

## 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 was not collected again until 1993, when we found it in Kirkklar and Enderun Mountain near Amasya, Turkey. The population of *S. amasiana* is quite small at that limited locations and is vulnerable to human impacts. Therefore, suitable conservation strategies should be developed in order to preserve the species as soon as possible. Here, we reported an additional three small populations. We also discuss its history, morphology, habitat and ecology. Its current conservation status was re-evaluated with respect to latest IUCN criteria. A key to distinguish it from the other closely related Turkish species is also provided and its distribution map is given.

**Key words:** *Scorzonera* . rediscovery . critically endangered . Turkey

### INTRODUCTION

Turkey covers 779.452 km<sup>2</sup>, of which 3% lies in European Turkey (Thrace), the remainder in Asian Turkey (Anatolia). With around 9000 species, the flora is the richest of any country in Europe, North Africa and the Middle East and indeed is more typical of a continent or tropical country than an individual temperate country. Of these, nearly one in every three plants is endemic, an astonishingly high percentage for a mainland country. The main reasons for this wealth are as follows: a variety of climates, topographical diversity with marked changes in ecological factors over a short distance, geological and geomorphic variation, a range of aquatic environments such as seas, lakes and rivers, altitude variations from sea level to 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. The situation of the country at the junction of three major phytogeographical regions: the Euro-Siberian element that predominates in the cooler northern parts of the country; the Mediterranean element that is mainly restricted to the mild climatic zone along Turkey's southern and western shores; and the Irano-Turanian element, characteristic of the vast steppes and mountains of Inner Anatolia with a continental climate characterized by soaring summer temperatures and often bitterly cold winters. Additionally, during many historical periods, Anatolia has served as a passage way

between the continents of Europe, Asia and Africa, resulting in the dispersal of a wide variety of plants and animals [1].

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 grouping of the genus *Scorzonera* was given by De Candolle [2]. Considerable changes in the treatment of the genus *Scorzonera* were made by Boissier [3] who included *Podospermum* DC. and *Epilasia* (Bunge) Benth. as sections within the genus *Scorzonera*. The most complete and much changed system were given by Lipschitz in the "Fragmente Monographiae *Scorzonera*" [4, 5].

In the account of *Scorzonera* L. in *Flora of Turkey and the East Aegean Islands* [6], 39 species, 4 subspecies and 4 varieties were recognised. Later, Three new taxa were added in the Flora of Turkey supplement II [7]. Recently, *Scorzonera ekimi* A.Duran, *S. adilii* A. Duran, *S. ulrichii* Parolly and N. Kilian [= Syn: *S. gokcheoglui* O.Ünal and R.S. Göktürk], *S. karabelensis* Parolly and N. Kilian, *S. yildirimlii* A.Duran and Hamzaoglu and *S. aytatchii* A. Duran and Sagioglu (*S. rigida* Aucher = Syn: *S. aytatchii* A.Duran and Sagioglu) have been described. The total number of *Scorzonera* in Turkey at present is 47 species, 4 subspecies and 4 varieties, 28 taxa of which are endemic to Turkey (endemism 50.9%) [8-15].

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The first specimens belonging to *S. amasiana* Hausskn. and Bornm. were collected by J.F.N. Bornmüller from Amasya (A5, *sensu* [16]) near the Lokman Mountain in 1889 and then described as a new species by C. Haussknecht and J.F.N. Bornmüller in 1904. Our study indicates that the specimen has not been collected since 1889. It is collected for the second time in 1993 from Kırklar Mountain in Amasya after 104 years.

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. Because of that, locally endemic taxa are the first to experience the negative effect of habitat destruction or fragmentation and endemic species are used to define areas 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 [17].

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

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

The species is only known from the type locality, but our recent field studies indicate that the species grows three small locations near Amasya (Fig. 1). When the species was detected, we recorded geographical location, habitat, phenological data and field notes. Following years, we visited these populations again to determine the vulnerability of *S. amasiana*, we applied a recently developed method for assessment of the extinction risk in IUCN [18]. We observed following criteria: its population and population size, the number of mature individuals, the area of occupancy and locations. In addition, we prepared herbarium specimens and took photographs (Fig. 2).

The Flora of Turkey and recent papers were utilized in the identification of the specimens [7, 8, 16].

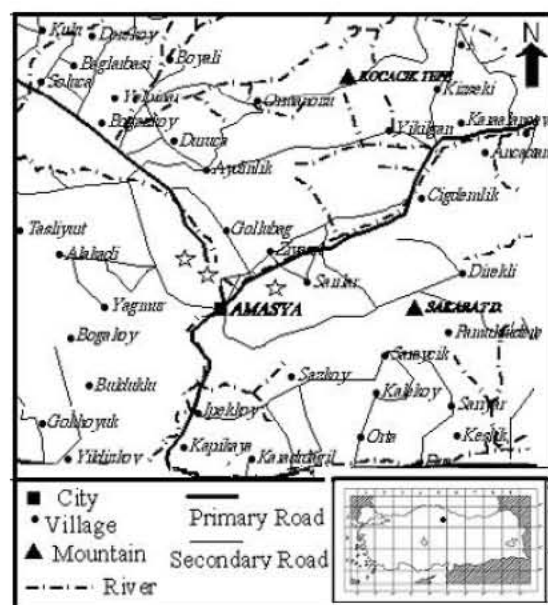


Fig. 1: Distribution map of *Scorzonera amasiana* (☆ )

Authorities for all cited plant names are given according to Authors of Plant Names [19]. The materials collected by authors are preserved in the Amasya University, Department of Educational Science.

Ascending caulescent perennial; rootstock cylindrical, thick; stems 8-27 cm. Leaves entire, (6) 8-12 x 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 per stem, 15-24 mm long. Outer phyllaries 5-8 mm, aristate-lanceolate; inner phyllaries 11-15 mm, ligulate. Flowers yellowish. Achenes 9-11 (12) mm, narrowly cylindrical, glabrous. Fl. 5-6. Calcerous rocky slopes, stony mountain slopes facing south, Altitude: 440-1000 m.

**Typus:** [Turkey A5 Amasya-Turkey] Amasya in rupibus regionis calidae (Mt. Logman), 360-800 m, 18 v and 26 v 1889, Bornmüller 699 (sub *S. pontica*) (iso. JE, K)

**Endemic, Local, New Localities:** A5 Amasya: Kırklar Mountain, SW slopes, calcerous rocks, 500-650 m, 15.5.1993 FK 5510!, ibid. 590 m., 20.5.1994, FK 6658!, ibid. 15.05.2000, FK 11200!; A5 Amasya Yesilirmak valley, around Kızılca village, Sahin-kaya, 440 m, 2.06.2003, FK 14550!.

## RESULTS AND DISCUSSION

**Distribution and recommended threatened category:** *S. amasiana*, previously known only from the type





Fig. 2: *Scorzonera amasiana*

locality, was discovered at three other locations (Kirkklar, Enderun Mountain and vicinity of Kizilca village placed on the southern part of the Yesilirmak Valley) 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. Local Mediterranean climates are seen in the region [20, 21].

Based on our data, we re-evaluated its current conservation status. For the first time, it was assessed as Critically Endangered (CR) in Turkish Red Data Book [22]. According to our recent field surveys, the species is distributed less than 500 km<sup>2</sup> (criterion B2) and the mature individual plants number is less than 2500 (criterion C) and known four locations. Therefore, it has to be placed in Endangered (EN) category [18].

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

**Pollination:** Some *Scorzonera* species are pollinated by apoid Hymenoptera, Lepidoptera, Diptera and Coleoptera [23] but we do not have any information about its pollinator. 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 440-1000 m. But, most

populations are located at altitudes between 500-750 m. Other species growing in the area are *Quercus infectoria* Olivier subsp. *infectoria*, *Cistus creticus* L., *Rhamnus petiolaris* Boiss., *Haplophyllum armenum* Spach, *Cotoneaster nummularia* Fisch. and Mey., *Phillyrea latifolia* L., *Verbascum naticolicum* (Fisch. and Mey) Hub.-Mor., *V. orientale* (L.) All., *Pistacia terebinthus* L. subsp. *palaestina* (Boiss.) Engler, *Scorzonera cana* (C. A. Meyer) Hoffm. var. *cana*, *Arabis caucasica* Willd. subsp. *caucasica*, *Sedum album* L., *Paracaryum ancyritanum* Boiss., *Inula aschersonianiana* 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* Lerchtl. ex Baker, *Micromeria myrtifolia* Boiss. and Hohen, *Cruciata taurica* (Pallas ex Willd.) Ehrend., *Bellevia gracialis* Feinbrun.

The climate of the research area was examined using data from the meteorology station in Amasya, where is located in the northern Turkey, but dominant bioclimate is characterized as a semi-arid Mediterranean climate. The Mediterranean climate is experienced by hot and dry summers followed cold and wet winters [24]. Rainfall is lower from the north to the south of the valley [25]. The mean annual average temperature is 13.6°C and precipitation is 430.4 mm. It can be seen that heavy rainfall is in November to April, while the dry period extends from the beginning of June until the end of October. The most of

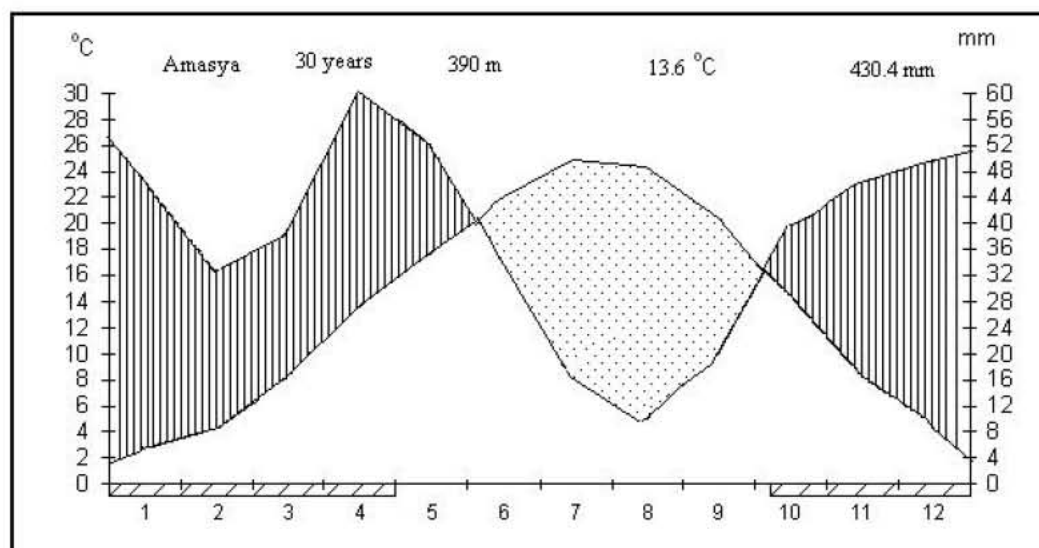


Fig. 3: Ombrothermic diagram of Amasya

precipitation occurs in the Spring and Winter. The ombrothermic diagram shows the months with dry and rainy period (Fig. 3).

**Conservation:** The population of *S. amasiana* is quite small at that limited locations and is vulnerable to human impacts. The highest density occurred in Lokman and Kırklar Mountain, where is 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 of species extinction.

The area needs to be legally protected with protection of the small population and vegetation is urgent. 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 [26]. Besides, during the endemic plants project which is supported by State Planning Organisation (SPO), we had collected many seeds and then they were sent to seed bank for long term preservation.

Although *S. amasiana* looks close to *S. cinerea*, it has quite different from *S. cinerea* because of its leaves sparsely villose and undulate at margin.

#### Key to Turkish species closely related to *S. amasiana*

- Capitula 15-25 mm long; leaves villous
  - Leaves densely grey-villous, margin plane... *S. cinerea*
  - Leaves sparsely villous, margin undulate... *S. amasiana*
- Capitula 25-45 mm. Long; leaves crisped-pubescent or lanate-floccose becoming glabrous
  - Flowers pink to lilac... *S. papposa*
  - Flowers yellow
    - Leaves subcoriaceous: Achenes ridged but not rugulos... *S. acuminata*
    - Leaves herbaceous: Achenes ridged and rugulose-tuberculate... *S. hispanica*

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