

## Lectotypification, description, and distribution of *Arabis deflexa* (Cruciferae)

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**Abstract:** In this paper, a lectotype for *Arabis deflexa* Boiss. is designated, and detailed morphological properties and differences between related taxa and a distribution map are given. Furthermore, an IUCN threat category is proposed.

**Key words:** *Arabis deflexa*, Brassicaceae, endemic, lectotype, Turkey

### *Arabis deflexa* Boiss. (Cruciferae) türünün lectotiplendirmesi, betimi ve dağılımı

**Özet:** Bu çalışmada, *Arabis deflexa* Boiss. için bir lektotip belirlendi, detaylı morfolojik özellikleri yakın taksonlar ile olan farklılıkları ve bir dağılım haritası verildi. Ayrıca IUCN tehlike kategorisi önerildi.

**Anahtar sözcükler:** *Arabis deflexa*, Brassicaceae, endemik, lektotip, Türkiye

### Introduction

*Arabis* L. (Cruciferae) is thought to be a well-defined genus with more than 180 species distributed in the temperate areas of the northern hemisphere. *A. alpina* L. and *A. glabra* L. were also reported to be seen in the high mountains of tropical East Africa (Al-Shehbaz, 1988). A compilation has been provided by Al-Shehbaz (1988) including about 75 taxa (60 endemic) from North America, 44 from Europe (30 endemic), 31 from south-west Asia and the Caucasus (20 endemic), 19 from Central Asia (10 endemic), 28 from China and the Far East (22 endemic), and 15 from north-western Africa (6 endemic). Molecular studies on this genus were considerably reduced in size (Koch et al., 1999; Koch et al., 2000; O’Kane &

Al-Shehbaz, 2003; Al-Shehbaz et al., 2006). *Turritis* L. is associated with *Arabis*, which was established in 1753 by Linnaeus and later by others (Akeroyd, 1993; Rollins, 1993; Mulligan, 1996; Tan, 2002). Recent studies, however, indicate that *Turritis* belongs to the tribe *Camelineae* DC., while *Arabis* belongs to the tribe *Arabideae* DC., and obviously it is remotely related to *Arabis* s. str. (Al-Shehbaz et al., 2006). Currently *Arabis* s. str. has 118 species (Warwick et al., 2006).

In Turkey the genus *Arabis* has about 25 species [inc. *Turritis galabra* L. and *T. laxa* (Sibth. & Sm.) Hayek] (Mutlu & Dönmez, 2003; Mutlu, 2004; Özhatay et al., 2011) *Arabis turrita* L. has been classified as a different genus called *Pseudoturritis*

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Al-Shehbaz (Al-Shehbaz, 2005). As a result the total number of *Arabis* species in Turkey (excluding *Turritis*) is now 22.

*Arabis deflexa* Boiss. was first collected by Bourgeau in Akdağ (Antalya region) before Boissier published it as a new species in *Flora Orientalis* (Boissier, 1867). It was established that this species could be found in Cyprus, as indicated in the *Supplement of Flora Orientalis* (Boissier, 1888a). Based on Boissier's records the distribution of this specimen extends from Turkey to Cyprus (Cullen, 1965). Specimens of *A. deflexa* discovered in Cyprus were published as a new species called *Arabis cypria* Holmboe in 1914 (Meikle, 1977). The differentiating characteristics between *A. cypria* and *A. deflexa* were as follows: their petal length (10-18 mm; 5.25-11 mm), their petal width (5-8 mm; 2.5-4.5 mm), and their siliqua width (2.5-3 mm; 0.8-1.1 mm) (Figure 1). Thus, *A. deflexa* Boiss., which was first collected in Turkey, was added to the endemic plant list of Turkey. Changes in its status were published in the *Med-Checklist* (Greuter et al., 1986) but the alteration was not indicated in the supplements of *Flora of Turkey* (Davis et al., 1988; Güner et al., 2000). Nowadays the number of endemic species in this genus has increased to 10 and the rate of endemism in the genus is 45.45%.

The typespecimens of *Arabis deflexa* collected from Turkey were based on the specimens of Bourgeau *s.n.* (Boissier, 1867). Examination of *Arabis* collections at the K, W, and G-Boiss. herbaria indicated that these specimens are 4 herbaria sheets (Figure 2); 2 of them are in G-Boiss., 1 of them is in K, and the other is in W. However, there was no reference to the type of *A. deflexa* in the reviews done by Cullen (1965), as only 1 specimen was stated in the K herbarium.

In 1860, Bourgeau came to South Anatolia and botanised in Elmalı, Antalya Province (Lycia region of Anatolia). He began to collect in Antalya in April 1860. He was in Elmalı from mid-May to early July. In 1862, he was in Bayburt, Gümüşhane Province (north-east Anatolia) (Baytop, 2010). Plant specimens collected during Bourgeau's studies in the Lycia region were numbered between 5 and 421, and they were used in *Flora Orientalis* (Boissier, 1888b).

Boissier described 45 new species based on Bourgeau's material (Baytop, 2010). *Arabis deflexa* is in the new species. The protologue of *Arabis deflexa*

in *Flora Orientalis* (Boissier, 1867) does not state the number of collectors or the date of collection. At the same time, Boissier did not give this number in the *Supplementum of Flora Orientalis* (Boissier, 1888b). Examination of *Arabis* collections at the G-Boiss. herbarium indicated that the number of collector and the date of collection are stated in the label state of only one sheet. The number is 44 and the date of collection is 3 July 1860 (Figure 2). This example is better than the samples in the Royal Botanic Gardens (K), Naturhistorisches Museum Wien (W), and G-Boiss. herbaria because the roots, base, and stem leaves are well preserved.

Thus, according to ICBN Art. 9.9 and 9.10 (McNeil et al., 2006), it is necessary to lectotypify *A. deflexa*. When all findings were evaluated together, the lectotype specimen of *Arabis deflexa* collected in the Lycia region of Anatolia should be sample no. 44 of Bourgeau in G-Boiss. herbarium.

***Arabis deflexa*** Boiss. *Flora Orientalis* 1: 175 (1867). (Figures 1-3).

**Lectotype** (designated here) [Turkey C2 Antalya] rocky slopes of Ak Mountain, Lyciae, 3 July, 1860, Bourgeau 44, G-Boiss.! (isolectotype, G-Boiss.! K! W!).

Perennial herb with a woody stock. Stem erect-ascending, 5.4-28 cm length and 0.8-1.8 mm width; branched at the base; simple, furcate, stellate and branched hairy. Basal leaves obovate; 8-62 × 5-18.5 mm, sinuate-dentate, teeth 4-9; stellate and branched hairy. Stem leaves 1-7; oblong, sagittate at base, amplexicaul, auriculate; 7-41 × 3-15 mm; dentate, teeth 4-12; stellate and branched hairy. Inflorescence 3.2-10.2 cm, glabrous, flowers 15-31, unbracteate. Pedicel refracted in fruit, 8-19 mm, glabrous. Sepals green, 2.75-3.5 × 1-2 mm, inner sepals saccate at base, ± furcate and stellate hairy. Petals white, 5.25-11 × 2.5-4.5 mm. Filament enlarged to the base, short filament 2.5-3.75 mm, long filament 3.5-6.5 mm. Anther 1.2-1.6 mm. Siliqua 19-49 × 0.8-1.1 mm, glabrous, the valves conspicuous median vein distinct to  $\frac{3}{4}$  of length, and 2 lateral vessels, style 0.5-1 mm in fruit, seed number per loculus 18-52. Seed uniseriate, 0.87-1.3 × 0.62-0.87 mm, winged, alveolate, mucilaginous when wet, radicle accumbent. *Fl.* 3-7, rocky slopes, *P. brutia* forest, 50-1800 m.

*Examined specimens:* C2 Antalya: rocky slopes of Ak Mountain Lyciae, Bourgeau *s.n.* (K, W, G-Boiss.);

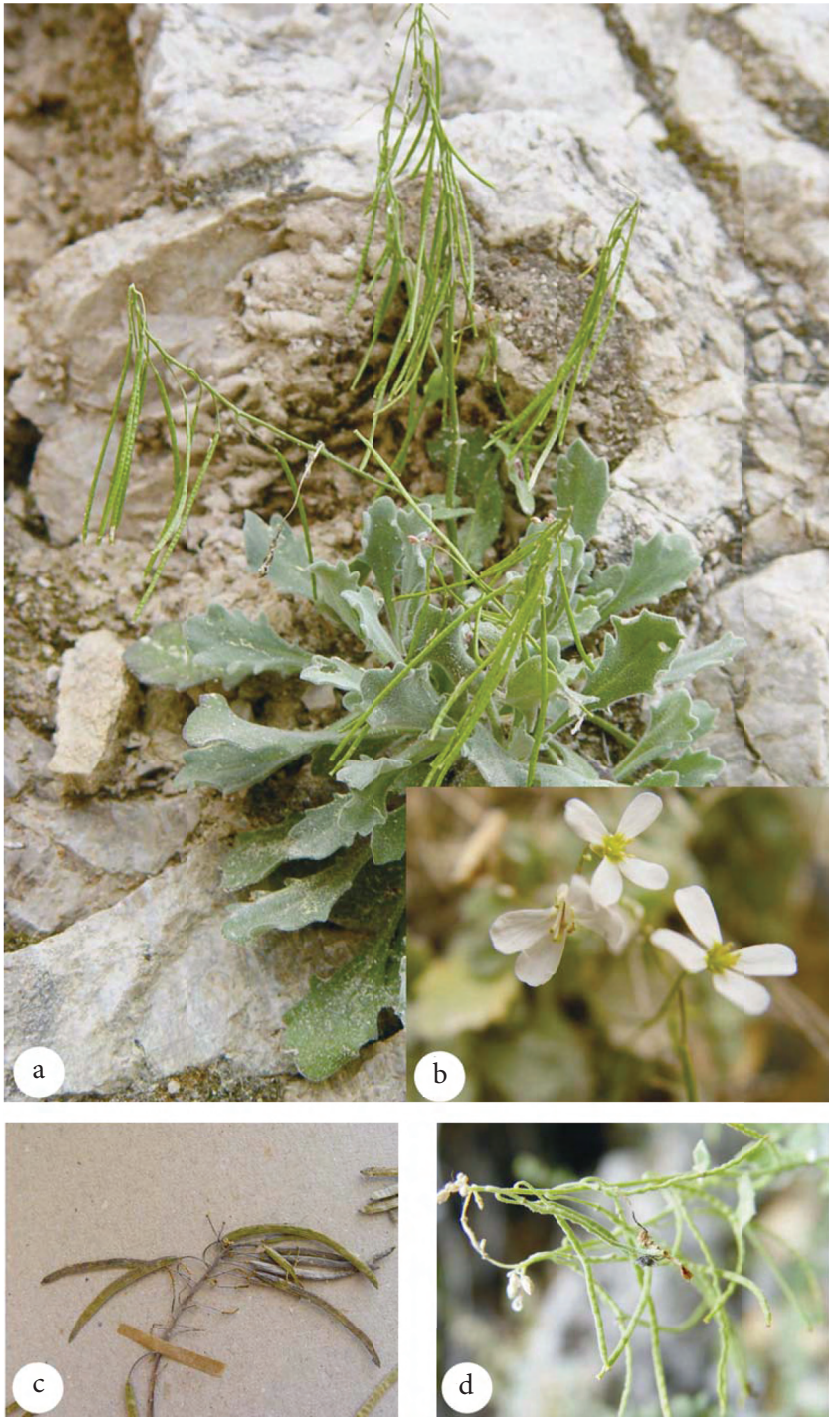


Figure 1. Different parts of *Arabis deflexa* (B.Mutlu 9839): a-habit, b-flowers; *A. cyprica* (K.Yıldız & S.Gücel, K030 in ISTE): c-fruits; *A. davisii* (B.Mutlu 9966 in INU): d-pedicels. photo: B.Mutlu.

Ak-Dagh region alpine, 03.06.1860, *Bourgeau* 44 (G-Boiss.); Gündoğmuş village, Sapa Çukuru Mountain, *Cedrus libani* forest, 1600-1700 m,

15.5.1971, *R.Çetik* 3437; S side of Avlan Lake, 1050 m, 1959, *It. Leyd.* 691. Muğla: Fethiye District, Baba Mountain, N side, rocky place, 1750 m, 30.06.1983,



Figure 2. Type specimens of *Arabis deflexa*: a-lectotype in G-Boiss.; b-isolectotype in G-Boiss.; c-isolectotype in K; d-isolectotype in W. photo: B.Mutlu.

*E.Tuzlacı s.n.* (ISTE 51346), C3 Antalya: Kemer District, Göynük Stream, limestone valley, 50-200 m, 22.03.1979, *H.Peşmen* 4206 (HUB-07844); Kemer District, Kesmeboğazı area, limestone rocky place, 200-300 m, 25.03.1978, *H.Peşmen* 4363 (HUB); Kemer District, Kesmeboğazı area, limestone rocky place, 300-450 m, 24.05.2000, *B.Mutlu* 5758 (INU); Kemer District, Kesmeboğazı area, limestone

rocky place, 154 m, N 36°36'026"N, 030°29'203"E, 18.04.2006, *B.Mutlu* 9839 (INU); Kemer District, between Kızıllalan and Kuzdere village, *P. brutia* forest and openness, 800 m, 07.06.1979, *H.Peşmen* 4363 (HUB); Çakırlar-Saklıkent, Balzacak Beli area, 1100 m, 02.06.1995, *N.Özhatay* 95/459 (ISTE); Olimpos, 10 km from Balme, Kemer District, 14.06.1997, *R.Ulrich s.n.* (B); NW of Antalya, 33 km from Antalya

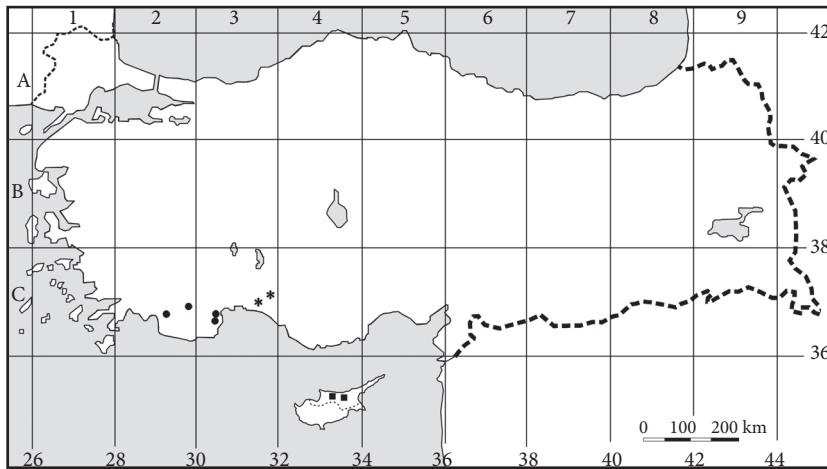


Figure 3. Distribution of *Arabis deflexa* (●); *A. davisii* (\*), and *A. cypria* (■).

to Korkuteli, rocks, north slope, 01.09.1979, Kehl s.n. (B).

**Phytogeographical distribution:** The geographical distribution of the species ranges from Antalya to Muğla (Figure 3), making it endemic to Turkey and classifying the fact that it belongs to the East Mediterranean phytogeographical region.

Five species of *Arabis* discovered in Turkey (*A. deflexa*, *A. alpina* L., *A. aubrietoides* Boiss., *A. davisii* H.Duman & A.Duran, and *A. ionocalyx* Boiss. & Heldr.) were found to be highly similar in vegetative properties. This similarity was identified by Cullen, who noted that the similarity was distinct in species similar to *A. alpina* (Cullen, 1965). Hence, these species had obviously been misidentified by some taxonomist. Some specimens (*D.* 25811; Coode & Jones 1135) were confirmed as *A. deflexa* by Cullen (1965). Since the fruit surface of this specimen is densely hirsute, it was published as a new species with the name *A. davisii* (Duman & Duran, 2001). Our own studies showed that reported specimens of *A. deflexa*, collected from the provinces of Kahramanmaraş-Mersin (Coode & Jones 1135; *D.* 26650; Siehe 1909:251) and Adana-Mersin (*E.Yurdakulol* 1293; *Y.Akman & Quezel* 7451) had not been observed in these provinces.

The results of field studies indicated that the common species in these provinces were *A. alpina*, *A. aubrietoides*, and *A. ionocalyx*, whereas *A. deflexa* was specific to districts of Kemer, Antalya Province, and Fethiye, Muğla Province (Figure 3).

**Status and threat category:** Due to this species' being widespread in mostly healthy populations, its exact geographical distribution was reported incorrectly, which is why it is not included in either Bern's List (Council of Europe, 1979) or by Ekim et al. (2000).

Because of the road construction works in Kemer District, the population in Kesmeboğazı is under threat. It has been observed that the population size of *A. deflexa* in Kesmeboğazı decreased by 33.3% between 2006 and 2007. This population size has been reduced  $\geq 50\%$  over the last decade or 3 generations.

The extent of occurrence of this species is calculated to be 2000 km<sup>2</sup>, severely fragmented, or known to exist at no more than 5 locations; the number of mature individuals was counted as 450 in all localities (no subpopulation estimated to contain more than 250 mature individuals). According to results of these observations, the threat category for *A. deflexa* is EN B1a C2a(i) (IUCN, 2001).

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