p>Vanden Berghen (1984); Ah-Peng et al. (2012); Söderström et al. (2016); CEPF (2016).</p>
<p>32. <i>Ludorugbya springbokorum</i> Hedd. & R.H.Zander in <i>Journal of Bryology</i> 29: 222 (2007).</p> <p>Pottiaceae. The strongly differentiated perichaetial leaves, immersed, urceolate capsules with a very long, conic-mitrate operculum and a persistent, evertable annulus are diagnostic features of the species.</p>	<p>Endemic to the Western Cape Province of South Africa.</p> <p>On clay banks in Renosterveld fragments of the Fynbos Biome, at 150–250 m a.s.l.</p>	<p>This monotypic genus is only known from a few remnant Renosterveld fragments in the Swartland region, in an area about the size of a half degree grid square. This vegetation type is one of the most threatened in South Africa and falls within the Cape Floristic Region biodiversity hotspot. <i>Ludorugbya springbokorum</i> is suggested to be amongst the most threatened mosses in the world (Hedderson &</p>	<p>Hedderson and Zander (2007); CEPF (2016).</p>

Zander 2007).

<p>33. <i>Meiothecium fuscescens</i> (A. Jaeger ex Paris) Broth. in <i>Die Natürlichen Pflanzenfamilien</i> I(3): 1103 (1908).</p> <p>Sematophyllaceae. The smooth leaf cells and single peristome place plants in <i>Meiothecium</i>, but the species has not been restudied recently.</p>	<p>Endemic to South Africa and only known from the original material, collected in the Cape (locality not precise) by Carl Heinrich Bergius between 1815 and 1817.</p> <p>Probably epiphytic in wooded areas.</p>	<p>Not collected since the early 1800s. The Fynbos, where this species was found, is one of the most threatened biomes in South Africa, classified as critically endangered. It is part of the Cape Floristic Region biodiversity hotspot.</p>	<p>Sim (1926); Driver et al. (2012); CEPF (2016).</p>
<p>34. <i>Neckeropsis pocsii</i> Enroth & Magill in <i>The Bryologist</i> 97: 171 (1994), fig. 1–9.</p> <p>Neckeraceae. The species resembles the widely distributed <i>N. disticha</i> (Hedw.) Kindb. in habit, but differs in the wider leaf bases, stronger serrulate to crenate leaf apices, exserted capsules and filiform post-fertilisation paraphyses.</p>	<p>Endemic to the Comoros island of Mayotte.</p> <p>Growing on boulders in mesic evergreen forest, ±400 m a.s.l.</p>	<p>Known only from the type locality where it was collected in 1992. The Comoros belong to the Madagascar and the Indian Ocean Islands biodiversity hotspot. The area of occupancy is less than 10 km² and the habitat is declining as a result of excessive logging.</p> <p>Critically Endangered globally: B1+2c (ver 2.3) (IUCN 2017b).</p>	<p>Enroth and Magill (1994); Enroth (2002); CEPF (2016).</p>
<p>35. <i>Picobryum atomicum</i> R.H.Zander & Hedd. in <i>Journal of Bryology</i> 33(2): 130 (2011).</p> <p>Pottiaceae. Plants of this monotypic genus are very small with a cleistocarpic, globose, short apiculate capsule and mitrate calyptra. It differs from <i>Syntrichia</i> Brid. in several</p>	<p>Endemic to South Africa and only known from Beaverlac in the Oliphants River Mountains of the Western Cape Province.</p> <p>Found in disturbed areas and patches of clayey mineral soil in Fynbos at ±300 m a.s.l.</p>	<p>Restricted to the Olifants River section of Leipoldtville Sand Fynbos, another lowland vegetation type of the Fynbos Biome (Cape Floristic Region biodiversity hotspot) under severe threat. The habitat is endangered by agriculture and invasive alien species.</p>	<p>Rebelo et al. (2006); Zander and Hedderson (2011); CEPF (2016).</p>

respects.

<p>36. <i>Pocsiella hydrogonioides</i> Bizot in <i>Cryptogamie: Bryologie, Lichénologie</i> 1: 424 (1980), pl. 1: fig. 2.</p> <p>Dicranaceae. The leaves are flexuose, ligulate and long-decurrent. The laminal cells are large and smooth and the alar cells undifferentiated. The peristome teeth are smooth.</p>	<p>Endemic to Tanzania: Kilimanjaro, ‘Bivouac Rocks’ along the Umbwe trail.</p> <p>In large turfs on dripping porphyry lava cliffs at 2900 m a.s.l.</p>	<p>This monotypic genus is known from one locality only, where mountaineers bivouac under the overhanging cliffs, making fire. The species was last observed in 1989 and is regarded as Critically Endangered. Kilimanjaro falls within the Eastern Afromontane biodiversity hotspot.</p>	<p>Frey and Stech (2009); CEPF (2016)</p>
<p>37. <i>Porella prolixa</i> (Gottsche ex Steph.) E.W.Jones in <i>Transactions of the British Bryological Society</i> 4: 460 (1963).</p> <p>Porellaceae. <i>Porella prolixa</i> appears to be distinct from other African species, none of which has apiculate leaves.</p>	<p>Endemic to Réunion, without a precise locality.</p> <p>Habitat unknown. The genus is rare in Africa, but species on the continent are rupicolous or corticolous and occur at high altitude, > 2000 m a.s.l.</p>	<p>The species is known only from the type collection. Urbanisation and invasive alien species are the main threats to biodiversity on Réunion, which forms part of the Madagascar and the Indian Ocean Islands biodiversity hotspot.</p> <p>Critically Endangered on Réunion: B2ab(i) (Ah-Peng et al. 2012).</p>	<p>Jones (1963); Ah-Peng et al. (2012); CEPF (2016).</p>
<p>38. <i>Pterobryopsis rehmannii</i> Magill in <i>Memoirs of the Botanical Survey of South Africa</i> 43: 5 (1979), fig. 33–41.</p> <p>Pterobryaceae. The broadly ovate to oval leaves with costa extending to above midleaf and upper margins inflexed and serrulate, distinguish this</p>	<p>Endemic to the KwaZulu-Natal Province of South Africa, without precise locality, where it was collected by Buchanan between 1861 and 1874.</p> <p>From substrate fragments in the specimen, it appears that</p>	<p>The plants of <i>P. rehmannii</i> are large and like other members of the genus probably cover large areas on trees and rocks in closed forests, which are protected in several reserves. It is therefore curious that the species has not been recollected during many field trips to the area.</p>	<p>Magill and Van Rooy (1998); CEPF (2016).</p>

species from others in the region.

the species grew on tree bark.

Habitat in the Maputaland–Pondoland–Albany biodiversity hotspot is threatened by cultivation, plantation forestry and urbanisation.

39. *Renauldia lycopodioides* Bizot ex Pócs in *Folia Historico-naturalia Musei Matraensis* 4: 33 (1976)[1977].

Pterobryaceae. This moss is described as spectacular, with tail-like stems about 10 cm long and 4 mm thick. The leaves are ovate to panduriform, concave, with a short, often channelled apiculus. The capsules are yellow, almost sessile and hang from the branches.

Endemic to the Eastern Arc mountains and known from the Western Usambara, Ukagura and Udzungwa mountains in Tanzania and the Taita Hills in south-eastern Kenya.

Epiphytic on tree branches in moist mossy elfin forest, 750–2200 m a.s.l.

The Eastern Arc mountains form part of the Eastern Afromontane biodiversity hotspot, characterised by a series of montane ‘islands’ and plateaus. The habitat is seriously threatened by deforestation for agricultural land and firewood as well as large-scale logging, resulting in forest degradation and fragmentation.

Endangered globally: B1+2cd (ver 2.3) (IUCN 2017b).

Pócs (2000); Bytebier and Chuah-Petiot (2002); CEPF (2016).

40. *Riccia alatospora* O.H.Volk et Perold in *Bothalia* 15: 534 (1985), fig. 4–6.

Ricciaceae. The species is distinguished from the closely related *R. duthieae* O.H.Volk & Perold by its smaller thalli but larger spores with very broad and often perforated and eroded wings.

Endemic to the Western Cape Province, South Africa.

Fynbos Biome. Annual on shallow, sandy soil in hollows on a dome-shaped granite outcrop, ±80 m a.s.l.

Since its initial collection in 1929, the species is only known from Platklip near Stellenbosch. Although the Platklip locality is locally protected, much of the surrounding Renosterveld vegetation has been destroyed by urban development, viticulture and alien invasive plants. This area is part of the Cape Floristic Region biodiversity hotspot.

Vulnerable globally: D2 (ver 3.1)

Perold (1999, 2008); Rebelo et al. (2006); CEPF (2016).

(IUCN 2017b).

<p>41. <i>Riccia hantamensis</i> Perold in <i>Bothalia</i> 19: 157 (1989), fig. 2–4: A–F: a.</p> <p>Ricciaceae. The robust size of the plants will distinguish it from the closely related <i>R. alatospora</i>.</p>	<p>Endemic to the Northern Cape Province of South Africa. Originally described from the Hantamsberge at Calvinia and tentatively reported from the Carolusberg near Springbok. In the Hantam, the species grows on neutral to somewhat alkaline soil, together with small <i>Crassula</i> spp. and mosses, for example, <i>Didymodon tophaceus</i> (Brid.) Lisa, in an area with predominantly Fynbos vegetation. Altitude of ±1500 m a.s.l. with winter rainfall of less than 200 mm p.a.</p>	<p>Only known from two localities, ±260 km apart, in the Succulent Karoo, a global biodiversity hotspot. Overgrazing as a result of inadequate farming practices and invasive alien plants are the greatest threats to the vegetation in the Hantam-Roggeveld region, identified as a priority area for conservation.</p>	<p>Perold (1999); Van der Merwe, Van Rooyen and Van Rooyen (2008); CEPF (2016).</p>
<p>42. <i>Riccia hirsuta</i> O.H.Volk et Perold in <i>Bothalia</i> 16: 187 (1986), fig. 1–3.</p> <p>Ricciaceae. <i>Riccia hirsuta</i> is distinguished from other species in section <i>Pilifer</i> by the very tall, shiny dorsal cell pillars and by the triangular scales, apically split into filamentous, short and loose cellular strands.</p>	<p>Endemic to the Kamiesberge of Namakwaland in the Northern Cape Province of South Africa.</p> <p>It grows on sandy soil amongst bushes in seasonally damp places or seepage areas, ±1160 m a.s.l. in a winter rainfall area with precipitation less than 200 mm p.a.</p>	<p>Only known from collections made between 1977 and 1988, at two localities ±20 km apart. The Namaqualand Uplands is one of the priority areas for conservation in the Succulent Karoo biodiversity hotspot. Overgrazing by livestock and cultivation along water courses are significant threats to the habitat.</p>	<p>Volk and Perold (1990); Perold (1999); CEPF (2016).</p>
<p>43. <i>Riccia rubricollis</i> Garside et A.V.Duthie ex Perold in</p>	<p>Endemic to Knysna in the Western Cape Province of</p>	<p>This rare endemic is only known from a couple of sites on opposite sides of the Knysna lagoon, ±3 km</p>	<p>Perold (1991, 1999); Rebelo et al. (2006); CEPF (2016).</p>

<p><i>Bothalia</i> 21(1): 51 (1991).</p> <p>Ricciaceae. The species can be distinguished by the conspicuous, mostly dark purple antheridial necks of the male plant and the spores with large, deep-set areolae on the distal face.</p>	<p>South Africa.</p> <p>The species grows at low altitude on turf in damp, shady places, frequently mixed with other bryophytes.</p>	<p>apart, collected by A.V. Duthie in the late 1920s. The Knysna Sand Fynbos as well as Garden Route Shale Fynbos vegetation types are endangered and the habitat is threatened by urban sprawl, encroachment from invasive alien vegetation, plantation forestry and agricultural activities. It falls within the Cape Floristic Region biodiversity hotspot.</p>	
<p>44. <i>Riccia sibayenii</i> Perold in <i>Bothalia</i> 31(1): 151 (2001).</p> <p>Ricciaceae. The species is more delicate than <i>R. rubricollis</i> and lacks purple coloration. The spore ornamentation also differs.</p>	<p>Endemic to Mpumalanga Province of South Africa.</p> <p>The species grew on black loamy soil of the Savanna Biome at an altitude of 270 m a.s.l.</p>	<p>Known only from the type locality, where it was found in 2000. Although the Tshokwane-Hlane Basalt Lowveld vegetation is classified as least threatened, the habitat at the type locality is threatened by cultivation and border patrols in South Africa, and overgrazing by livestock across the border in Mozambique. The locality falls within the Maputaland–Pondoland–Albany biodiversity hotspot.</p>	<p>Perold (2001b); Rutherford et al. (2006); CEPF (2016).</p>
<p>45. <i>Sauteria nyikaensis</i> Perold in <i>Bothalia</i> 33(2): 167 (2003).</p> <p>Cleveaceae. The species is distinguished from others in the genus by a combination of thallus, ventral</p>	<p>Endemic to the Nyika Plateau of northern Malawi.</p> <p>It grew on calcareous soil containing slivers of mica, in a small, cave-like cavity at the</p>	<p>The species is known only from the type locality, where it was collected in 2000. Although the locality is protected in the Nyika National Park, the ecology of the plateau is threatened by wildfires that</p>	<p>Perold (2003); Söderström et al. (2016); The Nyika Vwaza (UK) Trust (2016); CEPF (2016).</p>

scale, stolon, and male and female inflorescence characters. However, it is treated as a doubtful species in the World checklist of hornworts and liverworts (Söderström et al. 2016).	base of a large rock, at altitude 2343 m a.s.l. Associated with <i>Lunularia cruciata</i> (L.) Dumort. ex Lindb. and <i>Plagiochasma eximium</i> (Schiffn.) Steph.	fragment the forests as well as invasive alien plants such as pine trees and the Himalayan raspberry. The Nyika Plateau forms part of the Eastern Afromontane biodiversity hotspot.	
<p>46. <i>Sematophyllum rheophyticum</i> W.R.Buck & Hedd. in <i>Bothalia</i> 46(1) (2016).</p> <p>Sematophyllaceae. The species is distinguishable from others in Africa by a unique combination of characters including the concave, abruptly acuminate leaves, the alar areolation and the rheophytic habitat.</p>	<p>Endemic to Rwanda: Gisakura, Nyungwe National Park.</p> <p>Grows on highly mineralised schistose rock in a swift flowing mountain stream below a waterfall, at 1845 m a.s.l.</p>	<p>Known from a single locality where it was collected in 2012. The species is one of few in the genus (two in Africa) that occurs in rheophytic habitats. The type material was associated with the two rare species <i>Bryocrumia vivicolor</i> (Broth. & Dixon) W.R.Buck and <i>Scopelophila ligulata</i> (Spruce) Spruce. Threats to the Nyungwe Forest include forest fires, deforestation for firewood and construction materials as well as infrastructure development. The locality is situated in the Eastern Afromontane biodiversity hotspot.</p>	<p>Crawford (2012); Buck and Hedderson (2016); CEPF (2016).</p>
<p>47. <i>Streptocalypta pulchriretis</i> (Dixon) R.H.Zander in <i>Bulletin of the Buffalo Society of Natural Sciences</i> 32: 96 (1993).</p> <p>Pottiaceae. Originally described as <i>Weisiopsis pulchriretis</i> and later transferred to <i>Streptocalypta</i>, the</p>	<p>Endemic to the Drakensberg Mountains of KwaZulu-Natal, South Africa.</p> <p>Collected on dry banks in the Gudu forest.</p>	<p>Known only from the type locality where it was collected by H.A. Wager in 1918. This locality is protected in the UKhahlamba Drakensberg Park (Royal Natal) and it is curious that this species has not been recollected during many trips to the area. Habitat in</p>	<p>Dixon and Wager (1929); Magill (1981); CEPF (2016).</p>

species is distinguished by the narrowly elliptical leaves, extension of basal leaf cells up the margins and paroicous sexual condition.

the Maputaland–Pondoland–Albany biodiversity hotspot is threatened by cultivation, plantation forestry and urbanisation.

48. *Symbiezidium madagascariense* Steph. in *Species Hepaticarum* 5: 99 (1912).

Endemic to the East African islands of Madagascar (near St. Marie) and the Seychelles (Mahé).

Plants grow in small, brown-green mats on bark in lowland rainforest.

Not sighted on Madagascar since 1904, notwithstanding intensive collecting in recent years. In the Seychelles it is known from a single collection made on Mahé in the 1960's. The remaining lowland rainforest on Madagascar and the Seychelles, part of the Madagascar and the Indian Ocean Islands biodiversity hotspot, is under severe threat of deforestation.

Gradstein (2001b); CEPF (2016); IUCN (2017a).

Lejeuneaceae. The only species of the genus in Africa and it constitutes a separate subgenus, *Eosymbiezidium*. This species is morphologically quite distinct from the neotropical species.

Endangered globally: B1+2cd (Gradstein 2001b).

49. *Xylolejeunea grolleana* (Pócs) Xiao L.He et Grolle in *Annales Botanici Fennici* 38: 32 (2001).

Endemic to the East African islands of Madagascar and Réunion.

In Madagascar it grows in humid lowland rainforest at low elevation, 220–260 m a.s.l. In Réunion it was found on the southern slope of the active volcano Piton de La Fournaise.

Known from only two lowland rainforest localities in the Madagascar and the Indian Ocean Islands biodiversity hotspot. In Madagascar the habitat is severely threatened with deforestation and in Réunion the species is very rare and endangered as a result of forest fragmentation.

Pócs (1999); He and Grolle (2001); Ah-Peng et al. (2012); CEPF (2016).

Lejeuneaceae. Originally described in *Trachylejeunea* (Spruce) Steph., the species is easily recognised by its small leaf lobe with two transverse rows of considerably enlarged and elongated cells and ocelli at the base, and high, finger-like papillae on the dorsal surface.

Critically Endangered on Réunion [B2ab(iii)] (Ah-Peng et al. 2012) and most likely on Madagascar as

well.

50. *Xylolejeunea muricella* Xiao
L.He et Grolle in *Annales
Botanici Fennici* 38: 34 (2001).

Endemic to the Seychelles
island of Mahé.

It grew on shaded rocks, mixed
with *Bazzania approximata*
Onr., at an altitude of 40 m
a.s.l.

Only known from the type locality
where it could not be re-found
during a thorough search of the
area. There is almost no rainforest
left on the Seychelles, and the
species may already be extinct. The
island forms part of the Madagascar
and the Indian Ocean Islands
biodiversity hotspot.

He and Grolle (2001); CEPF
(2016).

Lejeuneaceae. The species differs from
the closely related *X. grolleana* in the
small, spherical papillae on the dorsal
surface of the leaf lobe, conspicuously
denticulate leaf margins, 3 or 4 lateral
marginal cells of the lobule and
orbicular underleaves.

†, Note that not all of the assignments follow IUCN methodology consequently; and that many of the global assignments are in need of revision.

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