

The Rediscovery of Some Taxa Thought to Have Been Extinct in Turkey

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Abstract: This paper reports the re-discovery of *Barbarea auriculata* Hausskn. ex Bornm. var. *auriculata* (Brassicaceae), *Onobrychis nitida* Boiss. (Fabaceae), *Onosma discedens* Hausskn. ex Bornm. (Boraginaceae), and *Silene oligotricha* Hub.-Mor. (Caryophyllaceae). All of these taxa had been listed as Extinct (EX), according to the World Conservation Union Red List Categories. This study provides the re-descriptions of these taxa, presents field observations of these taxa, and suggests new IUCN categories.

Key Words: Local endemic, *Barbarea*, *Onosma*, *Onobrychis*, *Silene*, Turkey

Türkiye’de Yok Olduğu Düşünülen Bazı Türlerin Yeniden Toplanması

Özet: Bu çalışmada, Dünya Doğayı Koruma Birliği Kırmızı Liste Kategorilerine göre yok olduğu düşünülen (EX) *Barbarea auriculata* Hausskn. ex Bornm. var. *auriculata* (Brassicaceae), *Onobrychis nitida* Boiss. (Fabaceae), *Onosma discedens* Hausskn. ex Bornm. (Boraginaceae) ve *Silene oligotricha* Hub.-Mor. (Caryophyllaceae) türlerinin yeniden toplandığı rapor edilmiştir. Türlerin deskripsiyonları yeniden yazılmış, türlere ait bazı gözlemlere yer verilmiş ve türler için yeni IUCN kategorileri önerilmiştir.

Anahtar Sözcükler: Dar endemik, *Barbarea*, *Onosma*, *Onobrychis*, *Silene*, Türkiye

Introduction

Turkey has the richest flora in the temperate zone, with approximately 10,000 vascular plants. Along with its rich flora, it also has a wide diversity of habitats; however, the unique flora and habitats of Turkey are threatened and have rapidly declined during the last 40 years (Özhatay, 2006).

Measuring the level of threat to plant and animal species is very important to conservation efforts. The IUCN Red List categories and criteria, which were designed by The World Conservation Union (IUCN), are used to classify all plant and animal species. The

categories of threat to species are especially crucial during conservation planning at the national and international level. Species that are no longer known to exist in the wild, despite repeated searches of their former localities and other known or likely places, are defined as Extinct (EX) (IUCN, 2001).

In the present study, *Barbarea auriculata* Hausskn. ex Bornm. var. *auriculata* (Brassicaceae), *Onosma discedens* Hausskn. ex Bornm. (Boraginaceae), *Onobrychis nitida* Boiss. (Fabaceae), and *Silene oligotricha* Hub.-Mor. (Caryophyllaceae), which were previously reported as extinct (Ekim et al., 2000; Özhatay et al., 2005), were collected.

Materials and Methods

All the specimens belonging to *Onobrychis* Adans., *Onosma* L., *Silene* L., and *Barbarea* R.Br. were collected in Erzincan during several excursions between 2004 and 2006. The specimens were determined using *Flora of Turkey* (Coode & Cullen, 1965, 1967; Hedge, 1969; Riedl, 1978) as a reference. Identification of the specimens was also confirmed in the herbaria of Edinburgh (E) and Kew (K). Descriptions of the plants were re-written, based in part, on comparisons with their descriptions in *Flora of Turkey* (Coode & Cullen, 1965, 1967; Hedge, 1969; Riedl, 1978). Data on their ecology and proposed new IUCN categories is given (IUCN, 2001). All specimens are kept in the herbarium of Erzincan University Education Faculty.

Results and Discussion

Barbarea auriculata Hausskn. ex Bornm. var. *auriculata* (Figure 1).

Perennial herb. Stem \pm 35 cm tall, glabrous, single or branched, ascending to erect. Basal leaves long petiolate, 4.5-8.5 cm, with slightly asymmetric orbicular or ovate terminal leaflets, 10-41 \times 8-28 mm. Lower leaves with a large terminal leaflet, 0-2 pairs of lateral leaflets, semi-amplexicaul auricles, larger than the lateral leaflets. Stem leaves highly variable in size and shape, entire or repand-dentate to lobed, with large auricles. Petal yellow, pale white in type. Siliquae strict, erect-spreading, torulose, 11-22 \times 0.5-1.2 mm. *Fl.* 5-6. *Damp meadow.* Alt. 1580 m.

Type: B7 Erzincan: Armenia Turcica: Eğin (ad fluvium Euphraterm) ad Argubaschi, Habenus Ereğ, 3 vi 1890, *Sintenis* 2460 (K!).

Examined specimens: *Barbarea auriculata* var. *auriculata*: B7 Erzincan: Kemaliye, top of Ergü village, 1580 m, 39°12.59'N, 38°31.20'E, ix iv 2005, 1580 m, *Kandemir* 6960. — *Barbarea auriculata* var. *paludosa*: B7 Erzincan: Pöske D., 2226 m, 39°53.04'N, 39°22.44'E, 17 vi 2004, damp meadows, *Kandemir* 6108; Erzincan: Sipikor D., 2426 m, 39°53.09'N, 39°34.47'E, 19 vi 2004, damp meadows, *Kandemir* 6179; Erzincan: Sipikor D., Mecidiye village, 2172 m, 39°51.17'N, 39°32.95'E, 26 vi 2004, water places, *Kandemir* 6213; Erzincan: Pöske D., near Ahmediye Bakım Station, 2225

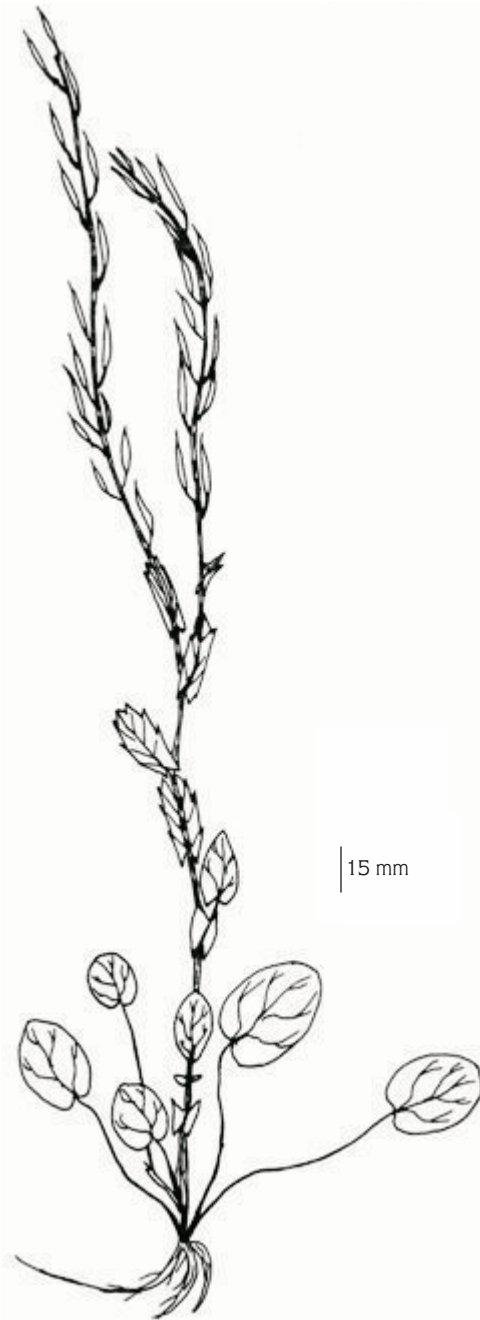


Figure 1. *Barbarea auriculata* Hausskn. ex Bornm. var. *auriculata*.

m, 30 v 2006, *Kandemir* 7757. — *Barbarea brachycarpa* var. *robusta*: B7 Erzincan: Pöske D., 2100 m, 39°53.48'N, 39°22.26'E, 15 v 2004, roadsides, watery places, *Kandemir* 5977; Erzincan: Sipikor D., 2426 m, 39°53.09'N, 39°34.47'E, 19 vi 2004, damp places, *Kandemir* 6182.

The samples of the genus *Barbarea*, collected by Sintenis in Eğin (known as Kemaliye at present), Argubaschi (refers to the top of Ergü village), and Habenus Ereğ (known as Yeşilyurt at present) in Erzincan in 1890 (Davis, 1958), were named *B. auriculata* in 1931 (Coode & Cullen, 1965). Then, it was determined that another specimen collected by Davis (D. 29537) in Tercan/Erzincan was very similar to *B. auriculata*. It differed from *B. auriculata*, however, by its retrorsely hispid-setose below the stems. During the revision of the genus, the species collected by Sintenis was named *B. auriculata* var. *auriculata* (Figure 2), and that collected by Davis and Hedge was named *B. auriculata* var. *paludosa* by Coode and Cullen (Coode & Cullen, 1965).



Figure 2. *Barbarea auriculata* Hausskn. ex Bornm. var. *auriculata* (type photo, K).

B. auriculata var. *auriculata* was listed as EX according to the IUCN Red List (Ekim et al., 2000). During the present study, *B. auriculata* var. *auriculata* was collected from the type locality (Kandemir 6960). Collected specimens were also checked with the type specimen in K.

B. auriculata var. *auriculata* is completely glabrous, including the fruits. The status of the hair is variable in *B. auriculata* var. *paludosa*. The fruit is pilose and the stem is hispid-setose above or sparsely or completely glabrous below in the specimen from Pöske Mountain (Kandemir 7757). In addition, the fruit is entirely glabrous in some specimens from Pöske Mountain (Kandemir 6179). According to Flora of Turkey, *B. auriculata* var. *auriculata* and *B. auriculata* var. *paludosa* can be distinguished from each other by the status of the stem hair (Coode & Cullen, 1965). The indumentum is not only variable within an individual plant, but may also be influenced by the site conditions in *B. brachycarpa* Boiss., which is another polymorphic species, as is *B. auriculata* (Parolly & Eren, 2006). More studies are needed to determine if *B. auriculata* var. *auriculata* and *B. auriculata* var. *paludosa* are conspecific.

The taxon is treated as *B. minor* K.Koch in most of the SW Asian standard Floras such as *Flora of Turkey*. In the light of more materials, the species was revised and correctly named *B. brachycarpa*, as this name takes priority over *B. minor* (Parolly & Eren, 2006). The position of fruits is given as an important character for differentiating between *B. auriculata* and *B. brachycarpa*. The fruits are strict in *B. auriculata* and erect-spreading in *B. brachycarpa* (Coode & Cullen, 1965). The fruits are mostly strict in immature fruits; sometimes they might change to erect-spreading in older fruits of the living *B. auriculata* var. *auriculata* and *B. auriculata* var. *paludosa* plants. According to the key to the genus *Barbarea* in the *Flora of Turkey*, some specimens are described as *B. brachycarpa* in the same population, while some can be described as *B. auriculata*. More studies are needed to diagnose the variations in these taxa.

B. auriculata seems to be different from *B. lutea* Cullen & Coode, with auricles that are larger than the lateral leaflets; however, the lateral leaflets are absent in some specimens of *B. auriculata* var. *auriculata* and *B. auriculata* var. *paludosa*. Therefore, identification of some specimens is very difficult. More studies are needed to diagnose the variations in these taxa.

Barbarea auriculata var. *auriculata* grows in damp places, with *Polygonum bistorta* L., *Alchemilla* sp., *Mentha* sp., *Gentiana* sp., *Galium* sp., *Salix* sp., *Poa* sp., and *Puccinellia* sp.

According to our field observations, the estimated area of occupancy is less than 10 km² and the number of individuals is less than 100. Additionally, the population appears to be under the continuous threat of excessive grazing; therefore, it should be graded as Critically Endangered (CR), because of its local existence and small population (IUCN, 2001).

***Onobrychis nitida* Boiss. (Figure 3)**

Perennial herb. Stem 30-80 cm, glabrous or sometimes sparse hairs below. Leaves with 3-5 pairs of ovate-oblong leaflets, leaflets 11-42 × 5-20 mm, glabrous or sparsely hairy in the leaf axils; stipules free, 4-7 mm long. Peduncles longer than the leaves. Inflorescence many-flowered, lax. Calyx sparsely pilose, 5-9 mm, including teeth. Corolla white, without darker venation. Standard c. 20 mm; wings 5-7 mm; keel c. 19 mm. Ovary glabrous. Fruit pendulous, 10 × 16 mm,

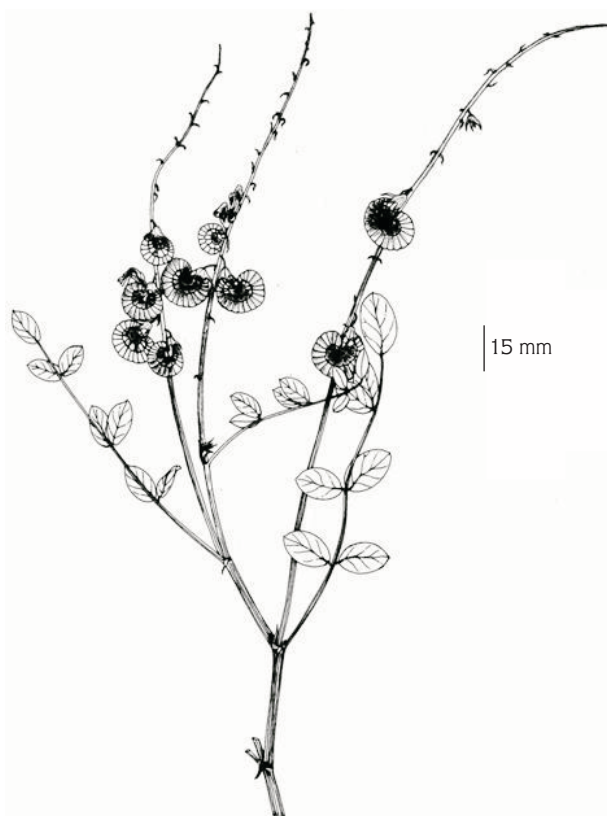


Figure 3. *Onobrychis nitida* Boiss.

glabrous with short marginal teeth and short spines on disc. Fl. 7. Roadside, gypsum. Alt. 1391 m.

Type: Turkey. B7 Cappadocia ad Euphratem, Aucher 1048 (holo. G, iso. K!)

Examined specimens: B7 Erzincan: İliç, north-east of Hasanova village, 1391 m, 39°32.10'N, 38°37.54'E, 8.vii.2005, *Kandemir* 7044.

Onobrychis nitida was listed as EX according to The IUCN Red List (Ekim et al., 2000). The specimens belonging to the genus *Onobrychis* Adans. were collected from İliç, Erzincan. These were compared with the isotype of *O. nitida* in the K herbarium (Figure 4). Then, it was determined that the specimens belonged to *O. nitida*. Some of their morphological characters differed from those of the type specimen. According to the descriptions in the *Flora of Turkey*, the type specimen of *O. nitida* is glabrous, has a yellow corolla, and leaves with 3 pairs of leaflets (Hedge, 1969); however, the specimen from İliç (*Kandemir* 7044) has a sparsely pilose calyx



Figure 4. *Onobrychis nitida* Boiss. (type photo, K).

tube, milky white corolla, sometimes sparsely pilose stem below and in the leaf axils, leaves with 3-5 pairs of leaflets. The colour of the corolla is milky white in the living specimen and it later turns yellow in the herbarium specimen.

O. nitida grows on gypsum steppes, with *Onosma sintenisii* Hausskn. ex Bornm., *Gypsophila lepidioides* Boiss., *Achillea sintenisii* Hub.-Mor., *Ebenus laguroides* Boiss. var. *laguroides*, *Ebenus macrophylla* Jaub. & Spach, *Hedysarum pastalozzae* Boiss., *Scrophularia lepidota* Boiss., *Allium nevsehirensense* Koyuncu et Kollmann, *Tanacetum alyssifolium* (Bornm.) Grierson, *Teucrium multicaule* Montbret et Aucher ex Benth, *Scorzonera aucherana* DC., *Thesium stellerioides* Jaub. et Spach, *Salvia euphratica* Montbret et Aucher ex Benth subsp. *liocalycina* (Rech.f) Hedge, and *Salvia divaricata* Montbret et Aucher ex Benth.

The population is estimated to number less than 2500 mature individuals and the extent of its distribution is estimated to be less than 5000 km². It should be graded as IUCN category Endangered (EN) (IUCN, 2001).

Onosma discedens Hausskn. ex Bornm. (Figure 5)

Perennial herb. Stems numerous, to 33 cm, erect, patent to subadpressed greyish-hairy, clothed at base



Figure 5. *Onosma discedens* Hausskn. ex Bornm.

with remains of old leaves. Basal leaves 55-120 × 5-12 mm, linear-lanceolate to oblanceolate, apex acute, densely silvery adpressed-setose on both surfaces, subadpressed to patent setose on margins below, margin revolute, canaliculate midrib on upper surface. Lower cauline leaves similar to basal leaves, but smaller. Upper cauline leaves sessile, silvery adpressed-setose on both surfaces, subadpressed to patent setose on margins. Cymes grouped into a dense terminal head, elongated after flowering. Lowest bracts broadly lanceolate, upper narrowly linear. Pedicels to 9 mm, long and short patent setose. Calyx c. 16 mm in flower, c. 20 mm in fruit, densely patent long and short setose. Corolla whitish to cream, slightly longer than calyx, narrowly cylindrical, villous. Nutlet 4 mm, ovoid-triangular, shiny brown, apex acuminate. *Fl.* 6. *Serpentine places*, 1050 m.

Type: B7 Erzincan: Armenia turcica, Eğin (Kemaliye) ad Eupratem fluv. in collibus ad Salachü (Salihli), 29 vi 1890, *Sintenis* 2770 (holo. JE, Photo!).

Examined specimens: Onosma discedens. B7 Erzincan: Kemaliye, Salihli, Çimento Pass, 1502 m, 39°31.29'N, 38°28.23'E, 16 vi 2005, serpentine places, *Kandemir* 6962. — *Onosma argentatum:* B7 Erzincan: Kalkgeröl 1 km von Refahiye, 1540-1750 m, 2 vii 1953, *Hub.-Morath* 12533 (iso. E); Erzincan: Sakaltutan, 2032 m, 39°52.91'N, 39°10.23'E, 17 vi 2006, serpentine places, *Kandemir* 7241; B6 Sivas: Kızıldağ, 1700 m, 12 vii 2006, serpentine places, *Kandemir* 7795.

Onosma discedens was first collected by Sintenis from Kemaliye, Salihli in Erzincan province in 1890 (Figure 6). Although the species was listed as EX (Ekim et al., 2000), it was collected by A. Kandemir from the type locality in 2005.

Onosma discedens is very similar to *O. argentatum* Hub.-Mor. in some morphological characters. *O. argentatum* was recorded between Erzincan and Refahiye (Figure 7). *O. discedens* and *O. argentatum* are in group A in the key of the genus *Onosma* in *Flora of Turkey* (Riedl, 1978).

According to the descriptions in the *Flora of Turkey*, the leaves are discoloured in *O. discedens* and concolourous in *O. argentatum* (Riedl, 1978). The leaves of the living specimens of these 2 species are concolourous. Their dried leaves become discoloured in the course of time. The *O. discedens* specimen in the *Flora* is very old; therefore, the change in the colour of its



Figure 6. *Onosma discedens* Hausskn. ex Bornm. (type photo, JE).



Figure 7. *Onosma argentatum* Hub.-Mor. (type photo, E).

leaves is greater than that of *O. argentatum*. The colour change does not take place on the surface of the leaves. The silvery colour of the seta on the leaves turns pale green at times. This may be the reason why the 2 species are differentiated from each other in the key of the genus. These 2 species appear to be very similar with respect to general morphological characters.

In comparison with their descriptions in the *Flora of Turkey*, the differences between *O. argentatum* and *O. discedens* are as follows: the nutlets are ovoid, acuminate, and keeled, the corolla has sparsely hairy in upper part in *O. argentatum*. The nutlets are ovoid-triquetrous, brown, apex cuspidate, and the corolla is villous in *O. discedens* (Riedl, 1978). These differences are not clear in the examined specimens. The hairs are denser in young flowers and the nutlets are ovoid to triquetrous, acuminate, and slightly keeled in the examined specimens.

According to these observations, there is not enough evidence for separating those 2 species; more research is necessary in order to reach a conclusion.

O. discedens grows in serpentine, with *Arenaria cucubaloides* Smith, *Allium sivasicum* Özhatay & Kollmann, *Convolvulus pseudoscammoia* D.Koch, *Campanula ptarmicifolia* Lam. var. *ptarmicifolia*, *Centaurea aucherana* DC., *Dianthus crinitus* SM, *Hedysarum candidissimum* Freyn, *Physoptychis haussknechtii* Bornm., *Silene ruscifolia* (Hub.-Mor. & Reese) Hub.-Mor., and *Verbascum calycosum* Hausskn. ex Murb.

According to our field observations, the estimated area of occupancy is less than 10 km² and the number of individuals is less than 100. Moreover, the population appears to be under the continuous threat of excessive

grazing; therefore, it should be graded as Critically Endangered (CR), because of its local existence and small population (IUCN, 2001).

Silene oligotricha Hub.-Mor. (Figure 8)

Perennial with a slender caudex. Stem erect, woody at base, glabrous below, glandular-pilose above, 28-34 cm tall; internodes 4-7 cm long. Leaves crowded at base; basal leaves slightly falcate, sparsely multi-cellular hairs at base, linear-lanceolate, acute, margins revolute, 30-60 × 1-2 mm; cauline leaves similar to basal leaves, decreasing upwards, 1-2.9 cm long; nodes lightly swollen.

Inflorescence a few-flowered dichasial cyme. Pedicels 0.4-4 cm long, glandular pilose. Calyx 13-17 mm, glandular pilose, tube widened above, constricted near apex, teeth with white membranous margins and apex. Petal whitish to greenish, bifid, glabrous. Anthophore 2.4 mm, pilose. Capsule 9-11 × 6-9 mm, included swollen calyx, teeth slightly longer than calyx. *Fl.* 6-7. Alt. 1780-1861 m.

Type: B7 Tunceli: d. Pülümür, Passhohe Pülümür-Mutu, alpine Trift, 1780 m, 7 vii 1959, *Huber-Morath* 15230 (holo. Hb. Hub.-Mor.)

Examined specimens: B7 Erzincan: Munzur Mountains, south-west of Tatlısu village, 1861 m, 39°33.61'N, 39°38.12'E, 04 vi 2005, *Kandemir* 7003.

Recent surveys have failed to rediscover *Silene oligotricha* and it is assumed that it has become extinct (Özhatay et al., 2005).

Some specimens of the genus *Silene* were collected from the Munzur Mountains (*Kandemir* 7003). They closely resembled *S. oligotricha*, except they are glandular-pilose above the stem and have a glandular-pilose calyx. The stem is glabrous and calyx puberulous in the description of *S. oligotricha* in the *Flora of Turkey* (Coode & Cullen, 1967). During a visit to the Library of Edinburgh Royal Botanic Garden in 2005, the original paper on *S. oligotricha* (Huber-Morath et al., 1967) was checked by the author and it was observed that the specimen belonged to *S. oligotricha*. It was also observed that the original description defined very well the specimen collected from the Munzur Mountains, but was shortened in the *Flora of Turkey*. Hence, the description of the species is not sufficient in the *Flora of Turkey* (Coode & Cullen, 1967).

Silene oligotricha grows with *Allium sintenisii* Freyn, *Dianthus crinitus* SM, *Eryngium illex* P.H.Davis, *Fritillaria crassifolia* Boiss., *Heldreichia rotundifolia* Boiss. and *Ricotia aucheri* (Boiss.) B.L.Burt.

According to field observations, the estimated area of occupancy is less than 10 km² and the number of individuals is less than 100. Additionally, the population appears to be under the continuous threat of excessive grazing and should therefore be graded as Critically Endangered (CR), because of its local existence and small population (IUCN, 2001).

Some very old specimens collected from only 1 locality in the past may have lost some of their morphological features. As their morphological characters are limited to a

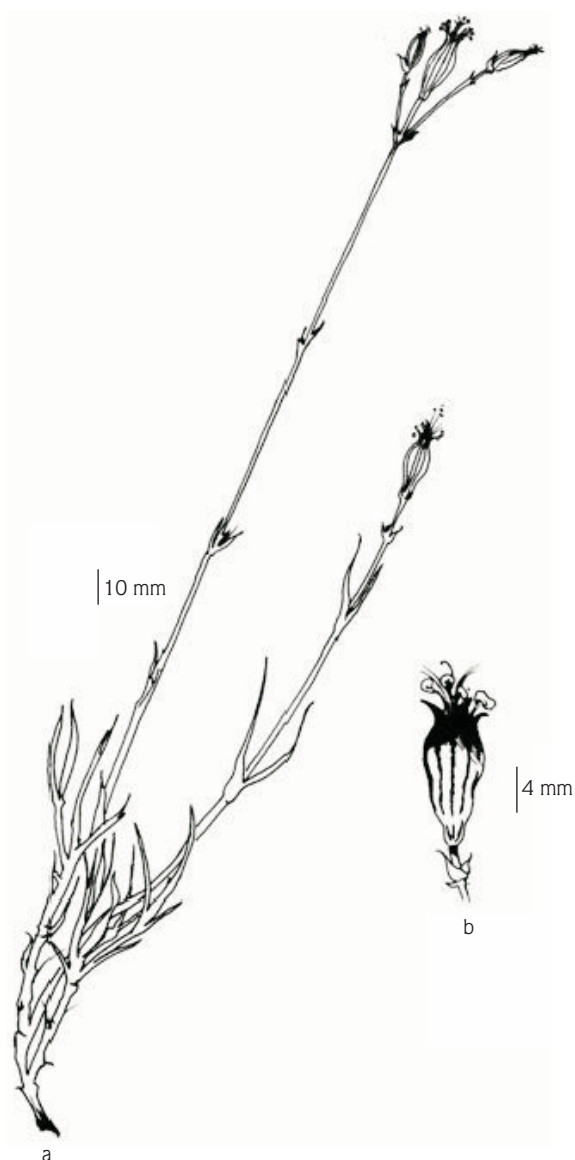


Figure 8. *Silene oligotricha* Hub.-Mor. a. habit, b. calyx in fruit.

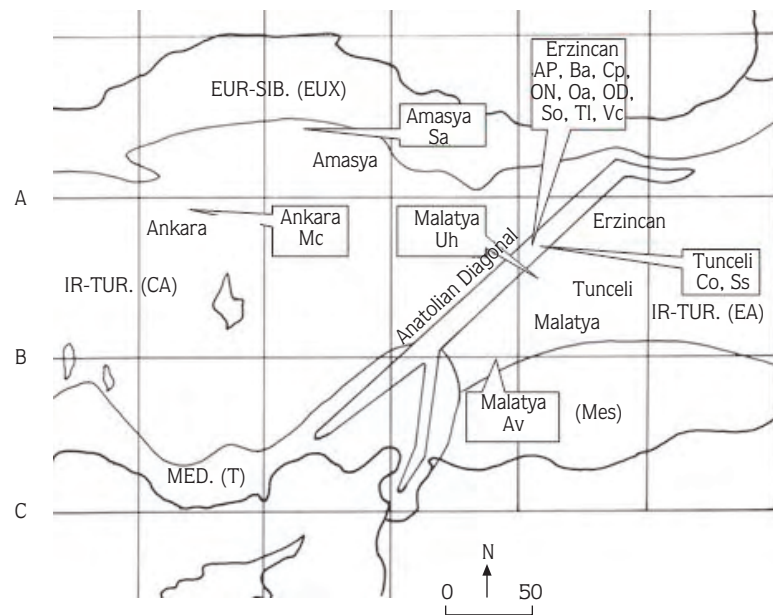


Figure 9. Distribution of the taxa thought to have been extinct in Turkey. Av: *Alkanna viscidula*; Ap: *Astragalus pseudocylindraceus*; Ba: *Barbarea auriculata* var. *auriculata*; Co: *Campanula oligosperma*; Cp: *Centaurea psephelloides*; Mc: *Minuartia corymbulosa* var. *breviflora*; On: *Onobrychis nitida*; Oa: *Onosma affine*; Od: *Onosma discedens*; Sa: *Serratula aznavoriana*; So: *Silene oligotricha*; Ss: *Silene surculosa*; TI: *Teucrium leucophyllum*; Uh: *Urtica haussknechtii*; Vc: *Verbascum calycosum*.

few samples, those samples naturally do not represent all variations of the species; therefore, sometimes taxonomical problems occur when checking the keys and the descriptions in the *Flora of Turkey* (Coode & Cullen, 1967).

Sixteen taxa, namely *Alkanna viscidula* Boiss. (Boraginaceae), *Astragalus pseudocylindraceus* Bornm. (Fabaceae), *Barbarea auriculata* Hausskn. ex Bornm. var. *auriculata* (Brassicaceae), *Campanula oligosperma* Dambolt (Campanulaceae), *Centaurea psephelloides* Freyn & Sint. (Asteraceae), *Minuartia corymbulosa* (Boiss. & Bal.) McNeil var. *breviflora* (Boiss.) McNeil (Caryophyllaceae), *Onobrychis nitida* Boiss. (Fabaceae), *Onosma affine* Hausskn. ex H.Riedl (Boraginaceae), *Onosma discedens* Hausskn. ex Bornm. (Boraginaceae), *Serratula aznavoriana* Bornm. (Asteraceae), *Silene oligotricha* Hub.-Mor. (Caryophyllaceae), *Silene surculosa* Hub.-Mor. (Caryophyllaceae), *Teucrium leucophyllum* Montbret & Aucher ex Benth (Lamiaceae), *Triticum parvicoccum* Kislev (Poaceae), *Urtica haussknechtii* Boiss. (Utricaceae), and *Verbascum calycosum* Hausskn. ex Murb. (Scrophulariaceae), were listed as EX in Turkey

(Ekim et al., 2000; Özhatay et al., 2005). Ten of these taxa, namely *Astragalus pseudocylindraceus* Bornm., *Barbarea auriculata* Hausskn. ex Bornm. var. *auriculata*, *Campanula oligosperma* Dambolt, *Centaurea psephelloides* Freyn & Sint., *Onobrychis nitida* Boiss., *Onosma affine* Hausskn. ex H.Riedl, *Onosma discedens* Hausskn. ex Bornm., *Silene oligotricha* Hub.-Mor., *Teucrium leucophyllum* Montbret & Aucher ex Benth, and *Verbascum calycosum* Hausskn. ex Murb., are known to grow in Erzincan. *Barbarea auriculata* var. *auriculata*, *Onobrychis nitida*, *Onosma discedens*, and *Silene oligotricha* were collected during the present study and *Verbascum calycosum*, *Centaurea psephelloides*, and *Onosma affine* were collected previously (Neydegger-Hügli, 2000; Kandemir & Makbul, 2004; Aytaç et al., 2005). Nonetheless, to date, *Astragalus pseudocylindraceus* and *T. leucophyllum* have not been collected in Erzincan. It is hoped that they will be collected in the future.

Erzincan is situated on the upper Euphrates in the eastern part of Turkey. It has perfect plant diversity. The

flora of the Munzur Mountains, located between Tunceli and Erzincan provinces, have been studied (Yıldırım, 1995) and 1407 vascular plant species belonging to 479 genera and 98 families were reported. This result is evidence of the plant richness of Erzincan and its environs. Since then, new species have been discovered in Erzincan and its environs. (Karavelioğulları et al., 2004; Duran & Aytaç, 2005; Ecevit Genç et al., 2007, Kandemir, 2007; Kandemir & Hedge, 2007; Kandemir et al., 2007).

There are many reasons for the observed diversity in Erzincan. The altitude extends to 3549 m in the Esence Mountains and to approximately 900 m in the Kemaliye district. The Munzur Mountains south of the Erzincan Plain consist of calcareous rocks. The Esence and Otlukbeli Mountains in the north contain serpentine. There are large areas of gypsum around Hasanova and Kuruçay in İliç district. Erzincan is almost on the layer known as the Anatolian Diagonal, which is an important region for the spread of the plants in Anatolia. Two of the centres of endemic plants in Turkey are in Erzincan (Ekim et al., 2000; Özhatay, 2006). One of the most distinctive features of biodiversity in this ecoregion is the Anatolian Diagonal, a remarkable floristic line crossing inner Anatolia. So named by Davis, the Anatolian Diagonal runs from the southern foothills of the Black Sea Mountains near Bayburt through the Munzur Mountains and the Anti Taurus Range, and then splits into 2 branches; 1 branch reaches the Mediterranean via the Amanus Mountains and the other via the Bolkar Mountains. Some plants species

have distributions largely confined to the Anatolian Diagonal. (Avcı, 1993). Many of Turkey's other plant species occur only to the west or only to the east of this line (Ekim & Güner, 1986).

One study emphasised that the altitude is higher east of the diagonal than to its west, that soil types and climatic conditions differ east and west of the diagonal, and that these differences affect the distribution of plants (Avcı, 1993).

It was reported, as mentioned above, that most of the species thought to have been extinct in Turkey are in the districts of Kemaliye and İliç in Erzincan. These districts are also rich in endemic species, some of which are found only in these areas. The regions of low altitude and moderate climate are on the Anatolian Diagonal. In addition, of the 16 taxa thought to have been extinct in Turkey, 12 are related to the diagonal (Figure 9). It seems that the Anatolian Diagonal was a refuge for some of these plants during the Glacial Period. Future floristic studies conducted in Erzincan may yield valuable data about the plant diversity of Erzincan and the effect of the Anatolian Diagonal on plant distribution.

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