

## A new species and a change of status in *Ophioglossum* (Ophioglossaceae: Pteridophyta) in Africa

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### ABSTRACT

A new species, *Ophioglossum gracile* Pocock ex J.E. Burrows, is described from South Africa. A lectotype is chosen for *O. vulgatum* var. *kilimandscharicum* Hieron. and its status upgraded to a subspecies.

### UITTREKSEL

*Ophioglossum gracile* Pocock ex J.E. Burrows, 'n nuwe spesie uit Suid-Afrika word beskryf. 'n Lektotipe word vir *O. vulgatum* var. *kilimandscharicum* Hieron. gekies en die status word opgegradeer tot 'n subspesie.

The species concept in *Ophioglossum* L. is greatly misunderstood and the species are consequently poorly delimited, largely because of the simple morphology of the genus and the resulting lack of characters upon which to base species. Recent research by the senior author (Burrows 1992) has resulted in a better understanding of the African taxa, largely due to extensive SEM studies of the spores. Consequently it has become necessary to describe and clarify the two following taxa.

1. *Ophioglossum gracile* Pocock ex J.E. Burrows, sp. nov. ab *O. vulgato* subsp. *africanum* trophophoris minoribus (longitudine plerumque < 33 mm) anguste ellipticis vel lanceolatis, sporisque muris secundariis tenuibus in quoque lumen descendentibus differt.

TYPE.—Western Cape, 3318 (Cape Town): Table Mountain, Woodhead Reservoir, (–CD), 30-6-1947, *Esterhuysen 13915* (BOL, holo.; GRA!, NBG!, PRE!).

*O. vulgatum* L. var. *gracile* Pocock, ined.

*O. nudicaule* L.f., sensu Roux: 9 (1979).

*Rhizome* linear, 13–22 × 2–3 mm. *Roots* horizontal, fleshy, proliferous. *Leaves* one or two. *Stipe* (14–)21–48(–83) mm long, 50–70% of its length subterranean, stipe:trophophore length ratio 0.8–1.7:1, old stipe bases not persistent. *Trophophore* variable in shape, narrowly elliptic to lanceolate, (17–)26–32(–43) × (4–)7–9(–13) mm, length:width ratio 2.3–7.5:1, apex acute, apiculate, base narrowly cuneate to attenuate, trophophore held at 50°–60° from the horizontal, margins flat. *Venation* with secondary veins and blind veinlets laterally and distally but sparse or lacking proximally, epidermal cells elongate throughout with wavy to sinuous anticlinal cell walls,

stomata aligned. *Sporophore* (46–)76–108(–145) mm long, with (13–)18–22(–28) pairs of sporangia, sporophore:trophophore length ratio 2.0–5.3:1. *Spores* 40–47 µm in equatorial diameter, trilete; muri continuous, somewhat uneven, with thin, secondary muri descending into each lumen; lumina conical, minutely granular. Figures 1C & D; 2A.

### Specimens examined

WESTERN CAPE.—3218 (Clanwilliam): Clanwilliam Dist., Boskloof, (–BB), 20-1-1947, *Schelpé 1982* (BOL, K); Piquetberg Mtn, between Mouton's Vlei and Gruys Kop, (–DA), 7-11-1934, *Pillans 7257* (BOL). 3219 (Wuppertal): Cedarberg, Langberg, (–AC), 15-12-1941, *Esterhuysen 7334* (BOL); 16-12-1941, *Compton 12764* (NBG). 3318 (Cape Town): Table Mtn, near 'Slaangully', (–CD), 4-1908, *Dümmer 1297* (NBG, SAM); Wood Ravine and Slangolie, pipe track, at the spring, (–CD), 8-1907, collector unknown ex *Herb. Marloth 3778* (PRE); Table Mtn, lower reservoir, (–CD), 19-5-1956, *Esterhuysen 25846* (BM, BOL); Table Mtn, *Carmichael s.n.* (K). 3322 (Oudtshoorn): S slopes of Outeniqua Mountains, next to Montagu Pass, (–CD), 750m, 3-11-1983, *Vlok 748* (BOL); next to Outeniqua Pass, (–CD), 7-2-1985, *Vlok 923* (PRE).

Historically this taxon has caused much confusion and has been given several names: *O. nudicaule* (Roux 1979), *O. lancifolium* (Schelpé & Anthony 1986) and *O. vulgatum* var. *ambiguum* (Pocock herb. annotation). Pocock named the taxon *O. vulgatum* L. var. *gracile* in an unpublished manuscript on southern African *Ophioglossum*. However, she confused the issue by including within the species collections which are now known to belong to *O. lusoafricanum* (Figure 2B) and *O. vulgatum* subsp. *africanum* (Figure 2D). While *O. gracile* appears to be most closely related to *O. vulgatum* subsp. *africanum*, it differs in its much smaller and narrower trophophores, and spores that consistently display primary muri that are interconnected by smaller and narrower secondary muri (Figure 2A), a character only seen elsewhere in the unrelated Namibian taxon currently included under *O. polyphyllum*. Its restriction to the winter rainfall area of the Cape separates it geographically from the summer

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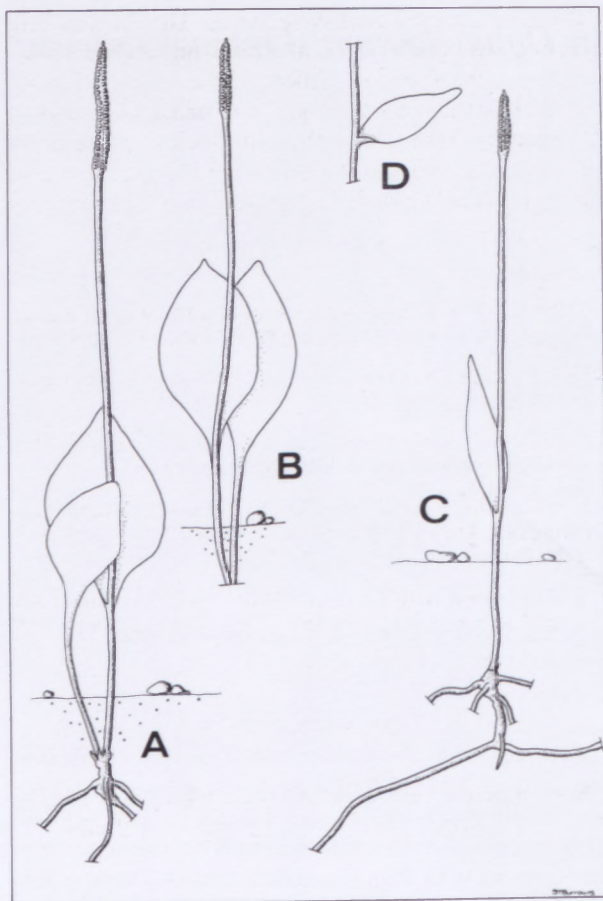


FIGURE 1.—*Ophioglossum vulgatum* subsp. *kilimandscharicum*: A, Schelpe 7177, whole plant; B, Schlieben 4987, trophophores. *O. gracile*, Esterhuysen 25846: C, whole plant; D, trophophore shape variant. All  $\times 0.5$ .

rainfall *O. vulgatum* subsp. *africanum*, and Pocock's species should therefore be awarded specific rank.

Within the circumscription of her original taxon, Pocock included two collections from the same locality near Grahamstown in the eastern Cape which most resemble *O. vulgatum* subsp. *africanum*. However, since I (senior author) have not examined the spores from this population, I cannot be certain of its identity. From the collection data, it seems that *O. gracile* is restricted to sandstones of the Table Mountain Series in ericoid scrub (fynbos) on moist soils. A collection from the Cedarberg (Esterhuysen 7334) was made on a 'damp spot at the base of a shale band'. The type collection was made on 'shallow soil on the banks of a small stream .... in shade of pines'. Collections have been recorded in January, February, April, May, June, August, November and December, indicating that this species may be evergreen in suitably moist situations. Its distribution falls within the winter rainfall area which receives most of its rain from May to September.

Although *O. gracile* shares the same phytogeological association as *O. bergianum*, there is no record of the two species growing in mixed communities. The third *Ophioglossum* species of the winter rainfall area of the Cape, *O. nudicaule*, is confined to shale-derived soils and does not occur with *O. gracile*.

### Key to *O. gracile* and two similar species

- 1a Trophophore lanceolate to ovate; trophophore length:width ratio  $< 3.3:1$ :
  - 2a Trophophores narrowly ovate to lanceolate, trophophore length:width ratio  $1.8-3.5:1$ ; spores uniformly and smoothly reticulate . . . . . *O. vulgatum* subsp. *africanum* Pocock ex J.E. Burrows
  - 2b Trophophores ovate, trophophore length:width ratio  $< 1.8:1$ ; spores with muri coalescing irregularly to form flattened areas . . . . . *O. vulgatum* subsp. *kilimandscharicum* (Hieron.) J.E. Burrows
- 1b Trophophore elliptic, rarely lanceolate; trophophore length:width ratio  $2.3-8.8:1$ :
  - 3a Trophophore elliptic or lanceolate; spores trilete, with secondary muri descending into the lumina . . . . . *O. gracile* Pocock ex J.E. Burrows
  - 3b Trophophore elliptic, rarely oblanceolate (never lanceolate); spores commonly alete, occasionally trilete, without secondary muri . . . . . *O. lusoaficanum* Welw. ex Prantl

### 2. *Ophioglossum vulgatum* L. subsp. *kilimandscharicum* (Hieron.) J.E. Burrows, stat. nov.

*Ophioglossum vulgatum* L. var. *kilimandscharicum* Hieron. in Engler: 89 (1895). Type: Tanzania, Kilimanjaro, Kifinika Volcano, 2 800 m, Oct. 1893, Volkens 1161 (B [destroyed]; BM!, lecto., here designated).

Differs from *O. vulgatum* subsp. *vulgatum* and *O. vulgatum* subsp. *africanum* (Pocock) J.E. Burrows by its more broadly ovate to elliptic trophophores with a length:width ratio of  $1.8:1$ , and the spores in which the muri coalesce irregularly into broad, flattened areas. Figures 1A & B; 2C.

Although Hieronymus designated no type specimen for his taxon (Engler 1895), all his new fern taxa from that expedition appear to have been collected by Volkens in 1893. Engler also visited Kilimanjaro in the previous year

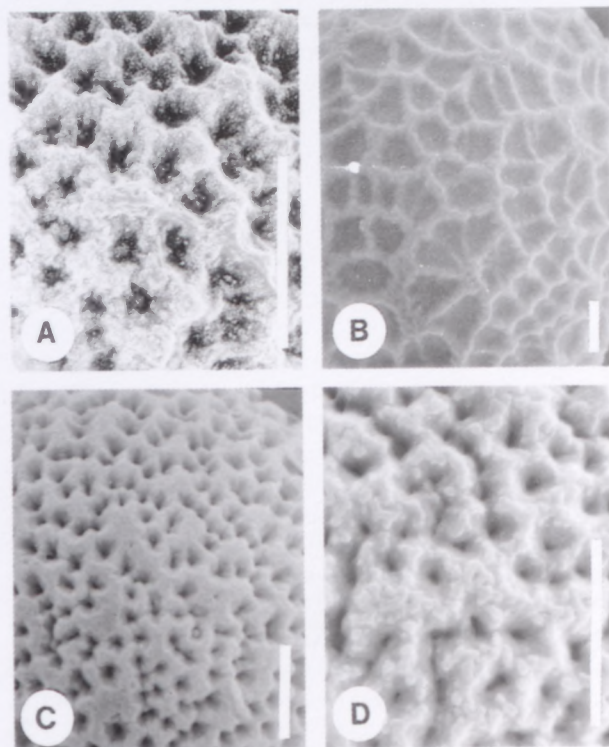


FIGURE 2.—Spores of *Ophioglossum*, distal face. A, *O. gracile*, Vlok 748; B, *O. lusoaficanum*, Burrows 5231; C, *O. vulgatum* subsp. *kilimandscharicum*, Lebrun 6016; D, *O. vulgatum* subsp. *africanum*, Chase 3758. Scale bar: 5  $\mu$ m.



(Gillett 1962) but since Engler mentions Volkens' collecting locality (Kifinika Volcano) in a subsequent account of the East African *Ophioglossum* (Engler 1908), it is likely that Volkens is the original collector of this taxon. A search for the type material in Berlin revealed that all pre-World War II material of *Ophioglossum* was destroyed (R.J. Johns pers. comm.). We can therefore assume that, if the specimen from which Hieronymus described the variety was in Berlin, it no longer exists.

There is, however, a collection made by Volkens on that expedition from the Kifinika Volcano, Kilimanjaro in the British Museum which is almost certainly isotypic. On the assumption that the Berlin material was destroyed and since no type was designated by Hieronymus, the sheet of *Volkens 1161* in BM is designated as the lectotype.

Hieronymus distinguished his variety on the basis of the plants having 'leaves nearly always in pairs, the sterile lamina obovate or elliptic (max.  $30 \times 17$  mm), obtuse or slightly acute, spores  $36-44$   $\mu$ m broad, areolae  $2-4$   $\mu$ m wide'. The six collections seen that match the type specimen, differ from typical *O. vulgatum*. However, occasional trophophores within variable populations of normal *O. vulgatum* match subsp. *kilimandscharicum* quite well. Conversely, no trophophores on the collections of subsp. *kilimandscharicum* resemble those of typical *O. vulgatum*.

In addition, spores from the Natal and Transvaal collections reveal a morphological pattern distinct from both typical *O. vulgatum* and subsp. *africanum* (Figure 2D). The spore muri frequently coalesce into large flattened areas and the lumina are correspondingly smaller and more widely separated. A specimen from Zaïre (*Lebrun 6016*, Figure 2C) displays similar spore sculpturing and trophophores which match the Volkens collection. If these three collections belong to the Kilimanjaro taxon, then the spore pattern is distinct and constant. The trophophores are also subtly different from the typical plants in that they are broader, have a rounder apex and a thinner texture.

Very little is known of the ecology of this subspecies. The Kilimanjaro specimens were both collected at 2 800

m but no ecological data were given. The Drakensberg collection was made in burnt marsh under *Miscanthus* (Poaceae). The Transvaal collection was made at 1 645 m in submontane grassland, growing under *Helichrysum* (Asteraceae) bushes. As the subspecies is presently known, it is an afro-montane taxon and could be expected from the Zimbabwe/Malawi gap which currently exists.

#### Specimens examined

KENYA.—0035: Kericho Dist., western Mau Forest to Mt Blacket, Kipkuny R., (—BA), 13-6-1972, *Faden, Faden & Grumbley 72/358* (K).

ZAÏRE.—0226: between Kinolu and (KatoKikombe?), Maniema, (—AA), 8-1932, *Lebrun 6016* (BR).

TANZANIA.—0337: Kilimanjaro, Bergwiesen, (—A?), 24-3-1934, *Schlieben 4987* [B? (K, photo.), BM, BR, PRE].

SOUTH AFRICA (EASTERN TRANSVAAL).—2530 (Lydenburg): Lydenburg Dist., Buffelskloof Nature Reserve, below Stone Huts, (—BC), 8-1-1991, *Burrows 5133* (Herb. J.E.B., K, MICH, NU, PRE, TI).

SOUTH AFRICA (KWAZULU-NATAL).—2829 (Harrismith): Cathedral Peak area, Mhlonhlo Valley, (—CC), 1-1-1965, *Schelte 7177* (BOL, NU).

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