

## CENTAUREA FENZLII, A NEW RECORD FOR THE FLORA OF THE SOUTH CAUCASUS

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*Centaurea fenzlii* Reichardt (Asteraceae) is reported as a new record for the flora of Armenia. *Centaurea fenzlii* is a species from the *Centaurea* sect. *Cynaroides*, a section with no previous records in the South Caucasus. It is found in Vayots Dzor Province, in the steppe surrounded by sparse juniper and oak communities. In this paper, a key for the biennial *Centaurea* spp. in the South Caucasus as well as updated diagnostic characters are provided. The article discusses phytogeographical data for the new population and addresses concerns related to the conservation status of the species.

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**Keywords:** Asteraceae; flora of Armenia; *Centaurea*; sect. *Cynaroides*; threatened species

### *Centaurea fenzlii* گزارشی جدید برای فلور جنوب قفقاز

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گونه *Centaurea fenzlii* از بخش *Cynaroides* به عنوان رکورد جدید برای فلور ارمنستان گزارش می‌شود. این گونه در استپهای محصور توسط جوامع ارس و بلوط در استان وایوتس دزور (Vayots Dzor) حضور دارد. در این مقاله کلید شناسایی گونه‌های دو ساله جنس *Centaurea* در جنوب قفقاز و هم‌چنین صفات تشخیصی به روز شده و شرح گونه *Centaurea fenzlii* ارائه می‌گردد. به علاوه اطلاعات فیتوجغرافیایی برای جمعیت جدید این گونه و مسایل مربوط به جایگاه حفاظتی آن مورد بحث قرار می‌گیرد.

## INTRODUCTION

Recent revisions and phylogenetic work have drastically changed the infrageneric taxonomy of the genus *Centaurea* L. (Asteraceae), (Garcia-Jacas & al. 2006; Hilpold & al. 2014). These changes have led, in particular, to the inclusion of many former subgenera into the subgenus *Centaurea* (former *Centaurea Jacea*

Group) at the level of sections. This major subgenus within *Centaurea* is distributed in the Irano-Turanian and Mediterranean floristic regions and has been accordingly divided into the Western Mediterranean (WMC), Circum-Mediterranean (CMC), and Eastern Mediterranean (EMC) clades (Hilpold & al. 2014). In the South Caucasus, the subgenus *Centaurea* is

represented by about 39 species grouped under the following 10 sections (Takhtajan 2008; Hilpold & al. 2014):

- 1) **WMC**: Sect. *Mesocentron* (Cass.) DC. (1 sp.)
- 2) **CMC**: Sect. *Phrygia* Pers. (4-5 spp.), Sect. *Centaurea* (12-14 spp.)
- 3) **EMC**: Sect. *Grossheimia* (Sosn. & Takht.) Dittrich (4 spp.), Sect. *Calcitrapa* DC. (2 spp.), Sect. *Chartolepis* (Cass.) DC. (1 sp.), Sect. *Cheirolepis* (Boiss.) O. Hoffm. (2 spp.), Sect. *Phaeopappus* (DC.) O. Hoffm. (4 spp.), Sect. *Microlophus* (Cass.) DC. (4-5 spp.), Sect. *Rhizocalathium* Tzvelev (5-6 spp.)

The section *Cynaroides* Boiss. ex Walp., an enigmatic section within *Centaurea* subgen. *Centaurea*, includes 37 species with very narrow distribution areas, mainly in W Iran, Iraqi Kurdistan, SE Anatolia, and NW Syria, except for the two isolated species distributed in NE Greece and SW Iran (Negaresh & Rahiminejad 2018). Moreover, two species of unresolved status endemic to NE Iran and E Anatolia are attributed to this section (Akhani, 1999; Behcet & al. 2017). None of the species from this section has ever been recorded in the South Caucasus till now.

During three field trips to the Herher Open Woodland State Sanctuary, Vayots Dzor province of Armenia, conducted in July and October 2021, a population of a beautiful *Centaurea* species was found. After detailed studies, the species was identified as *C. fenzlii* Reichardt. Therefore, we report a new record of *Centaurea fenzlii* from Armenia. The species was previously known as a Turkish endemic with disjunctive populations in E Anatolia (Wagenitz 1975). The closest record of *C. fenzlii* to the South Caucasus was detected at a distance of 100 km from the borders of Armenia (Hamur, Murat valley, Turkey; for details, see "Additional specimens examined"). As a result, *C. fenzlii* is the single representative of the section *Cynaroides* in the S Caucasus.

## MATERIAL AND METHODS

The first finding of the species was obtained in July 2021, during a field trip to Herher Open Woodland State Sanctuary. Literature screening (Wagenitz 1975; Negaresh & al. 2018; Behcet & al. 2017; Duran & al. 2006) and studies of additional virtual herbarium specimens (see Results) were applied to determine the species. The species' population and habitat were further studied during two supplementary expeditions held in July and October 2021. Herbarium vouchers were collected and stored in the Herbarium of the Institute of Botany after A. Takhtajyan, National

Academy of Sciences of Armenia (ERE). Mapping data were retrieved from virtual herbarium specimens (see the Results section) and published data (Behcet & al. 2017; Wagenitz 1975).

## RESULTS

### New record

*Centaurea fenzlii* Reichardt, 1863, Verb. Zool. -Bot. Ges. Wien 13:1039, (Figs. 1a-d)

**Typus:** Turkey, Muş: "in Kurdistaniae armenae provincia Musch ad radices montis Bimgoell prope pagum Gungum, ubi semina mense Aug. 1859 legit clariss. Dr. Theodor Kotschy. Planta ex his culta in horto bot. Vindobonensi floruit mense Julio anni 1863".

Biennial plant with a thickened taproot. Stems are erect, 30-130 cm tall, mostly unilaterally branched. Leaves are rigid-coriaceous, scabrous; the basal ones are ovate-rotundate, slightly cordate at base, petiolate, and the lower cauline leaves are similar to the basal ones, with broadly winged petiole; median cauline leaves are elliptic, sessile, and narrowly decurrent; the upper cauline leaves are linear; the uppermost ones/bracts are similar to the appendages of the outer phyllaries. Axils of cauline leaves often have undeveloped small capitula, acute reniform, 3x6 mm to hypocrateriform, globose, and very depressed, (5) 10-20 x 5-15 mm. Large (developed) capitula (1) 2-3 (4) are characteristic. Involucre globose, adpressed-globose or crateriform, (20) 25-35 x 35-60 mm. Phyllaries are multiseriate and imbricate, 12-14 x 9-11 mm, 20-27 x 12-15 mm, 30-36 x 5-6 mm (length and width of the outer, middle, and inner phyllaries respectively). Appendages are orbicular, totally concealing the basal part of phyllaries, straw-colored but the shades become lighter gradually towards the outer parts, without spine, and ciliate, 11-12 x 9-10mm, 15-17 x 12-15mm, 3-4 x 2.5-3 mm (length and width of outer, middle and inner appendages respectively). Cilia are 1-3.5 mm long, shortening towards the apex. The receptacle is densely covered with long, white, soft, and spiral twisted bristles. The flowers are yellow. Achenes are oblong, 5.5-6 mm long, brown; with brown, double, persistent pappus, 5-10 mm long. Fl. June, Fr. July-Aug

**Specimens examined:** Armenia, Vayots Dzor Province, the southeastern slope of Teksar mountains, Herher Open Woodland State Sanctuary, steppe habitat, 2050 m a. s. l., leg. A. Asatryan, 6 July 2021, det. A. Rudov, 22 July, 2021, ERE 200120-200122; the same site, 25.07.2021, A. Asatryan, A. Nersesyan, A. Rudov, ERE 200123; the same site, 2030 m a. s. l., 15 October 2021, A. Asatryan, ERE 200124.



Fig. 1. *Centaurea fenzlii*. A, Flower; B, undeveloped capitule; C, capitule in fruit; D, receptacle with bristles (photos by A. Asatryan).

**Additional specimens examined:** Turkey, Mush: in Kurdistaniae armenae provincia Musch ad radices montis Bimgoell prope pagum Gumgum. 01.07.1863, Kotschy 0017531 (holo.: W); Mush: road from Mush to Bingöl. 1200M, sandy loam, 1972, Brown 00476306 (E); Mush: 6 km S. of Varto, 1600 m, bare S banks, 11.07.1966, Davis 00476304 (E); Mush: ad viam 35 km NW Mush versus Bingöl, 1500 m, 01.07.1975, Rechanger 00476302 (E); Malatya: Arapkir-Kemaliye, Brachfeld 12 km nach Arapkir, 1160 m, 28.06.1949, Huber-Morath 00476303 (E); Agri: 2km SW of Hamur (Murat valley), 1670 m, sloping meadows, 01.06.1966, Davis 00476305 (E)

**Karyology:** The chromosome number  $2n=18$  has been reported for the Turkish populations of *C. fenzlii* (Uysal & al. 2009; Polat 2009; Gedic & al. 2014; Aksoy & al. 2016). No information is currently available on the chromosome number of the Armenian population. However, it is likely that their chromosome set will not differ from the Turkish populations, as in general the same chromosome numbers have been reported for most species of *Centaurea* sect. *Cynaroides* (Negaresh & Rahiminejad 2018).

#### **Distribution and habitat in the South Caucasus:**

According to our field data, only one population of *C. fenzlii* is known in Armenia. It occupies an area of about 20 hectares in the Dareghegis floristic region within the Herher Open Woodland State Sanctuary. The population is located at an altitude of 1990-2070 m, on a slightly sloping (15-20°) area of SW exposition. The species' habitat represents small fragments of steppe vegetation surrounded by sparse juniper and oak communities (Fig. 2). Tree and shrub species are found all over the area as single individuals, as well as small groups of *Juniperus polycarpus* K. Koch, *Quercus macranthera* Fisch. & C. A. Mey. ex Hohen, *Crataegus orientalis* Pall. ex M. Bieb., *Acer ibericum* M. Bieb., *Fraxinus excelsior* L., *Pyrus* spp. and others.

*Centaurea fenzlii* dominates over the 30-50 cm high grass stand. The accompanying species, which are abundant in large parts of the area, are *Stipa lessingiana* Trin. & Rupr., *Rosa pimpinellifolia* L., *Vicia tenuifolia* Roth, *Hordeum bulbosum* L., and *Phleum phleoides* (L.) H. Karst.

The following species are rather abundant: *Asyneuma rigidum* (Willd.) Grossh., *Dactylis glomerata* L., *Teucrium polium* L., *Hypericum hyssopifolium* Chaix, *Falcaria vulgaris* Bernh., *Galium verum* L., *Centaurea daralagoezica* (Fomin) Greuter, *Ferula rigidula* DC., *Klasea radiata* (Waldst. & Kit.) Á. Löve & D. Löve, *Centaurea phrygia* subsp.

abbreviata (K. Koch) Dostál, *Centaurea aggregata* Fisch. & C. A. Mey. ex DC., *Centaurea virgata* Lam., *Crepis pannonica* (Jacq.) K. Koch, *Helichrysum armenium* DC., *Onobrychis transcaucasica* Grossh., *Salvia nemorosa* L., *Dianthus calocephalus* Boiss., *Rumex crispus* L., *Phlomis pungens* Willd., *Pimpinella saxifraga* L.

The following species, such as *Eryngium campestre* L., *Rindera lanata* (Lam.) Bunge, *Prangos ferulacea* (L.) Lindl., *Astragalus lagopoides* Lam., *Rosa oxyodon* Boiss., *Cerintho minor* L., *Gelasia latifolia* (Fisch. & C. A. Mey.) Zaika, Sukhor. & N. Kilian, *Scorzonera bicolor* Freyn & Sint., *Polygonum luzuloides* Jaub. & Spach., *Silene bupleuroides* L., *Astragalus compactus* Lam., *Reichardia glauca* Matthews, *Chaerophyllum macrospermum* (Willd. ex Schult.) Fisch. & C. A. Mey., *Taraxacum montanum* (C. A. Mey.) D. and *Cotoneaster transcausicus* Pojark. are found as few individuals or as single plants.

The area in which *C. fenzlii* is found has been touched by reforestation works in 1978-80s and 1995-96s and has been used for hay mowing for several decades until the mid-1990s.

**General Distribution:** SE & E Turkey/E Anatolia (Ağrı, Bingöl, Erzurum, Mush and Malatya Provinces), S Caucasus (Armenia), (Fig. 2). In Turkey, the habitats of the species include steppes, forests, fallow fields (Wagenitz 1975), as well as hay meadows with sparse deciduous trees and small groves (Wagenitz 1975; Negaresh & al. 2018; Behcet & al. 2017; Duran & al. 2006), on 1100-1850 m a. s. l.

#### **Conservation assessment**

We observed both, young and mature individuals of *C. fenzlii*. For a preliminary assessment of the population size and density, the mature plants were considered. The population density is dishomogenous: there are few groups with a higher number of individuals (5-7/m<sup>2</sup>) and areas with a lower number or just a few individuals in between the groups. Within the entire population of *C. fenzlii*, we counted about 1300 individuals of mature specimens. All of them were healthy, producing a large number of fertile achenes.

Despite the Armenian population being more or less isolated and located in a hardly accessible natural habitat within a protected area, the factors of small population size, single location, and very limited area of occupancy, rank the *C. fenzlii* as a threatened species of Armenian flora, in need of both *in situ* and *ex situ* conservation. Seeds from the Armenian population are stored for the long-term *ex situ* conservation in the Seed Bank of Armenian Flora of the A. Takhtajyan Institute of Botany.

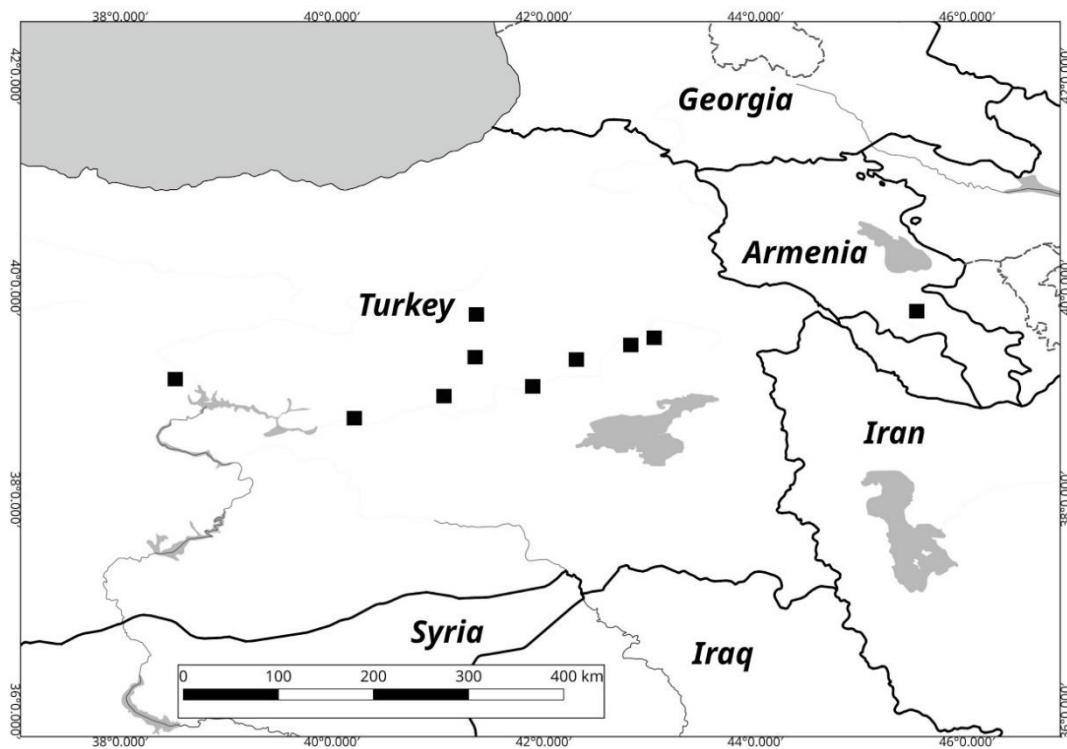


Fig. 2. Habitat of *C. fenzlii* in Herher Open Woodland State Sanctuary (Armenia, photo by A. Asatryan) and the distribution map of the species.

There is a need for more detailed studies on the species' distribution area, its population size and the main threats to its habitat. Important further steps should be a global assessment of the species' extinction risk according to IUCN criteria as well as a regional assessment for the upcoming 3<sup>rd</sup> edition of the Red Data Book of Armenia.

Moreover, the new finding emphasizes the role of the Herher Open Woodland State Sanctuary as a protected area and as an important plant area (Asatryan & Fayvush 2013). In fact, the area serves as a habitat for at least 8 plant species threatened globally and nationally and includes 5 threatened habitat types (Asatryan & Fayvush 2013).

#### Key to the biennial *Centaurea* species with thickened taproot in the S Caucasus.

1. Flowers apricot-pink, pink or pinkish. Involucre 20-30 x 20-30 mm, globose, not compressed on top by fruits. Appendages triangular, narrowed into spine. Leaves dissected ..... **1. *C. carduiiformis* DC.**  
-Flowers yellow. Involucre larger or smaller, compressed on top after flowering. Appendages different. Median and upper leaves entire..... **2**
2. Appendages without terminal spine, ciliate, concealing basal part of phyllaries. Stems one-sidedly branched in upper part with few capitulas. Involucre globose, adpressed-globose or crateriform, (20) 25-35 x 35-60 mm ..... **2. *C. fenzlii* Reichardt**  
-Appendages with easy deciduous minute tip up to 2 mm long. Stems with corymbosely arranged capitulas. Involucre ovoid, smaller ..... **3**
3. Upper leaves broadly-lanceolate to oblong, enveloping involucre. Stems branched from upper half. Capitulas few. Involucre 20-23 (25) x 15-20 (25) mm ..... **3. *C. szovitsiana* Boiss.**  
-Upper leaves narrow-lanceolate, not enveloping involucre. Stems branched from the base. Capitulas numerous. Involucre 15-20 x 8-15 mm.....  
..... **4. *C. polypodiifolia* Boiss.**

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