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## New and noteworthy bryophyte records for the flora of Yemen Additions to the Bryophyte Flora of the Arabian Peninsula and Socotra 8.

### Abstract

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Based on recent bryophyte collections eight new records are added to the bryophyte flora of mainland Yemen, increasing the number of known species to 133 (one hornwort, 39 liverworts, 93 mosses). First records for the Arabian Peninsula among the new findings are *Archidium alternifolium* (*Archidiaceae*) and *Tuerckheimia svihlae* (*Pottiaceae*), which are briefly described and illustrated.

### Introduction

Our knowledge of the bryophyte flora of mainland Yemen (for Socotra Island see Kürschner 2003a) is still very incomplete and despite various collecting activities, the country appears to be bryologically undercollected. As a first step towards a better understanding of this neglected group of plants and to act as a stimulus for future bryological research, the Bryophyte Flora of the Arabian Peninsula and Socotra (Kürschner 2000a) was published, listing 103 taxa (one hornwort, 31 liverworts, 71 mosses) for the Yemeni mainland.

Ongoing bryophyte collecting activities within the last three years in the frame of the Yemeni German BIOTA (BIODiversity monitoring Transect Analysis) Project ([http://www.biota-africa.de/800/biota\\_east/structure\\_east.htm](http://www.biota-africa.de/800/biota_east/structure_east.htm)) has resulted in a number of new records (e.g., Kürschner & al. 2001, Kürschner 2003b-c, Kürschner & Ochyra 2003), which increased the bryophyte flora of mainland Yemen to 125 species (one hornwort, 39 liverworts, 85 mosses). The continuous determination of the large collections led to the discovery of eight additional species so far unknown to mainland Yemen. New records of taxa are an important first step towards a flora of a country. In this respect, the following eight new records are a further contribution to reach this ambitious aim.

The voucher material is deposited at B, duplicates are in the herbarium H. Kürschner (Berlin) and, as far as available, in Leiden (L). Authors of botanical names are abbreviated according to Brummitt & Powell (1992).

## New records for mainland Yemen

### Archidiaceae

#### *Archidium alternifolium* (Hedw.) Mitt. – Fig. 1

Plants yellow to yellowish green, 3–10 mm high, in dense, glossy tufts or loose gregarious patches. *Stems* simple, later branched by fertile innovations, often capitate-foliolate. *Leaves* erect-spreading, ovate-lanceolate to narrowly triangular-lanceolate, 0.7–2 mm long, acuminate to  $\pm$  subulate, grading into the much longer perichaetial leaves; margins plane, entire to serrulate; costa percurrent to short-excurrent; laminal cells rhomboidal to linear rhomboidal,  $45\text{--}70 \times 9\text{--}12 \mu\text{m}$ , becoming shorter above; basal cells rectangular, at margin quadrate to short-rectangular; perichaetial leaves ovate-lanceolate to narrowly lanceolate, long-acuminate to subulate, 2–3.5 mm long; paroicous. *Capsules* immersed, globose, terminal, 1–2 per stem, 0.5–0.8 mm in diameter, cleistocarpous. *Spores* very large, 125–250  $\mu\text{m}$  in diameter, irregularly polyhedral, 8–30 per capsule.

AL-MAHRA: Fartak Mts, Jabal Karmoun,  $15^{\circ}50'N$ ,  $51^{\circ}59'E$ , 780 m, on soil in isolated island-like patches of *Anogeissus dhofarica*, 6.10.2001, *H. Kürschner 01-1383*.

A northern, somewhat polymorphic species frequently growing on damp, often sandy soils at the margins of temporary pools, on ditch banks, pastures, among grasses and fields. Widely distributed in the northern hemisphere and known from W and Central Europe eastwards to Greece and W Russia, northwards to Faeroer and Iceland, also from the Azores and Canary Islands (Hill & al. 1992), SE United States (Florida, Louisiana north to Missouri, Ohio, N Carolina; Crum & Anderson 1981), N Africa (Algeria, Morocco, Tunisia, Ros & al. 1999) and S Asia (Turkey; Frey & Kürschner 1991). Former reports from China could not be confirmed by Gao & Crosby (1999) and all so determined specimens from Africa south of the Sahara should be referred to *A. ohioense* Schimp. (O'Shea 1999, Snider 1975).

### Pottiaceae

#### *Barbula consanguinea* (Thwaites & Mitt.) A. Jaeger

AL-MAHRA: Hawf Mts, Uteq area near Al-Ayn, Jabal Chattan,  $16^{\circ}38.9'N$ ,  $52^{\circ}57.6'E$ , 780 m, on soil beneath rocks in *Anogeissus dhofarica* woodland, 29.9.2001, *H. Kürschner 01-1296*; Shah'rut area near Damqawt,  $16^{\circ}33.5'N$ ,  $52^{\circ}46.2'E$ , 700 m, on soil in *Anogeissus dhofarica* woodland, 2.10.2001, *H. Kürschner 01-1333*, *01-1345*; N Fartak Mts, Jabal Karmoun,  $15^{\circ}50'N$ ,  $51^{\circ}59'E$ , 780 m, on soil in isolated *Anogeissus dhofarica* patches, 6.10.2001, *H. Kürschner 01-1379*, *01-1382*; *ibid.*, 950 m, 6.10.2001, *H. Kürschner 01-1400*; S Fartak Mts, northeast of Khadifud,  $15^{\circ}39'N$ ,  $52^{\circ}12'E$ , 780 m, on soil in isolated *Anogeissus dhofarica* patches, 10.10.2001, *H. Kürschner 01-1417*.

Our concept of this very variable taxon follows Eddy (1990) and Sollman (2000), conflicting with Zander (1993), who listed *Barbula consanguinea* as a synonym of *B. javanica* Dozy & Molk. However, both taxa are clearly distinct by the laminal cells (mamillose and pellucid in *B. javanica*, pluripapillose and obscure in *B. consanguinea*; cf. Sollman 2000). *B. consanguinea* is considered as a pantropical species frequent and widespread on damp soils and rocks throughout tropical Asia, Africa and Central America. Previous Arabian records are from the neighbouring Oman (Dhofar; Kürschner 2000b).

#### *Gymnostomiella vernicosa* var. *tenerum* (Müll. Hal. ex Dusén) Arts

AL-MAHRA: Hawf Mts, Jabal Lusaka northeast of Faydami, west of Al-Fatk, 550 m, isolated *Anogeissus dhofarica* patches, on soil in rock crevices near a spring, 5.10.2001, *H. Kürschner 01-1361*.

A pantropical species reported from the Americas (Lesser Antilles), Africa [Cape Verde Islands, Central African Republic, Comoro Islands, Democratic Republic of Congo (Zaire), Kenya, Liberia, Réunion, Tanzania, Zambia; O'Shea 1999] and Asia (Burma, China, India, Indonesia, Nepal,

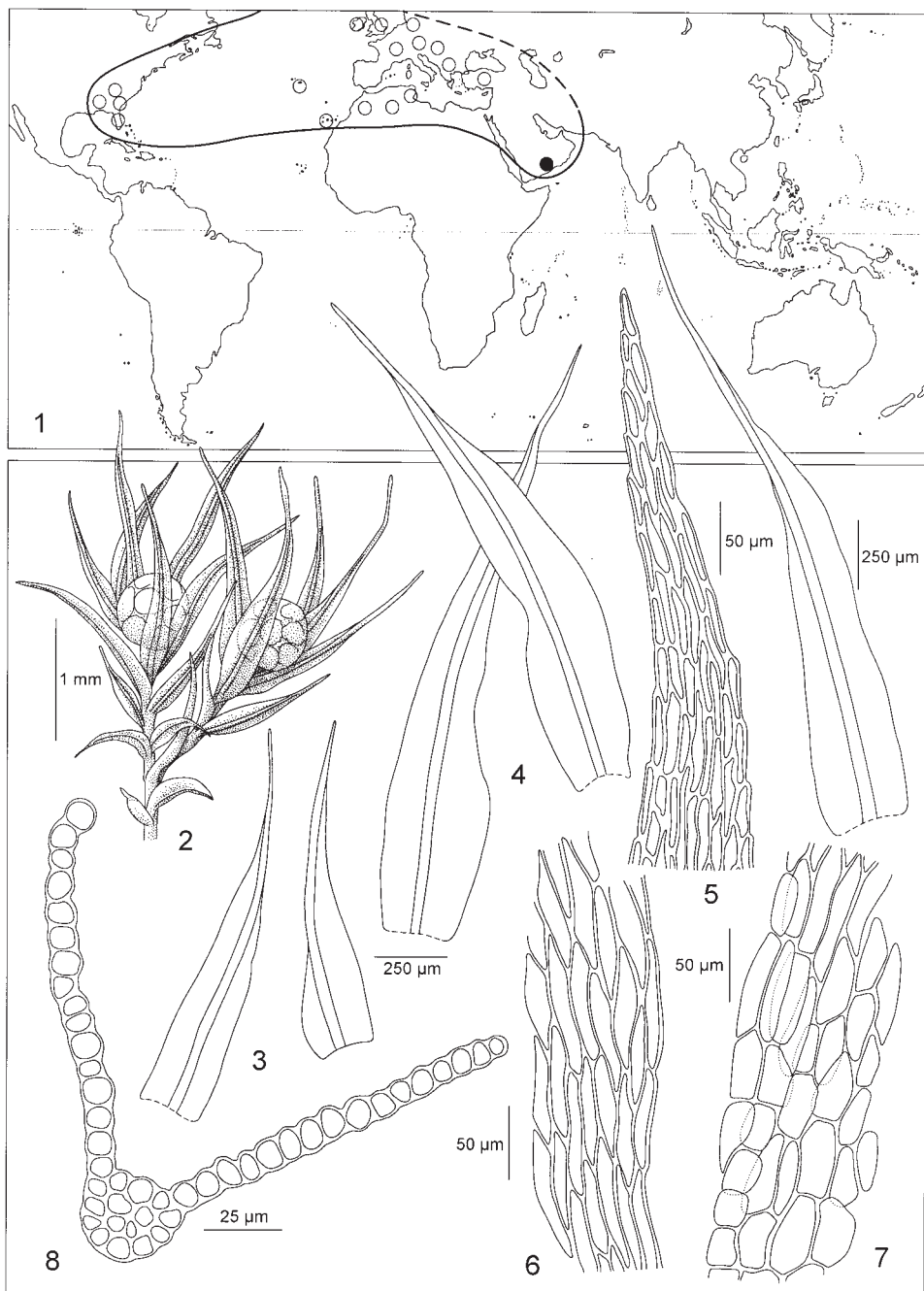


Fig. 1. *Archidium alternifolium* – 1: distribution (open circles: regional and country records); 2: habit; 3: leaves; 4: perichaetial leaves; 5: leaf apex; 6: mid-laminal cells; 7: basal laminal cells; 8: cross-section of costa. – All drawn from *Kürschner 01-1383* (herb. Kürschner).

Sri Lanka, Thailand; Arts 1998). Previous Arabian records are from the neighbouring Oman (Dhofar, Arts 1998).

***Hymenostylum crassinervium*** Broth. & Dixon

AL-MAHRA: Hawf Mts, Uteq area near Al-Ayn, Jabal Chattan, 16°38.9'N, 52°57.6'E, 780 m, on soil in *Anogeissus dhofarica* woodland, 29.9.2001, *H. Kürschner 01-1282*; *ibid.*, 700 m, 30.9.2001, *H. Kürschner 01-1304, 01-1308*; Shah'rut area near Damqawt, 16°33.5'N, 52°46.2'E, 700 m, on soil beneath rocks in *Anogeissus dhofarica* woodland, 2.10.2001, *H. Kürschner 01-1335*; *ibid.*, 700 m, 2.10.2001, *H. Kürschner 01-1336*; Jabal Lusaka, northeast of Faydami, west of Al-Fatk, 550 m, on soil beneath rocks in *Anogeissus dhofarica* remnants, 5.10.2001, *H. Kürschner 01-1358*; N Fartak Mts, Jabal Karmoun, 15°50'N, 51°59'E, 780 m, on soil beneath rocks in isolated *Anogeissus dhofarica* patches, 6.10.2001, *H. Kürschner 01-1365, 01-1367*; *ibid.*, 950 m, 6.10.2001, *H. Kürschner 01-1402*; S Fartak Mts, northeast of Khadifud, 15°39'N, 52°12'E, 950 m, on soil beneath rocks in isolated *Anogeissus dhofarica* patches, 10.10.2001, *H. Kürschner 01-1409*; *ibid.*, 780 m, on soil in isolated *Anogeissus dhofarica* patches, 10.10.2001, *H. Kürschner 01-1419*.

An afrotropical species, reported from the Democratic Republic of Congo (Zaire), Kenya, Somalia, Tanzania, Zambia and Zimbabwe (O'Shea 1999). Previous Arabian records are from the neighbouring Oman (Dhofar, Kürschner & al. 2001).

***Tuerckheimia svihlae*** (E. B. Bartram) R. H. Zander – Fig. 2, 3

Plants light to dark green, growing in short-tufts, to 1-1.5 cm high. *Leaves* incurved, weakly twisted when dry, widely spreading when moist, oblong to linear-lanceolate, 2-3.5 mm long; margins plane, entire; apex narrowly acute; costa short excurrent and ending in an apiculus; costa in cross-section circular, ventrally bulging, with 2 stereid bands, both strong, with 2-4 guide cells; upper laminal cells rounded-quadrate to hexagonal, mostly 10-14 µm width, with massive, compound papillae centred over the lumen; basal cells differentiated, thin-walled, often hyaline, rectangular, smooth. *Sporophytes* not seen in Yemen material.

*Tuerckheimia* is very similar to *Trichostomum* and also *Molendoa* in habit but differs from both by the massive papillae centred over the lumen of the rather large upper laminal cells (Fig. 3). In *Trichostomum*, they are smaller and covered by crowded, multiplex, flattened papillae (Zander 1993). For the differences from *Molendoa* see especially Saito (1972).

AL-MAHRA: S Fartak Mts, northeast of Khadifud, 15°39'N, 52°12'E, 500 m, on soil in rock fissures; 10.10.2001, *H. Kürschner 01-1407*; Hawf Mts, northeast of Al-Ayn, Uteq area, 16°38.9'N, 52°57.6'E, 780 m, on soil in *Anogeissus dhofarica* forest, 30.9.2001, *H. Kürschner 01-1290*.

A species known from the SE United States and Mexico [as *Tuerckheimia angustifolia* (K. Saito) R. H. Zander, *nom. inval.*], E Asia (Japan, Korea, Taiwan) and SE Asia [Burma, as *Oxystegus svihlae* (E. B. Bartram) Gangulee, Philippines]. According to O'Shea (1999) and Ros & al. (1999), *Tuerckheimia svihlae* has not been recorded from Africa. *Trichostomum abyssinicum* (Thér.) R. H. Zander obviously was erroneously recorded as a synonym of *Tuerckheimia svihlae* by Zander (1993: 344; Crosby & Magill 1997). We have not yet studied type material of *Trichostomum abyssinicum*, nor seen any material so-determined. However, according to the protologue of *Weissia abyssinica* Thér. (Thériot 1928), which is the basionym of *T. abyssinicum*, it is clearly different.

**Bryaceae**

***Bryum dichotomum*** Hedw. (Syn.: *B. bicolor* Dicks.)

LAHJ: Jabal Eraf, summit plateau, 13°06'N, 44°15'E, 1380-1400 m, on soil in *Juniperus procera* woodland, 10.3.2002, *H. Kürschner 02-43*.

A subcosmopolitan species, ubiquitous in northern and southern temperate zones. Previous Arabian records are from Saudi Arabia and Socotra (Kürschner 2000a).

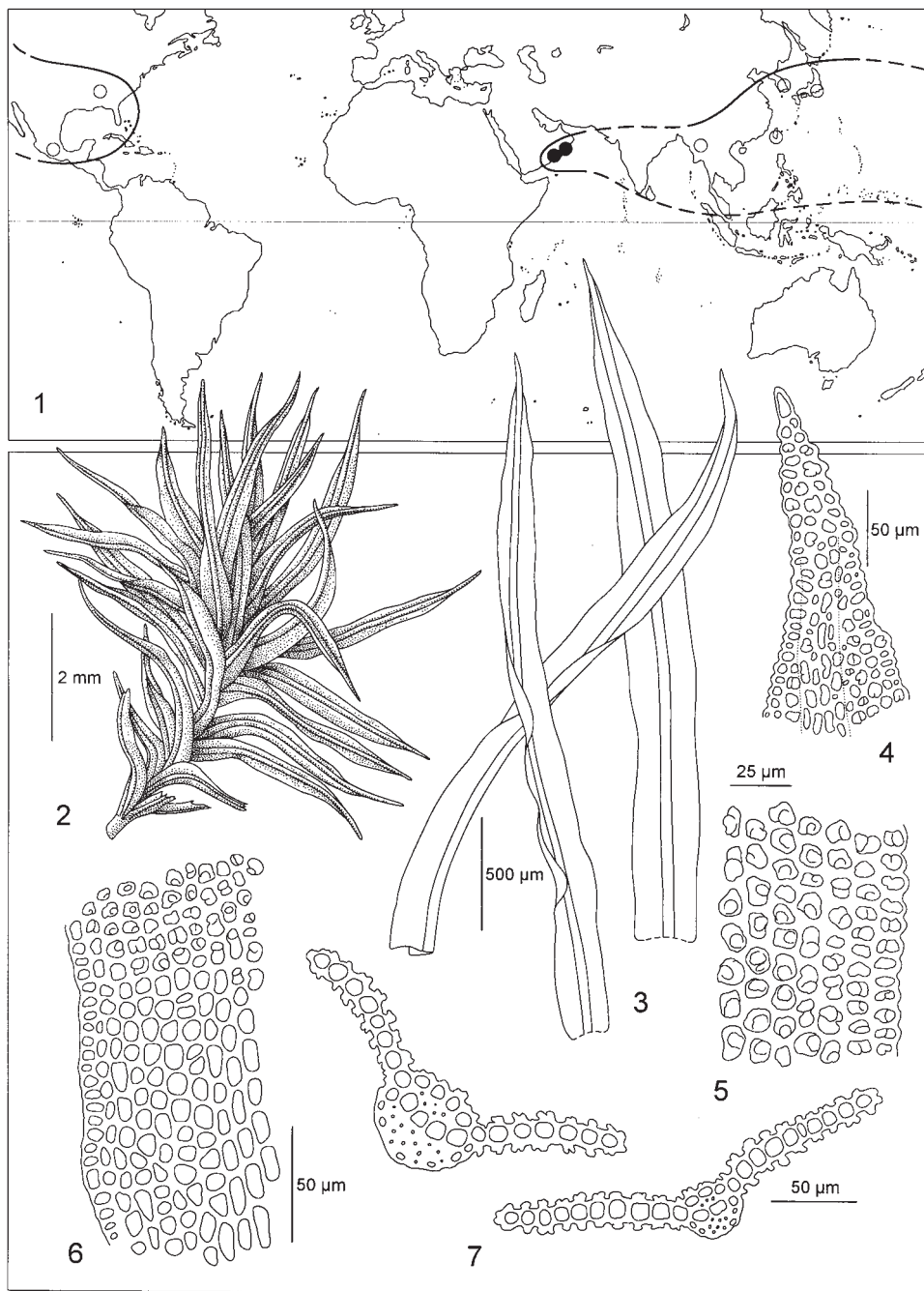


Fig. 2. *Tuerckheimia svihlae* – 1: distribution (open circles: regional and country records); 2: habit; 3: leaves; 4: leaf apex; 5: mid-laminal cells; 6: basal laminal cells; 7: cross-section of leaf. – All drawn from Kürschner 01-1290 (herb. Kürschner).

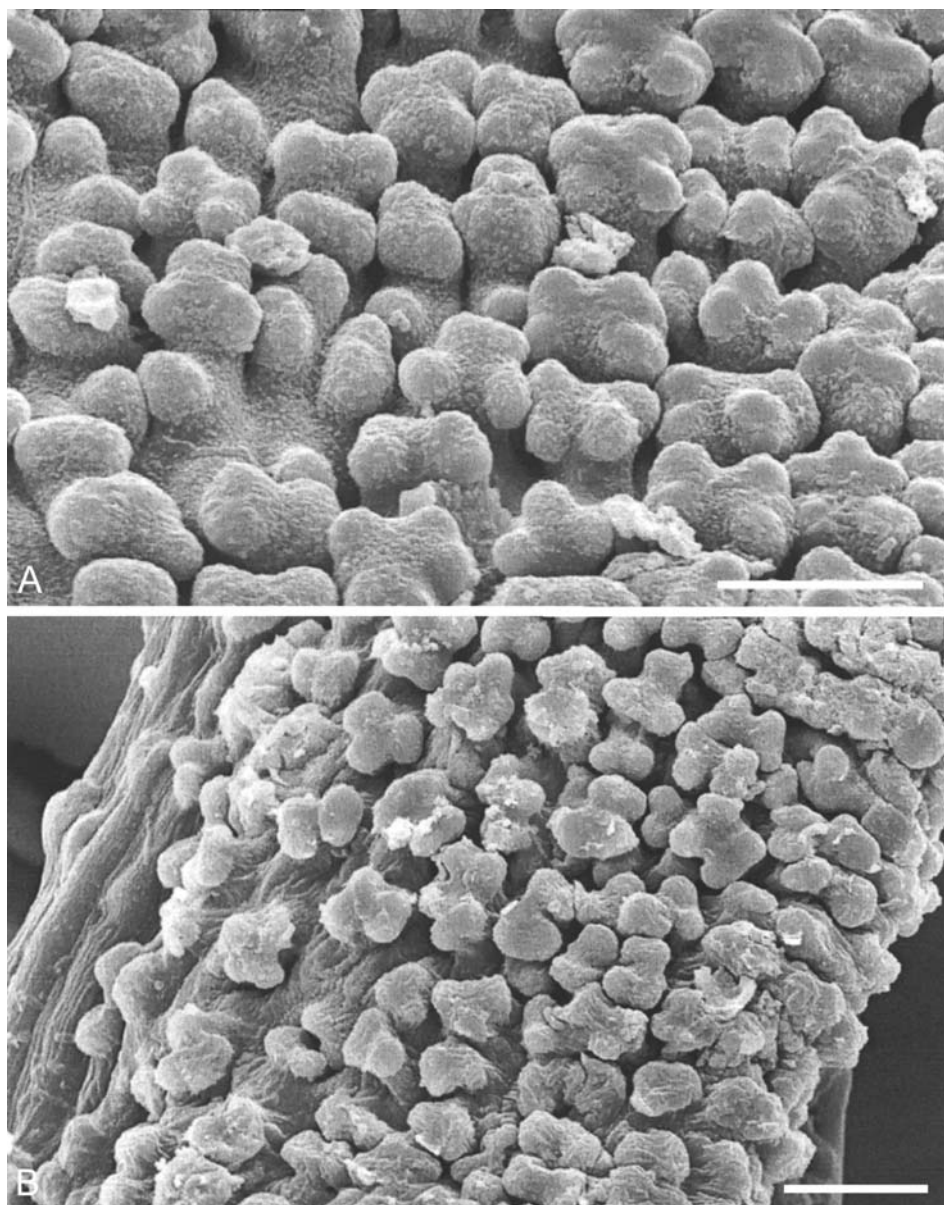


Fig. 3. *Tuerckheimia svihlae* – 1: mid-laminal cells with massive papillae centred over the lumen; 2: leaf margin (right) with massive papillae and costa (left). – Scale bars = 10 µm; SEM photographs from Kürschner 01-1290.

***Bryum capillare* Hedw.**

AL-MAHRA: Hawf Mts, Uteq area near al-Ayn, Jabal Chattan, 16°38.9'N, 52°57.6'E, 780 m, on soil in *Anogeissus dhofarica* woodland, 1.10.2001, H. Kürschner 01-1319.

A subcosmopolitan species of northern origin. Previous Arabian records are from Saudi Arabia and Socotra (Kürschner 2000a).

## Funariaceae

### *Entosthodon muhlenbergii* (Turner) Fife

DHAMAR: Jabal Uthmar, near Mirsa'a, c. 5 km southwest of Uthmar, 14°28.7'N, 44°00.2'E, 1620-1720 m, in loamy pockets between rocks, 12.8.2002, *N. Kilian, P. Hein & Al-Naggan YP 2615b*.

A circum-Tethyan species, widely distributed in Europe, N Africa, North America and SW Asia. Previous Arabian records are from Saudi Arabia and the United Arab Emirates (Kürschner 2000a).

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