

## REDISCOVERY OF *SCORZONERA AMASIANA* HAUSSKN. AND BORNM. - A THREATENED ENDEMIC SPECIES IN TURKEY

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### Abstract

*Scorzonera amasiana* Hausskn. and Bornm. was described from type specimens collected by J.F.N. Bornmueller in 1889 but it was not collected again until 1993, when it was found near Amasya, Turkey. Populations of *S. amasiana* were quite small at that limited locations and were vulnerable to human impacts. Therefore, suitable conservation strategies should be developed immediately in order to protect the species from probable extinction. Here, an additional three small populations are reported. Brief history, morphology, habitat and ecology of this endemic species have been discussed. Its current conservation status was re-evaluated with respect to the latest IUCN criteria. A key to distinguish it from the other closely related Turkish species is also provided and its distribution map is appended.

### Introduction

Turkey has an interesting and biodiversified rich flora. Nearly one in every three plants in Turkey is endemic, an astonishingly high percentage for a mainland country. The exceptional diversity in Turkey's flora is the collective results of a variety of climates, topographical diversity with marked changes in ecological factors over a short distance, geological and geomorphological variation, and a range of aquatic environments, such as seas, lakes, and rivers, altitudinal variation from sea level to c. 5000 m. There are a number of major mountain ranges in Anatolia that constitute effective barriers, and these have further encouraged a greater diversity of species, particularly in the inland ecosystems due to isolation (Davis and Hedge 1971, 1975).

The genus *Scorzonera* (Asteraceae) has over 160 species throughout the world. *Scorzonera* is distributed over central and southern Europe and in arid regions of Eurasia and Africa. Its centre of diversity lies in the Mediterranean phytogeographic region. The first thorough classification of the genus *Scorzonera* was given by De Candolle (Candolle 1805). Considerable changes in the treatment of the genus *Scorzonera* were later on made by Boissier (1875) who included *Podospermum* DC. and *Epilasia* (Bunge) Benth. as sections within the genus *Scorzonera*. The most complete and much changed treatments were given by Lipschitz (1935, 1939).

In the account of *Scorzonera* L. in *Flora of Turkey and the East Aegean Islands* (Chamberlain 1975), 39 species, 4 subspecies and 4 varieties were recognised. Later, three new taxa were added in the Flora of Turkey, Supplement II (Güner *et al.* 2000). Recently, *Scorzonera ekimi* A. Duran, *S. adilii* A. Duran, *S. ulrichii* Parolly & N. Kilian [= Syn: *S. gokcheoglui* O.Ünal & R.S. Göktürk], *S. karabelensis* Parolly & N. Kilian, *S. yildirimlii* A. Duran & Hamzaolu and *S. aytatchii* A. Duran & Saıro lu (*S. rigida* Aucher = Syn: *S. aytatchii* A. Duran & Saıro lu) have been described. The total number of *Scorzonera* in Turkey at present is 47 species, 4 subspecies and 4 varieties, out of which 28 taxa are endemic to Turkey (endemism 50.9 %) (Davis *et al.* 1988, Güner *et al.* 2000, Duran 2002 a,b, Duran and Saıro lu 2002, Parolly and Killian 2002, 2003, Ünal and Göktürk 2003, Duran and Hamzaoglu 2004).

The first specimens belonging to *S. amasiana* were collected by J.F.N. Bornmueller from Amasya (A5, *sensu* Davis 1965) near the Lokman mountain in 1889 and then described as a new species by C. Haussknecht and J.F.N. Bornmueller in 1904. The present study indicates that the species has not been collected since 1889. Now, it is collected for the second time in 1993 from Kırklar mountain in Amasya after 104 years.

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Numerous studies show that narrow endemisms are susceptible to extinction for a variety of reasons, one of the most important being the destruction of their habitats. Locally endemic taxa are the first to experience the negative effect of habitat destruction or fragmentation, and endemic species are used to define areas which need to be preserved. The precise evaluation of the conservation status of a particular species is a necessary condition in order to successfully prevent its extinction. An important tool for this purpose is the determination of the degree of threat (or alternatively the expectation of survival) of taxa to which a special significance is attributed (Bernardos *et al.* 2006). Because of these reasons, the objectives of this paper are to document the rediscovery of populations of *S. amasiana*, to provide its amplified morphological descriptions, distributions and habitats, to report the vegetation where it grows and to accurately assess its conservation status.

### Materials and Methods

All published informations on the presence of this taxon and consulted documentation in main Turkish herbaria such as ANK, GAZI, ISTE and HUB were reviewed but the authors could not find any specimens of *S. amasiana* in these herbaria. During the period 1993 - 2003, its type locality, as well as a number of other sites at which it might potentially occur, were visited.

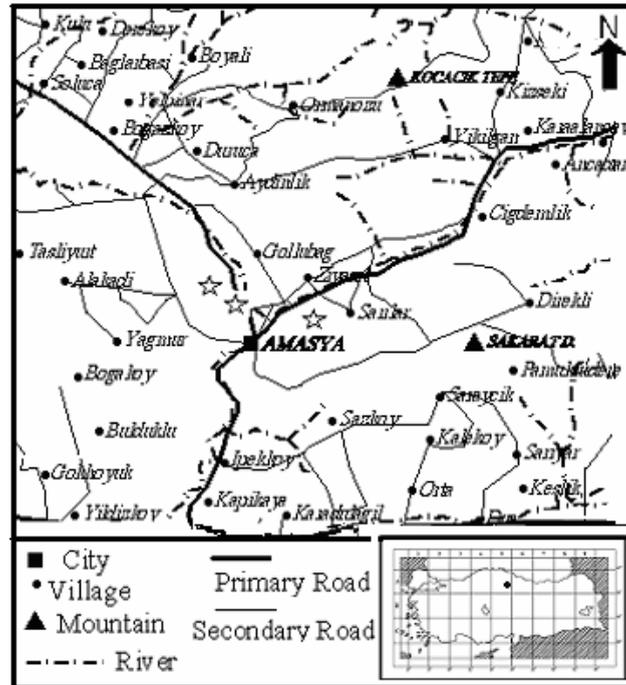


Fig. 1. Distribution map of *Scorzonera amasiana* (☆).

The species is only known from the type locality, but our recent field studies indicate that the species grows in three small locations near Amasya (Fig.1). When the species was detected, the authors recorded geographical location, habitat, phenological data and field notes. Following years, the authors visited these populations again to determine the vulnerability of it; and applied a recently developed method for assessment of the extinction risk (IUCN 2001). The authors observed following criteria: its population and population size, the number of mature individuals, the area of occupancy and locations. In addition, they prepared herbarium specimens and took

photographs (Fig. 2). Besides, during the endemic plants project which is supported by TUBITAK and State Planning Organisation (SPO), the authors collected many seeds and then they were sent to seed bank for long term preservation.



Fig. 2. General appearance of *S. amasiana* in type locality.

The Flora of Turkey and recent papers were consulted for the identification of the specimens (Davis 1965; Davis *et al.* 1988; Güner *et al.* 2000). Authorities for all cited plant names are given according to Authors of Plant Names (Brummit & Powell 1992). The materials collected by authors were preserved in the OMUB.

### Results and Discussion

*Scorzonera amasiana* Hausskn. & Bornm. in Mitt. Thür. Bot. Ver. 20:24 (1904). Ic: Lipschitz, Fragm. Monogr. Gen. Scorz. 1: t. 56 (1956).

Ascending, caulescent, perennial; rootstock cylindrical, thick; stems (8-) 12 - 27 cm. Leaves entire, (6-) 8-12 × 0.7-1.2 cm, narrowly lanceolate, sparsely villous, more densely so below; margin undulate, contracted below into a c. 0.8-1.1 cm petiole. Capitula 2-3 (-5) per stem, 15-24 mm long. Outer phyllaries 5-8 (-10) mm, aristate-lanceolate; inner phyllaries 11-15 mm, ligulate. Flowers yellow. Achenes 9-11 (12) mm, narrowly cylindrical, glabrous; ridged, pappus hairs sparsely plumose below, barbellate above.

*Typus*: [Turkey A5 Amasya-Turkey] Amasya in rupibus regionis calidae (Mt. Logman), 360-800 m, 18.5.1889 & 26.5.1889, *Bornmüller* 699 (sub *S. pontica*) (iso. JE, K!).

Endemic, New Localities: A5 Amasya: Kırklar Mountain, SW slopes, calcareous rocks, 500-650 m, 15.5.1993 *FK 5510!*, *ibid.* 590 m., 20.v.1994, *Cansaran* 293, *ibid.* 30.6.1996, *FK 6658!*; *ibid.* 15.5.2000, *FK 11200!*; A5 Amasya Ye ilırmak valley, around Kızılca village, ahinkaya, 440 m, 2.6.2003, *FK 14550!*.

*S. amasiana* is closely related to *S. cinerea* Boiss. and *S. kotschyi* Boiss., but it seems to be quite different. *S. amasiana* differs from *S. cinerea* in its leaves being sparsely villous and

undulate at margin. Similarly, it is clearly different from *S. kotschyi* on its stem being not lanate hairy, petiole 8-11 mm, and glabrous achenes..

**Key to the species of *S. amasiana*, *S. cinerea* and *S. kotschyi*.**

1. Capitula 10-20 mm long; inner phyllaries 8-12, achenes 4 mm and densely lanate *S. kotschyi*
1. Capitula 15-25 mm long; inner phyllaries 12-20; achenes 9-12 mm and glabrous
  2. Leaves densely grey-villous, with entire margin *S. cinerea*
  2. Leaves sparsely villous, with undulate margin *S. amasiana*

**Table 1. A comparison of selected characters of *S. amasiana*, *S. cinerea* and *S. kotschyi*.**

Characters	<i>S. amasiana</i>	<i>S. cinerea</i>	<i>S. kotschyi</i>
Habit	Ascending	Erect	Decumbent or ascending
Stem (cm)	12-27	20-50	10-25
Petiole (mm)	8-11	Sessile	Sessile
Indumentum of stems	Not lanate	Not lanate	Patchily lanate
Capitula (mm)	17-20	15-25	10-20
Capitula per stem	2-3(-5)	1-5	1(-3)
Outer phyllaries (mm)	5-8 (-10)	6-10	5-10
Inner phyllaries(mm)	11-15	14-20	8-12
Achenes (mm)	9-11 (12)	10-12	4
Indumentum of achenes	Glabrous	Glabrous	Densely lanate

*Distribution and recommended threatened category:* *S. amasiana*, previously known only from the type locality, was discovered at three other locations (Kırklar, Enderun Mountain and vicinity of Kızılca village) near Amasya province. The area in which *S. amasiana* was discovered, is a transition zone between two phytogeographical provinces; Irano-Turanian and Euro-Siberian phytogeographical region. Such transition zones have interesting properties, due to the mixing zone of oceanic and continental climates (Karaer *et al.* 1995).

Based on the available data, its current conservation status was re-evaluated. For the first time, it was assessed as Critically Endangered (CR) in Turkish Red Data Book (Ekim *et al.* 2000). According to the recent field surveys, the species is distributed in less than 500 km<sup>2</sup> (criterion B2) and the mature individual plants number is less than 2500 (criterion C) and known from four locations. Therefore, it has to be placed in Endangered (EN) category (IUCN 2001).

*Phenology:* *S. amasiana* starts to flower in early May, but main flowering period is mid May to mid June.

*Pollination:* Some *Scorzonera* species are pollinated by aphid Hymenoptera, Lepidoptera, Diptera and Coleoptera (Colling & Matthies 2004). Its achenes are wind-dispersed.

*Habitat and ecology:* *S. amasiana* grows on limestone rocks and stony mountain slopes facing south. Its altitudinal range varies between 360 and 1000 m. But, most of the populations are located at altitudes between 500 and 750 m. Other species growing in the area were *Quercus infectoria* Olivier subsp. *infectoria*, *Cistus creticus* L., *Rhamnus petiolaris* Boiss., *Haplophyllum armenum* Spach, *Cotoneaster nummularia* Fisch. & Mey., *Phillyrea latifolia* L., *Verbascum naticum* (Fisch. & Mey) Hub.-Mor., *V. orientale* (L.) All., *Pistacia terebinthus* L. subsp. *palaestina* (Boiss.) Engler, *Arabis caucasica* Willd. subsp. *caucasica*, *Sedum album* L., *Paracaryum ancyritanum* Boiss., *Inula aschersoniana* Janka, *Minuartia anatolica* (Boiss.) Woron. var. *anatolica*, *Linum nodiflorum* L., *L. corymbulosum* Reichb., *Sideritis montana* L. subsp. *remota* (D'urv.) P.W. Ball ex Heywood, *Muscari armeniacum* Lerchtlin ex Baker,

*Micromeria myrtifolia* Boiss. & Hohen, *Cruciata taurica* (Pallas ex Willd.) Ehrend, and *Bellevalia gracialis* Feinbrun.

The climate condition of the research area was obtained from the meteorology station in Amasya. The dominant bioclimate is characterized as a semi-arid Mediterranean climate. The Mediterranean climate is experienced by hot and dry summers followed by cold and wet winters. Rainfall is lower from the north to the south of the valley. The mean annual average temperature is 13.6°C and precipitation is 430.4 mm. It can be seen that heavy rainfall is received in November to April, while the dry period extends from the beginning of June until the end of October. The most of precipitation occurs in the Spring and Winter (Akman and Daget 1971). The ombrothermic diagram shows the months with dry and rainy period (Fig. 3).

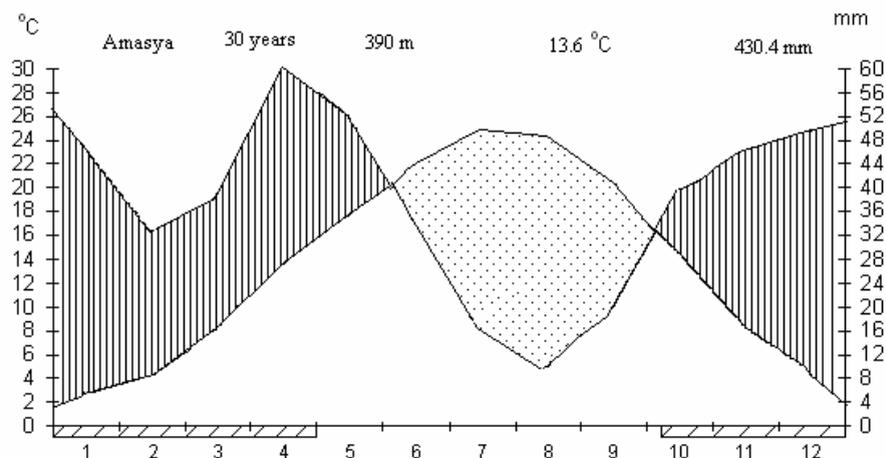


Fig. 3. Ombrothermic diagram of Amasya.

**Conservation:** The population of *S. amasiana* is quite small at limited locations and is vulnerable to human impacts. The highest density occurred in Lokman and Kırklar mountain, which are very close to city center. The distance between these two localities is approximately 5 km. Kırklar and Lokman mountain have not any conservation priority although they contain the majority of the members of *S. amasiana* and many isolated endemic taxa. Both distribution areas are affected by anthropic habitat degradation by urbanization and recreational activities. Therefore, it is necessary to take steps to conserve the habitat as soon as possible, because urbanization is one of the leading causes for species extinction.

The area needs to be legally protected with protection of the small populations and vegetation. In addition, several other measures need to be considered such as a population census, rehabilitation or restoration of damaged habitats, transferring the species in surrounding protected areas and cultivation in botanical gardens (Akhani and Ghorbani 2003).

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