

https://dspace.org/

Diversity and Conservation of Ultramafic Flora in Swaziland

McCallum, Donald Alexander

2007-02-21T12:18:22Z
http://hdl.handle.net/10539/2056

Downloaded from a DSpace repository. https://dspace.org/

Appendix 4

Botanical Journal of the Linnean Society, 2004, **145**, 379–383. With 5 figures

A new species of *Ocimum* (Lamiaceae) from Swaziland

DONALD A. McCALLUM* and KEVIN BALKWILL

C.E. Moss Herbarium, School of Animal Plant & Environmental Sciences, University of the Witwatersrand, Private Bag 3, Wits 2050, South Africa

Received August 2003; accepted for publication January 2004

A new species of *Ocimum*, ***O. motjaneanum*** McCallum & K. Balkwill, endemic to serpentine soils in the north-west of Swaziland, is described and compared with *O. obovatum*, the species it most closely resembles. It has a very localized distribution with an area of occupancy under threat of encroachment by exotic trees and development, which makes it critically endangered (CR B1a + b(iii)) using the IUCN guidelines. We recommend habitat protection and incorporation of one site into an existing nature reserve to assure the continuation of this species. © 2004 The Linnean Society of London, *Botanical Journal of the Linnean Society*, 2004, **145**, 379–383.

ADDITIONAL KEYWORDS: endemic – red data – serpentine – ultramafic.

INTRODUCTION

The genus *Ocimum* L. has 64 species in three subgenera, with 19 species occurring in southern Africa. Whilst investigating the serpentine (ultramafic) flora of Swaziland one of us (K. Balkwill) found a sterile plant of an undescribed species of *Ocimum*. On subsequent visits to the site, fertile material was collected and it was confirmed that the plant belonged to *Ocimum*, subgenus *Ocimum*, section *Hiantia*, subsection *Hiantia* series *Hiantia* (Paton, Harley & Harley, 1999). Compton (1976: 513) mentioned a prostrate *Becium* that is the same new species. An extensive search has yielded only three further sites, all on serpentine, and it was concluded that the species is a serpentine endemic with a very restricted range. The new species most closely resembles *Ocimum obovatum* E. Mey. ex Benth. var. *hians* Benth., having a similar corolla shape, a leaf apex that is flat, rather than conduplicate like *O. decumbens* Gürke and allies, and a woody caudex giving rise to annual stems. *Ocimum reclinatum* (S.D. Will. & K. Balkwill) A.J. Paton shares a prostrate habit but differs in many ways from *O. motjaneanum*, some of the most noticeable being: stems perennial, hairy and square in cross-section, rather than stems annual, almost glabrous and round in cross-section; leaf axils frequently bearing short branches, rather than short axillary branches rare; leaves smaller and usually relatively narrower (17–24 × 9–15 mm), tomentose and densely covered with sessile glands, secondary veins prominent beneath, not visible above, rather than leaves larger (20–32 × 9–17 mm), almost glabrous with sparse sessile glands, secondary veins prominent above and beneath; corolla lobes rounded rather than fimbriate. At the time of discovery by Compton, this taxon would have been classified as a species of *Becium* Lindl. In 1901, N. E. Brown transferred *Ocimum obovatum* to *Becium* and reduced *O. galpinii* Gürke and *O. hians* Benth. to varieties of *Becium obovatum* (E. Mey. ex Benth.) N.E. Brown. Sebald (1989) then reduced *B. obovatum* to a variety of *B. grandiflorum* (Lam.) Pic.Serm. as he could find no diagnostic characters to split the two species. However, Williamson & Balkwill (1995) and Paton (1995) continued to recognize the two as distinct. *Becium* had been distinguished from *Ocimum* by the nectar gland below each cyme and by the elongated anthers with parallel thecae. Paton *et al.* (1999), when examining the classification and relationships of *Ocimum*, found that when New World species of *Ocimum* are considered, the distinctions between *Ocimum* and *Becium* cannot be maintained. Several New World species of *Ocimum* possess the nectary gland, but also have divergent thecae. Using parsimony analysis, they resolved these difficulties in classification by transferring the species formerly in

*Corresponding author. E-mail: donald@gecko.biol.wits.ac.za

Becium to *Ocimum*, and recognizing the groups at the level of subgenus and section, rather than genus.

DESCRIPTION

OCIMUM MOTJANEANUM MCCALLUM & K. BALKWILL **SP. NOV.**

O. obovato similis sed habitu prostrato non erecto, foliorum nervo medio et nervis secundariis supra et subtus elevatis a ceteris speciebus adhuc cognitis distincta.

Type: Swaziland, Mbabane district, Motjane, *D.A. McCallum & M-J. Balkwill 352* (*holotype:* J; *isotypes:* B, C, K, MO, PRE, SNH).

Description: Procumbent branched perennial; STEMS annual, about 15 cm long at first flowering and 35 cm or more at the end of the growing season, spreading along the ground, 3 cm tall, becoming upright at the inflorescences, 8–12 cm tall (Fig. 1), not rooting at nodes, square, grooved down each face, the grooves directly below each leaf narrower than those directly above each leaf, sparsely hairy with slender adpressed 3- or 4-celled trichomes and sessile glands; ROOTSTOCK a woody caudex, narrowly conical, 2.0–3.5 × 9–15 cm (based on 2 specimens), the top is dry, grey and appears dead, with the stems arising around the edge. LEAVES bright green, sometimes purplish at margin and on teeth, slightly glossy, elliptic or obovate, 20–32 × 9–17 mm, glabrous above and below, 9–13 sessile glands mm^{-2} above and below (Fig. 2), main and secondary veins translucent, raised above and below; apex acute or obtuse; margin entire or with 2 or 3 small teeth on each side in the apical half; base cuneate; petiole short (0–)1–2(–4) mm long. INFLORESCENCES: thyrses composed of 2–6 verticels of opposite 3-flowered cymes. All three flowers in a cyme usually open simultaneously (Fig. 3). Bracts caducous, the scars becoming bowl-shaped auxiliary nectaries in the mature part of the inflorescence, 4 uppermost often forming an apical coma and the second and third pair from the apex sometimes persisting, triangular or lanceolate, 1.5–5.0 × 0.5–1.5 mm. Flowering calyx: upper lip broadly panduriform, 3–5 × 3–5 mm; lower lip deeply keeled, 5.5–6.0 mm long including acicular median lobes; median lobes 2, 1.5–2.5 mm long. Fruiting calyx: not seen. Corolla white or tinged mauve towards the edge with mauve nectar guides on upper lip; upper lip 10-15 × 5–7 mm with lobes fimbriate; lower lip 7 mm long. Stamens: filaments, upper pair (12–)19–22(–23) mm long, lower pair 10–27(–29) mm long; anthers 0.2 mm long; pollen smooth, ellipsoid, white. Style 18–24 mm long; stigma lobes purplish, 0.5–2.0 mm long.

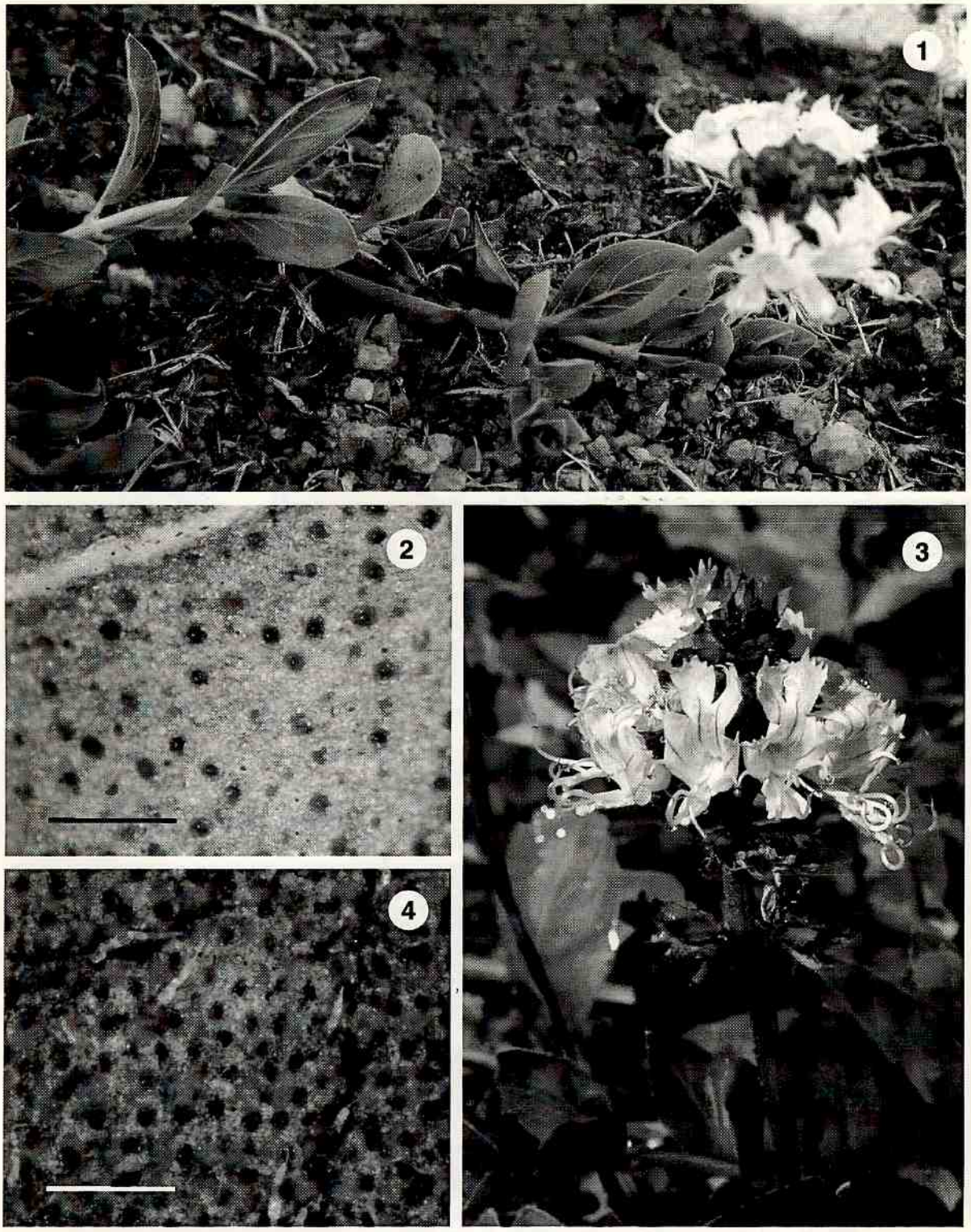
Distinguishing features: This species is easily distinguished from *O. obovatum* var. *hians* by the prostrate habit, the raised veins on the upper surface and the bright green glabrous or almost glabrous leaves. The leaves of *O. obovatum* var. *hians* are a duller green due to a dense covering (more than 26 mm^{-2}, see Fig. 4) of sessile glands and generally have trichomes on the veins and at least a few scattered between veins. There is also a difference in leaf shape, the leaves of *O. obovatum* var. *hians* are mostly relatively narrower, usually around twice as long as broad compared to somewhat less than twice as long as broad in *O. motjaneanum*. Another difference in the new species is that all three flowers of a cyme are open at the same time, unlike *O. obovatum* var. *hians* where usually at least one flower is out of phase with the rest. The flowers in both species are similar and have fimbriate upper corolla lobes, but those of the new species are smaller and have a narrower tube. The anthers of the new species are much smaller and the pollen is white rather than orange–yellow.

Distribution and habitat: Usually in cracks between rocks. This species is known from four localities, all on serpentine (ultramafic) soils and all within a 15 km radius (Fig. 5). The sites are all located on heavily grazed communal lands with an altitudinal range of 1300–1420 m a.s.l. Plants are locally abundant, but within a very restricted area at each locality.

Reproduction: No fruiting material has been collected and no seed set has been observed either in plants *in situ* or *ex situ*. This contrasts with *O. obovatum* var. *hians* where enlarged fruiting calyces can usually be found on fertile plants. No individuals recognizable as young plants or seedlings have been found. Rooting of stems has also not been observed, although this is presumably possible, as stem cuttings can be rooted fairly readily. The anthers of this species are smaller than those of *O. obovatum* var. *hians*, and pollen is of similar size, so fewer pollen grains are produced. Anthers mature first and after the pollen has been shed, the filaments curl, shortening and moving the anthers below the lower lip of the corolla. The stigma branches then diverge and lengthen slightly.

Cultivation: A plant was successfully transplanted and is growing well in cultivation on a granitic soil. Stem cuttings rooted readily in Palm Peat but only produced the woody caudex from which shoots arise annually, if planted early in the growing season. Plants that had not established a sufficient rootstock did not survive the dormant period.

Flowering season: Plants flower between September and January.



Figures 1–4. ***Ocimum motjaneanum*** **sp. nov.** Fig. 1. Branch showing prostrate habit. Fig. 2. Lower leaf surface showing glands (Scale bar = 0.5 mm). Fig. 3. Inflorescence with all three flowers in cyme open. Fig. 4. Lower leaf surface of *Ocimum obovatum* var. *hians* for comparison (Scale bar = 0.5 mm).

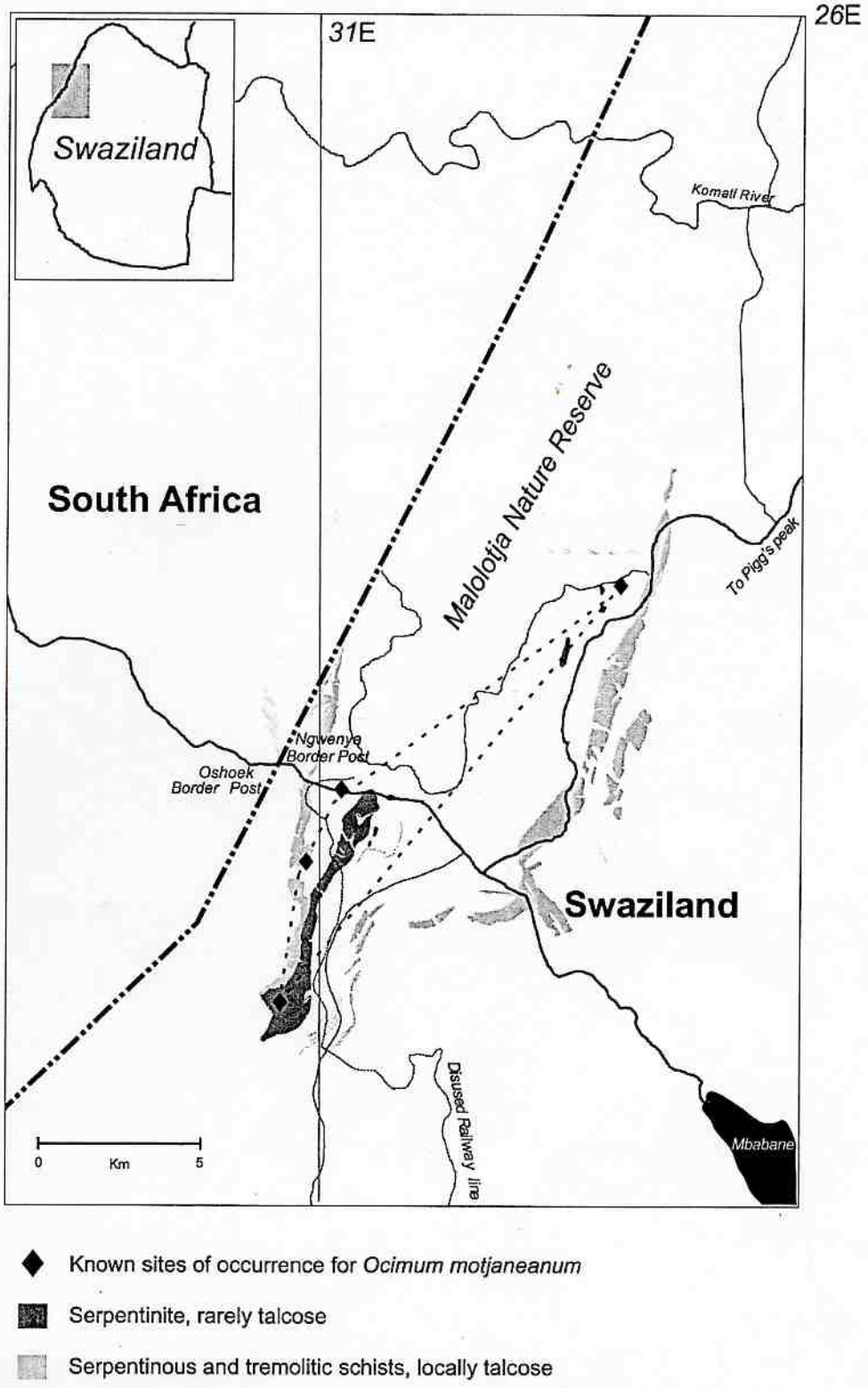


Figure 5. Distribution map showing known sites of occurrence of ***Ocimum motjaneanum* sp. nov.**

Conservation status: This species has an area of occupancy of perhaps 1 km^2, with all known populations within an area of less than 25 km^2. The subpopulations are severely fragmented, with farmland and/or nonserpentine soils separating them. There is also a decline in the quality and extent of the habitat due to development in the area and due to encroachment by black wattle. These factors make the species critically endangered (CR B1a+b(iii)) or CR B2 a+b(iii) in the wild according to the IUCN *Red List Categories* v.3.1 (IUCN Species Survival Commission, 2000).

Specimens seen: Compton 31716, Devil's Bridge (PRE), *Karsten 17.ix.65,* Forbes Reef (PRE), *Matima, K. Balkwill & Boycott 10,* Motjane Serpentine North 3 km south of Oshoek Border Post (J), *McCallum, Boycott, K. Balkwill & Magagula 157a,* Motjane Serpentine, Road to Atlas Engineering, *McCallum & M-J. Balkwill 315,* Motjane Serpentine, Road to Atlas Engineering.

DISCUSSION

The highveld serpentine sites in Swaziland are of great botanical interest. They are situated in intensively used areas and relatively natural areas are small in extent. Even seemingly natural areas usually show evidence of previous cultivation. The remaining areas with least disturbance are those where the soil is shallow and rocky, or the ground is marshy, but even these areas are intensively grazed and regularly burnt and the drier sites have black wattles, *Acacia mearnsii* De Wild., encroaching. They are at the highest elevation of any serpentine sites in the Barberton Greenstone Belt (Truswell, 1977) and two red data species are known to be endemic to them. *Kniphofia umbrina* Codd has a localized distribution on Forbes Reef near the Hawane Dam (Witkowski, Dahlmann & Boycott, 2001). The unique combination of geology and altitude and the two narrow endemics presents a strong case for the conservation of these serpentine sites in Swaziland.

There is no evidence that present land use poses a threat to *O. motjaneanum*. Grazers appear to avoid it, and the woody caudex affords protection from fire. Land-use change resulting in reduced grazing could even harm the population, as more grass might overshadow or out-compete the *Ocimum*. Loss of habitat through wattle encroachment, use of land for roads, building or the collection of stone pose the greatest threat. Resource management should address the threats to habitat as a first priority. We recommend a restriction on building or new roadworks on three sites, and that efforts be made to obtain and incorporate into the Malolotja Nature Reserve, a site on Forbes Reef situated a few hundred metres from the reserve boundary. It would be important to investigate how best to manage this site to maintain suitable conditions for the *Ocimum*. Regular burning during the dormant period would probably be necessary. The Hawane Nature Reserve may have suitable areas for the introduction of *O. motjaneanum*. This possibility should be investigated, and if practical a population should be established in the reserve. A study of the conservation biology of this species should be carried out to ensure that these measures are sufficient. Provided that the areas of habitat are maintained this species should continue to grow in the hills of Swaziland.

ACKNOWLEDGEMENTS

We wish to thank Richard Boycott for his enthusiasm, his help in locating sites and for arranging a botanical research permit without which this work would not have been possible. We also thank Swaziland National Trust Foundation for issuing a botanical research permit, the National Research Foundation, the University of the Witwatersrand and the Barkers for financial support, and the National Botanical Institute (PRE) for the loan of specimens.

REFERENCES

Compton RH. 1976. The flora of Swaziland. *Journal of South African Botany* **11**(suppl.): 512–513.

IUCN Species Survival Commission. 2000. *IUCN Red List Categories*, Version 3.1. Gland, Switzerland: IUCN.

Paton A. 1995. The genus *Becium* (Labiatae) in East Africa. *Kew Bulletin* **52(2):** 199–242.

Paton A, Harley RM, Harley MM. 1999. *Ocimum* – an overview of relationships and classification. In: Holm Y, Hiltunen R, eds. *Ocimum. Medicinal and aromatic plants – industrial profiles*. Amsterdam: Harwood Academic.

Sebald O. 1989. Die Gattung *Becium* Lindley (*Lamiaceae*) in Africa und auf der arabischen Halbinsel. Teil 2. *Stuttgarter Beiträge zur Naturkunde Serie A* **437:** 1–63.

Truswell JF. 1977. *The geological evolution of South Africa.* Cape Town: Purnell.

Williamson SD, Balkwill K. 1995. Four new species of *Becium* Lindl. (*Labiatae*) from South Africa. *Kew Bulletin* **50:** 739–751.

Witkowski ETF, Dahlmann LA, Boycott RC. 2001. Conservation biology of *Kniphofia umbrina*, a critically endangered Swaziland serpentine endemic. *South African Journal of Science* **97:** 609–615.