

the identification of all known species of *Pavetta* occurring within the Soutpansberg and its surroundings.

### Key to *Pavetta* species in the Soutpansberg

- 1a Calyx lobes less than 1 mm long:  
 2a Leaves large, up to 160 × 90 mm, circular in outline .....  
     ..... *Pavetta eylesii* S.Moore  
 2b Leaves not circular in outline:  
 3a Leaves spatulate:  
 4a Leaves glabrous .....  
     ..... *Pavetta gardeniifolia* A.Rich. var. *gardeniifolia*  
 4b Leaves hairy .....  
     ..... *Pavetta gardeniifolia* A.Rich. var. *subtomentosa* K.Schum.  
 3b Leaves elliptic to lanceolate:  
 5a Petiole 5–15 mm long; forest trees .....  
     ..... *Pavetta inandensis* Bremek.  
 5b Petiole 2–6 mm long; occurring in savanna or on forest margins .....  
     ..... *Pavetta lanceolata* Eckl.  
 1b Calyx lobes more than 1 mm long:  
 6a Calyx lobes acute:  
 7a Leaves sessile ..... *Pavetta harborii* S.Moore  
 7b Leaves stalked ... *Pavetta schumanniana* F.Hoffm. ex K.Schum.  
 6b Calyx lobes ensiform:  
 8a Leaf lamina obovate to spatulate; calyx lobes up to 9 mm long; *Androstachys* woodland .....  
     ..... *Pavetta tshikondeni* N.Hahn  
 8b Leaf lamina ovate; calyx lobes up to 5 mm long; occurring in high mountain mistbelt vegetation .....  
     ..... *Pavetta trichardtensis* Bremek. *sensu lato*

### Etymology

The new species was discovered on 4-05-1996 in the course of a vegetation survey for the Tshikondeni Mining

Company. The specific epithet is derived from the name of this company, in recognition of their responsible mining practises and conservation efforts in the region.

### Specimens examined

NORTHERN PROVINCE—2230 (Messina): Venda, Klein Tshipise, (–BC), (in fl. & fr.), 01-02-1980, *A.E. van Wyk 3606* (PRE, PRU). 2231 (Pafuri): Kruger National Park, 32 miles northeast of Punda Maria, steep sandstone hillside overlooking Pafuri (Luvuvhu) River, (–AC?), *L. E. Codd & B. de Winter 5538* (PRE). Makhuya Park, World's View, (–CA), (in fr.), 04-05-1996, *N. Hahn s.n.* (K, Herb. Sout.), 27-01-1997, (in fl.), *N. Hahn 1367* (K, PRE, Herb. Sout.).

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## OPHIOGLOSSACEAE: PTERIDOPHYTA

### TWO NEW TAXA OF *OPHIOGLOSSUM* FROM TROPICAL AFRICA

#### INTRODUCTION

Historically, the species within the genus *Ophioglossum* L. have been taxonomically misunderstood and poorly delimited, due mainly to their simple morphology and the resulting lack of characters upon which to base the delimitation of species. A recent detailed study of the genus (Burrows 1992) has shown that extensive field research, in which taxa are compared to one another when growing together in a single locality (Burrows 1996), and the use of scanning electron microscopy to categorise spore morphology (Burrows 1997), provides reliable taxonomic information with which to separate taxa and has led to the recognition of several undescribed taxa. This paper describes two new taxa of *Ophioglossum* from south-central Africa.

1. ***Ophioglossum richardsiae*** *J.E.Burrows*, sp. nov., ab *O. lusoafriano* trophophoris lanceolatis vel anguste ellipticis ultra 8 mm latis, et sporis cum foveis multis conicis differt; et ab *O. vulgato* trophophoris angustis, plerumque ellipticis, infra latis, differt.

TYPE.—Zambia, Northern Province, 24 km from Mbala (Abercorn), The Rocks, 4.8 km N of Kawimbe, 1 700 m, 26 Feb. 1959, *McCallum-Webster C8* (K, holo.!).

Perennial herb with annual aerial parts. *Rhizome* fusiform to thickly linear, 7–22 × 1.5–5.0 mm. *Roots* fleshy, horizontal, proliferous. *Leaves* usually single; stipe 12–(27–69)–100 mm long, 25–40% of its length subterranean, stipe : trophophore length ratio 1:0.57–1.83, bases not persistent; trophophore elliptic, narrowly elliptic or lanceolate, 22–(28–50)–60 × 6–(8–13)–15 mm, length : width ratio 2.5–5.7:1, apex acute, often apiculate, base narrowly cuneate, dull green, lamina somewhat folded along midline in fertile leaves, margins flat; venation with linear areolae medially and elongate areolae laterally, with fine veins and included veinlets confined to lateral areas; epidermal cells linear with wavy walls medially, to elongate with sinuous anticlinal walls laterally, stomata partially aligned. *Sporophore* arising from base of trophophore, 77–(95–115)–140 mm long, sporophore : trophophore length ratio 2.0–4.1:1, with 9–(12–21)–29 pairs of sporangia. *Spores* 30–40 µm in equatorial diam., trilete, rarely alete or monolete, muri often so broad that lumina are reduced to conical pits, superficially smooth but always minutely undulate (*sensu* Murley in Stearn 1978). Figures 12A, B; 13A–C.

This taxon was first collected by Edgar Milne-Redhead and Peter Taylor on their 1956 expedition to southern Tanzania. This and subsequent collections have either remained unnamed or have been attributed to

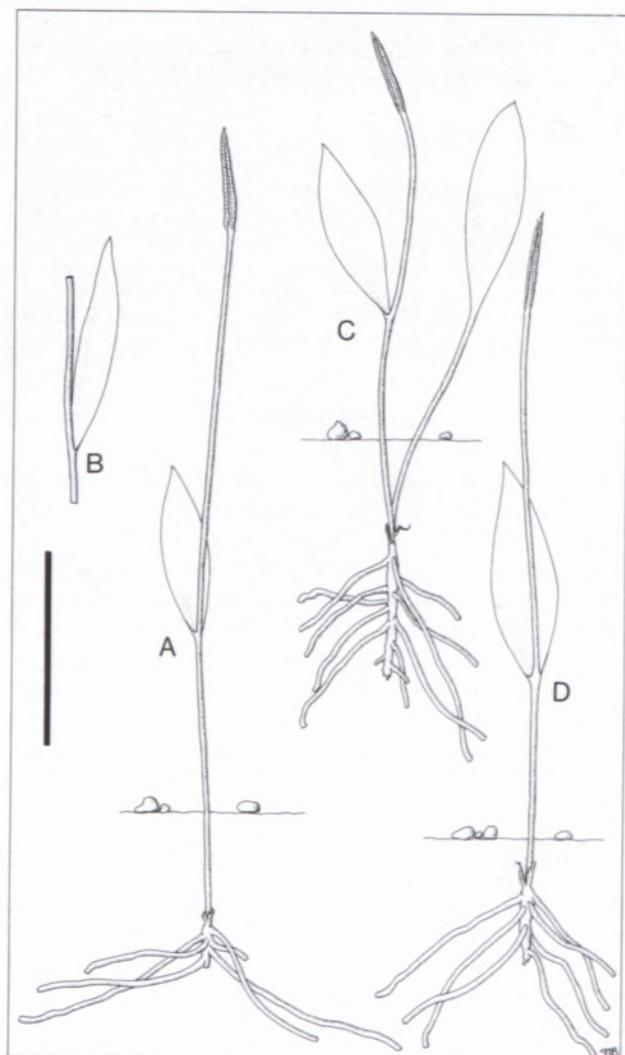


FIGURE 12.—A, B, *Ophioglossum richardsiae*, McCallum-Webster C8, holotype: A, whole plant; B, narrow trophophore form. C, D, *O. vulgatum* subsp. *africanum* var. *taylorianum*, Milne-Redhead & Taylor 8406: whole plants. Scale bar: 50 mm.

*O. lancifolium* C.Presl, a taxon now regarded to be correctly termed *O. lusoaffricanum* Welw. ex Prantl (Burrows & Edwards 1993).

Although previously included under *O. lusoaffricanum*, *O. richardsiae* most closely resembles a narrow form of *O. vulgatum* subsp. *africanum* Pocock ex J.E.Burrows, particularly the following taxon, var. *taylorianum* J.E.Burrows. It was not until the spores from four of the collections were examined by SEM that it was realised that this taxon was a uniform species with a consistent and distinctive spore morphology. The spores are normally trilete and display a very smooth sculpturing (Figure 13C), considerably smoother than those of *O. vulgatum* subsp. *africanum*. In addition, the spores of all four specimens display a faint rippling on the muri that is not evident in the spores of *O. vulgatum* subsp. *africanum*. By contrast, the spores bear no resemblance to the large spores of *O. lusoaffricanum* with its open reticulum of muri and flat-bottomed lumina.

Milne-Redhead & Taylor record in their collecting notes that the trophophore is dull green, a feature that is normally associated with *O. polyphyllum* Seub. ex

A.Braun. However, although there is a superficial resemblance between *O. richardsiae* and a narrow form of *O. polyphyllum*, the former lacks the persistent stipe bases that characterise *O. polyphyllum*. The Mkushi specimens, seen by the author, were  $\pm$  dull green but were not the greyish green normally associated with the trophophores of *O. polyphyllum*.

The name of this species commemorates Mrs Mary Richards (1885–1977), an indomitable plant collector in northeastern Zambia and southern Tanzania who, during her extensive travels, collected many interesting taxa of *Ophioglossum*. Although she apparently collected her specimen of this species the day before that of her friend Miss McCallum-Webster, Mary Richards' specimen lacks rhizomes and is therefore unsuitable as a type specimen.

#### Ecology

The distribution of this fern falls within the centre of the Zambezi Domain of the Sudano-Zambezi Region of White (1983), a region uniquely rich in *Ophioglossum* (Burrows 1996). The two Mwinilunga specimens were both collected in damp sands near trees, presumably in *Brachystegia/Julbernardia* (miombo) woodland. The Mbala collections were from sandy-loam pockets on flat rock, whereas the Mkushi collection was made in open miombo woodland on a quartzite outcrop where the plants were growing in seasonally wet, shallow white/grey sandy soils. In this latter site, *O. richardsiae* was growing intermingled with *O. thomasi* R.T.Clausen although there is no mention made of other species of *Ophioglossum* growing together with it at the other sites. Altitude ranges from 1 350–1 700 m.

From the presence of the large basal roots on the small rhizomes of juvenile plants, and from the clustered grouping of the plants seen at Mkushi, it is assumed that the roots of *O. richardsiae* are proliferous and that this species forms interconnected colonies.

#### Specimens examined

ZAMBIA.—0831: Northern Province, Abercorn (Mbala) Dist., rocks 3 miles beyond Kawimbe, Sumbawanga Road, (–DC), 1 700 m, 25 Feb. 1959, Richards 10975 (K). 1124: North-Western Province, Mwinilunga Dist., base of Kalene Hill, (–AA), 1 400 m, Hooper & Townsend 328 (K); source of Isongela R, near Matonchi, (–CA), 1 350 m, 18 Feb. 1975, Hooper & Townsend 171 (K). 1329: Central Province, between Mkushi town and the main road, (–CB), 1 400 m, 7 Feb. 1995, J.E. & S.M. Burrows 5756 (K, PRE, Herb. JEB).

TANZANIA.—1035: Songea Dist., Matengo Hills, valley of R Halau, about 3 km from Miyau, (–D?), 1 500 m, 12 Jan. 1956, Milne-Redhead & Taylor 8234B (K).

2. *Ophioglossum vulgatum* L. subsp. *africanum* Pocock ex J.E.Burrows var. *taylorianum* J.E.Burrows, var. nov., a *O. vulgatum* var. *africanum* trophophoro angustello elliptico vel sublanccolato differt.

TYPE.—Tanzania, Songea Dist., by Likonde R, 750 m, 26 June 1956, Milne-Redhead & Taylor 10905 (K, holo., EA, iso.).

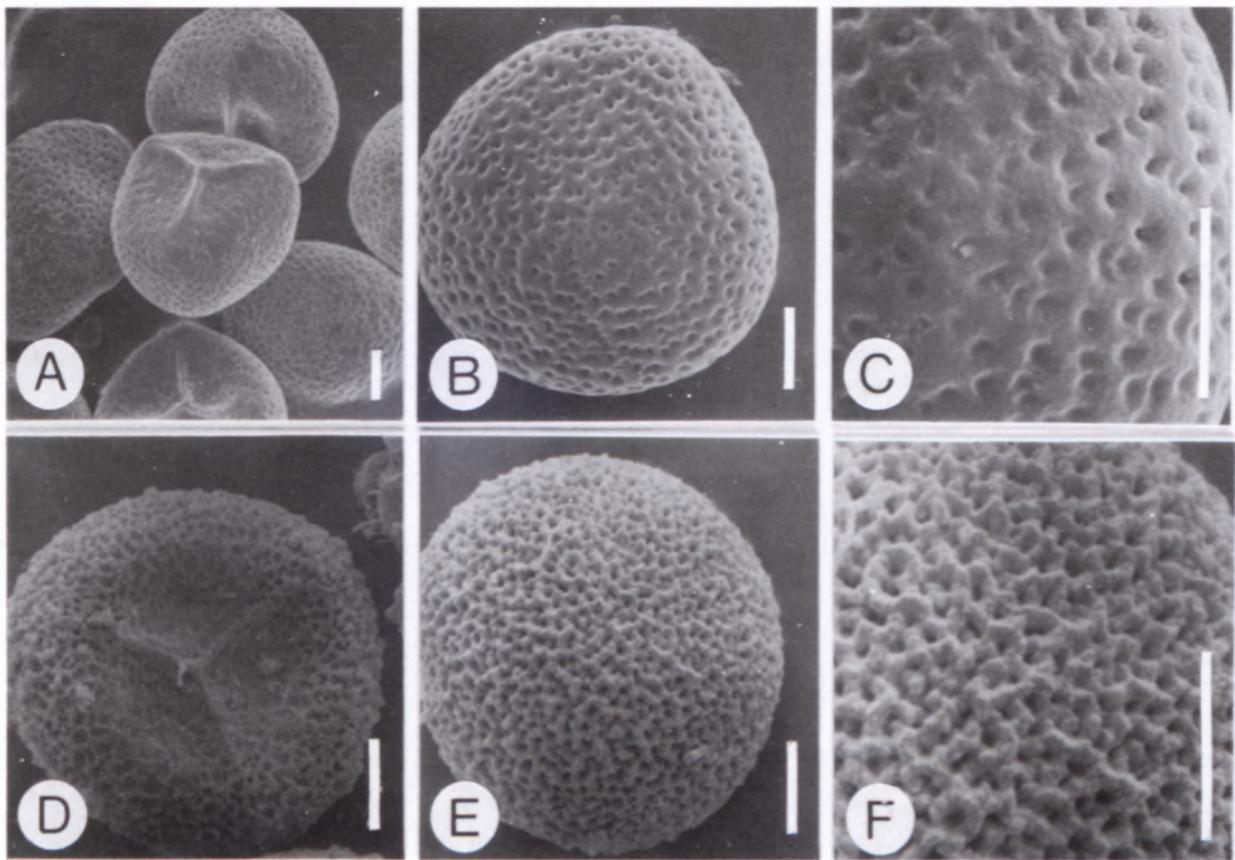


FIGURE 13.—Spores. A–C, *Ophioglossum richardsiae*, Richards 10975: A, proximal face; B, C, distal face. D–F, *O. vulgatum* subsp. *africanum* var. *taylorianum*, Milne-Redhead & Taylor 10905, holotype: D, proximal face; E, F, distal faces. Scale bar: 10  $\mu$ m.

*Rhizome* fusiform to linear, 14–30  $\times$  2.0–3.5 mm. *Roots* descending or horizontal, proliferous. *Leaves* 1 or 2; stipe 50–75 mm long, 25–40% of its length subterranean, stipe : trophophore length ratio 0.94–1.56:1, bases not or weakly persistent; trophophore elliptic to somewhat lanceolate, 45–60  $\times$  12–20 mm, length : width ratio 3.0–4.7:1, apex acute, apiculate, base cuneate, dull green, margins slightly undulate; venation with elongate areolae, with many secondary or fine veins and included blind veinlets; epidermal cells oblong to subisodiametric, anticlinal cell walls wavy medially, sinuous laterally, stomata aligned to subaligned. *Sporophore* arising from base of trophophore, 90–125 mm long, sporophore : trophophore length ratio 2.0–2.5:1, with 30–40 pairs of sporangia. *Spores* trilete (sometimes alete), variable in size, 27–50  $\mu$ m in equatorial diam., finely pitted with conical lumina terminating in a pit, muri thick, uneven, granules absent. Figures 12C, D; 13D–F.

This taxon has been attributed variously to *O. polyphyllum* or *O. vulgatum* subsp. *africanum* in the past. Its narrowly elliptic or sublanceolate trophophores separate it readily from *O. vulgatum* subsp. *africanum* var. *africanum*, whereas the absence of the ruff of dead, persistent stipe bases distinguishes *O. vulgatum* subsp. *africanum* var. *taylorianum* from *O. polyphyllum*. These two characters can be used to separate readily var. *taylorianum* from the other two taxa. Although *O. vulgatum* subsp. *africanum* var. *africanum* closely resembles var. *taylorianum*, the latter taxon appears to be confined to areas below 1 000 m, whereas var. *africanum* occurs up to altitudes of 2 000 m or more. Conversely, var. *vulga-*

*tum* is seldom found at low altitudes in the interior of the continent where winter is consistently dry and spring is both hot and dry.

The varietal epithet honours Peter Taylor (b. 1926), Kew botanist who, together with Edgar Milne-Redhead, made outstanding botanical collections, including many species of *Ophioglossum*, in southern Tanzania in 1955/56.

#### Ecology

The two widely disjunct known localities of *O. vulgatum* subsp. *africanum* var. *taylorianum* both occur in drier miombo woodland of the Zambezi Domain (White 1983) which is dominated by the tree genera *Brachystegia* and *Julbernardia*. This region is characterised by wet summers with an average annual rainfall of 670 mm (Sengwa) to 1 120 mm (Songea), and an extended dry season from about May to November, during which time the aerial parts of *Ophioglossum* die back to the rhizome. The Sengwa populations occur in sandy-loam soils overlying sandstone-conglomerate bedrock, among sparse, short grasses and sedges. In the Songea area of Tanzania the habitat is similar although the type specimens were recorded as growing in about 5–8 cm of water in a large pool, now starting to dry up, growing among strong sedges and grasses with its fronds under water. Milne-Redhead & Taylor surmise that this plant must have been under water rather deeper for at least five months. Although some species of *Ophioglossum* have been recorded totally submerged at the edge of seasonal

pans (*O. costatum*, *O. rubellum*), it is unlikely that any *Ophioglossum* could tolerate an aquatic environment for that length of time.

Var. *taylorianum* is found growing together with, or in the vicinity of, other *Ophioglossum* species, forming genus communities (Burrows 1992, 1996). In Tanzania, it was recorded growing with *O. rubellum* Welw. ex A. Braun and *O. gomezianum* Welw. ex A. Braun. In Zimbabwe it was found growing near the same two species as well as *O. costatum* R.Br., *O. gracillimum* Welw. ex Hook. & Baker and *O. latifolium* (Prantl) J.E. Burrows. It is of interest to note that var. *africanum* is generally a 'loner taxon', seldom occurring together with other species of *Ophioglossum*.

This variety almost certainly also occurs in Zambia and Malawi.

#### Specimens examined

TANZANIA.—1035: Songea Dist., ± 21 km N of Songea, near Lumecha Bridge, (–DD), 945 m, 23 Jan. 1956, Milne-Redhead & Taylor 8406 (K).

ZIMBABWE.—1828: Gokwe Dist., Sengwa Wildlife Research Area, Leguan Vlei, (–AA), 870 m, 11 Feb. 1991, J.E. & S.M. Burrows 5155 (TI, Herb. JEB). 1930: Gweru Dist., Central Estates, 60.5 km SE of Kwekwe on Mvuma road, 30 Jan. 1994, J.E. & S.M. Burrows 5525 & 5529 (Herb. JEB).

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## ERICACEAE

### THREE NEW SPECIES OF *ERICA* FROM WESTERN CAPE, SOUTH AFRICA

***Erica cubitans* E.G.H. Oliv., sp. nov., (§*Ephebus*)** in genere aliquantum sejuncta sed corolla ovarioque pilis brevibus glandulosis et pilis longis, poris antherarum parvis, ovulis tribus in quoque loculo, bractea in positione mediana, vena media foliorum crassa et habitu repenti (cubitanti) distinguitur. Figura 14.

TYPE.—Western Cape, 3320 (Montagu): Swellendam [Heidelberg] Dist.; Langeberg, ridge near Lemoenshoek, 4000–4500 ft [1 220–1 370 m], (–DD), 1-01-1951, *Esterhuysen 18247* (BOL holo.; BM, K, MO, NY, PRE, SAM).

Sparsely branched, decumbent, sprawling shrublet, single-stemmed reseeder. *Branches*: a few lax thin main branches, 400–500 mm long, mostly with continuous vegetative growth, occasionally ending in a florescence, numerous secondary branches, ± 100–200 mm long, terminating in a florescence, rarely also tertiary branchlets; branchlets not at every node, sometimes only every 2–4th node; internodes on main branches ± 10 mm long, on lower order branchlets ± 1 mm long; all branches with long and very short eglandular and/or gland-tipped hairs.

*Leaves* 3-nate, subspreading to older ones reflexed, ± 3.0 × 0.8 mm, narrowly elliptic, acute, open-backed with slightly inrolled margins with distinctly thickened midrib, adaxially glabrous, abaxially densely and very shortly pubescent with occasional stouter longer gland-tipped hairs, margins with numerous simple hairs, 1.0–1.5 mm long, and a few short gland-tipped hairs; petiole 0.6 mm long, glabrous, long ciliate. *Inflorescence*: flowers 3-nate in 1(2) whorls, umbel-like when 2-whorled, terminal on secondary, rarely tertiary branchlets; pedicel 2.5 mm long, with dense short-stalked glands only; bract partially recaulescent in middle position, 2.2 × 0.5 mm, narrowly elliptic, leaf-like, open-backed; bracteoles in 3/4 position, slightly shorter than bract, otherwise similar. *Calyx* 4-partite, fused ± 1/10 at base; segments 2.0 × 0.8 mm, narrowly triangular, leaf-like, broadly sulcate for ± 2/3 its length, with prominent abaxial midrib vein, indumentum as in bract. *Corolla* 4-lobed, 3.2 × 3.0 mm, cyathiform, sparsely long puberulous and densely shortly glandular hairy, light purplish pink; lobes very short, erect, 1.8 × 0.5 mm, subacute, finely erose-crenulate. *Stamens* 8, free, included; filaments linear slightly curved, glabrous, ± 1 mm long;