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PTERIDOPHYTA–SINOPTERIDACEAE

A NEW SUBSPECIES OF CHEILANTHES DELTOIDEA FROM GAUTENG AND LIMPOPO, SOUTH AFRICA

Cheilanthes deltoidea Kunze is a small and easily overlooked fern endemic to southern Africa. Hitherto it has been recorded in the western and northwestern parts of the Northern Cape, the Cederberg area of the Western Cape, and in southern Namibia. To the east, there is a disjunct record from the Waterberg in Limpopo Province (Jacobsen & Jacobson 1986; Burrows 1990), and Klopper et al. (2006) reported the discovery of a particularly small form of C. deltoidea in the Centurion area of Gauteng. Klopper et al. (2006) suggested that this form (perhaps including the plants from the Waterberg) may warrant description as a new infraspecific taxon, but further studies were needed to confirm the suggested status. Recently, a population of this same entity was discovered north of the Cradle of Humankind area, very close to the Gauteng/North-West border. The population in the Waterberg was located and a comparative study of the various forms and their habitat was completed.

Northern Cape populations of Cheilanthes deltoidea fall within the winter rainfall region and produce new fronds during this time of year; during the dry summer months the plants are desiccated and shrivelled. In this region, C. deltoidea grows predominantly in fissures on granite or gneiss rock formations. The northeastern populations in Centurion, the Cradle of Humankind area and the Waterberg are in the summer rainfall region and the seasonality of its growing cycle differs accordingly. Centurion and Cradle of Humankind plants were only found on outcrops of chert rock associated with dolomite representing the Malmani Subgroup, Chuniespoort Group of the Transvaal Supergroup (Obbes 2000; Eriksson et al. 2006). These populations were present on chert in Carletonville Dolomite Grassland (Mucina & Rutherford 2006), but apparently do not occur on the chert outcrops of the Rand Highveld Grassland in Centurion (Petro Lemmer pers. comm.). In the Waterberg, plants of C. deltoidea grow in Central Sandy Bushveld (Mucina & Rutherford 2006), on phonolitic lava that forms part of the lower strata of the Waterberg Group (Barker et al. 2006; Prof. P. Eriksson & Dr N. Lenhardt pers. comm.). Plants were consistently smaller in Centurion, the Cradle of Humankind area and the Waterberg than in the Northern Cape. Based on the clear disjunction in the distribution range, the specific geological requirements, and the morphological and phenological differences observed, the small form from Gauteng and Limpopo is here described as a new subspecies.

Cheilanthes deltoidea Kunze subsp. silicicola Klopper & A.E. van Wyk, subsp. nov., a subspecie typica frondis minoribus (lamina ± 8–21 mm longa, pinnis basaliibus ± 5–15 mm longis), squamos rhizomatis pallide brunnescensitub, stipa lamina sesquiligior, in silicula vel lava phonolithica aestate crescente differt.

TYPE.—Gauteng, 2528 (Pretoria): Centurion, Irene, Doornkloof, Smuts House Museum, on koppie close to monument, (–CC), 30-03-2006, R.R. Klopper & A.W. Klopper 217 (PRE, holo.).

Rhizome shortly creeping, 2–3 mm diam., densely covered with roots and old stipe bases; scales lanceolate, attenuate, ± 2–3 mm long, pale light brownish, concolorous, entire. Fronds closely tufted, erect, herbaceous to thinly coriaceous; stipe sulcate, slender, 10–22(–45) mm long, dark reddish brown, becoming darker with age, glabrous. Lamina broadly deltate in outline, 8–21 (–30) × 9–26(–35) mm, 2- or 3-pinnatifid, pinnae in 3–5 ± opposite pairs, basal pinnae basiscopically developed, 5–15(–18) mm long; ultimate segments oblong acute to broadly spathulate in fertile fronds, obtuse in sterile or partially sterile fronds, margins entire, glabrous; rhachis

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dark reddish brown, glabrous, narrowly winged for its entire length. Venation free, obscure adaxially. Sori linear; false indusium continuous, 0.3–0.4 mm broad. Figure 21.

Diagnostic characters: *Cheilanthes deltoidea* subsp. *silicicola* can be distinguished by its small, broadly deltoid fronds, continuous false indusium, and winged rachis. It is consistently smaller (frond lamina ± 8–21 mm long, basal pinnae ± 5–15 mm long) than the typical subspecies and has an average stipe:lamina ratio of ± 1.5 (compared to ± 1 in subsp. *deltoidea*). When growing in the shade of rocks, as at the type locality, plants can become larger (stipe up to 45 mm long, and lamina up to 30 × 35 mm), but they never reach the average size of *C. deltoidea* subsp. *deltoidea*, and the stipe:lamina ratio remains consistent. Rhizome scales of *C. deltoidea* subsp. *silicicola* are a pale brownish colour as opposed to more castaneous in *C. deltoidea* subsp. *deltoidea* (Table 2). Furthermore, *C. deltoidea* subsp. *deltoidea* only grows in sheltered rock crevices on south-facing aspects, whereas *C. deltoidea* subsp. *silicicola* grows on north- or northwest-facing aspects, and is confined to chert and phonolithic lava outcrops (Klopper et al. 2006).

Distribution: only known from the Centurion area of Gauteng and north of the Cradle of Humankind (Gauteng/North-West border), with an outlier record from the Waterberg in the Limpopo Province (Figure 22). It could be more widespread where suitable geology is present.

Habitat and ecology: grows in sheltered soil pockets and rock crevices mainly on northern and northwestern aspects of chert outcrops associated with dolomite of the Malmani Subgroup, Chuniespoort Group of the Transvaal Supergroup, and on phonolithic lava of the Waterberg Group. In Centurion and the Cradle of Humankind area, this fern has only been found on chert and not on the associated dolomite.

In Centurion it is found in a relatively small area in Carletonville Dolomite Grassland near the transition with Rand Highveld Grassland (Mucina & Rutherford 2006), but is not present in the latter (Petro Lemmer pers. comm.). The population north of the Cradle of Humankind also occurs in Carletonville Dolomite Grassland, whereas the Waterberg population is associated with Central Sandy Bushveld (Mucina & Rutherford 2006). During the dry season it shrivels up completely and revives when sufficient moisture is available.

Etymology: from Latin, *silicus* (silica), and -*cola* (inhabiting), alluding to the narrow geological preference of this subspecies that only grows on chert and phonolithic lava, both having a very high silica content.

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**TABLE 2.**—Differences between *Cheilanthes deltoidea* subsp. *silicicola* and *C. deltoidea* subsp. *deltoidea*

<table>
<thead>
<tr>
<th>Character</th>
<th>subsp. <em>silicicola</em></th>
<th>subsp. <em>deltoidea</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rhizome scales</td>
<td>2–3 mm long, pale</td>
<td>± 3 mm long, castaneous</td>
</tr>
<tr>
<td>Stipe length</td>
<td>10–22 mm</td>
<td>16–34 mm</td>
</tr>
<tr>
<td>Lamina length</td>
<td>8–21(–30) mm</td>
<td>18–50(–100) mm</td>
</tr>
<tr>
<td>Basal pinnae length</td>
<td>5–15(–18) mm</td>
<td>11–34(–55) mm</td>
</tr>
<tr>
<td>Stipe:lamina ratio</td>
<td>± 1.5</td>
<td>± 1</td>
</tr>
<tr>
<td>Geology (substrate)</td>
<td>chert or phonolithic lava</td>
<td>granite or gneiss</td>
</tr>
</tbody>
</table>

FIGURE 21.—*Cheilanthes deltoidea* subsp. *silicicola*, R.R. Klopper & A.W. Klopper 217. A, habit; B, mature leaf growing in deep shade; C, immature leaf; D, marginal sori; E, rhizome scale. Scale bars: A–C, 5 mm; D, E, 2 mm. Artist: G. Condy.
Conservation status: owing to its very small size and the fact that this fern shrivels up during dry periods, it is easily overlooked. Much of the suitable habitat for this plant has already been destroyed through massive urban expansion in Centurion. For this reason Cheilanthes deltoidea subsp. silicicola was assessed as Vulnerable [VU B1ab(iii,iii,iv,v) + 2a(i,ii,iii,iv,v); C2a(i); D1+2] by the Threatened Species Programme (Vctor & Pfab 2009, as Cheilanthes deltoidea subsp. nov.). It is exposed to several threats, the most prominent being habitat loss from urbanization, but also alien vegetation, unnatural fire regimes, and trampling.

Other specimens examined


Doryopteris deltoidea (Kunze) Diels var. laxa Sim: 217 (1915). Type: Northern Cape, Namaqualand, between O’Kiep and Nababeep, 1883, H. Bolus 9463 (PRE, holo.; BOL!, K, iso.).

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REFERENCES


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