

# The Balkan endemic *Colymbada finazzeri* (*Centaureinae*, *Asteraceae*) in the Bulgarian flora

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**Abstract.** *Colymbada finazzeri* is a Balkan endemic, with only one population in Bulgaria in the Zemen Gorge, Kyustendil district (in the floristic region of the Valley of River Strouma, northern part). The species was considered extinct in the course of several decades, until it was found again in 2004. The present article reconfirms the distribution of *C. finazzeri* in Bulgaria. It also produces data on the taxonomy, morphology, biology of reproduction, and ecology of the species, as well as on the status of its population.

**Key words:** Balkan flora, *Centaurea*, *Centaureinae*, *Colymbada*, endemic species, threatened plants

## Introduction

Subtribe *Centaureinae* is one of the richest in species in the tribe *Cardueae* (*Asteraceae*). The Mediterranean region is the center of species diversity for the *Centaureinae* which comprises 31 genera with c. 800 species (Wagenitz 1986; Meusel & Jäger 1992; Hellwig 2004). A few years ago most taxa of that group were referred to genus *Centaurea* s.l. Recently the ever wider use of molecular methods [Susanna & al. (1995), nrITS; Garcia-Jacas & al. (2001), nrITS + *matK*] has helped accumulate new data on the structure of the phylogenetic scheme. This led to splitting of genus *Centaurea* s.l. into several smaller genera. The major genera are *Centaurea* (c. 200), *Colymbada* (c. 130), *Psephellus* (c. 80), *Cyanus* (c. 50), *Rhaponticoides* (c. 30) etc. (Hellwig 2004; Bancheva, unpubl.).

Subtribe *Centaureinae* is one of the endemic-richest groups in Europe and Turkey and holds the lead in the Bulgarian flora in the number of species of conservation value: endemics and threatened plants,

some with single locations (Velchev 1984; Velchev & al. 1992; Bancheva & Greilhuber 2006).

The Balkan endemic *Colymbada finazzeri* (Adamović) Holub [= *Centaurea rupestris* subsp. *finazzeri* (Adamović) Hayek], is the object of this study. According to Ninova (1984), it had not been found in recent decades, irrespective of the numerous attempts to this end.

In 2004, during taxonomic revision of materials of *Centaurea* s.l. in the Herbarium of the Institute of Botany, Bulgarian Academy of Sciences (SOM), the author has found a herbarium specimen of *Colymbada finazzeri*, erroneously determined as *Centaurea ovina* Pall. ex Willd. (SOM 159048, the Valley of Strouma River, Zemen Gorge, 23.07.2003, Det. & Leg. D. Stoyanov). Soon after that, in a target study of the Zemen Gorge the population of the species was located and observations of it have been carried out.

The aim of the present study is to reconfirm *C. finazzeri* for the Bulgarian flora, as well as to improve the information on the taxonomy, biology, ecology, and the status of its population.

## Material and methods

The morphological description is based on the description of *Centaurea rupestris* subsp. *finazzeri* in *Flora Europaea* (Dostál 1976) and on personal data.

The karyotype was studied on mitotic metaphase plates obtained from root tips of three wild-collected plants, pretreated with 8-oxyhinoline for 30 min, than fixed in acetic alcohol (1:3) for 24 h at 4°C, hydrolysed in 1 M HCl for 15 min at 60°C, stained with haematoxylin after Gomori (Melander & Wingstrand 1953) for 30 min at 60°C and than squashed in 45% acetic acid.

The voucher specimen is deposited in the Herbarium of the Institute of Botany, Bulgarian Academy of Sciences (SOM 162667).

## Results and discussion

### Genus *Colymbada* Hill, Veg. Syst. 4: 31. 1762.

The genus includes c. 130 species (Hellwig 2004). In the taxonomical literature, incl. *Flora Europaea* (Dostál 1976) and the regional Europaen, Asian, African Floras, genus *Colymbada* is enlisted within the limits of *Centaurea*: the taxa of the subgenus *Lopholoma* (Cass.) Dobrocz. [sections *Acrocenton* (Cass.) DC., *Orientalis* (Hayek) Tzvelev and *Lopholoma*]. According to Hellwig's phylogenetic scheme (2004), based on the floral and achene micromorphology, pollen morphology, karyology and DNA sequences, there are sufficient grounds for delimiting *Colymbada* from *Centaurea* s.l. The recent studies of different *Centaurea* s.l. taxa (Bancheva & Greilhuber 2006) have shown that the genome size of all *Colymbada* species is twice larger than that of the species in *Centaurea* s.str. These results support the generic status of *Colymbada*.

### *Colymbada finazzeri* (Adamović) Holub, Folia Geobot. Phytotax., 7: 315. 1972.

Basionym: *Centaurea finazzeri* Adamović, Österr. Bot. Z., 55: 235. 1905.

Synonym: *C. rupestris* subsp. *finazzeri* (Adamović) Hayek, Prodr. Fl. Penins. Balc., 2: 754. 1931.

**Taxonomic notes.** *Colymbada finazzeri* was reported for the first time for the Bulgarian flora by Stojanov & al. (1967) as *Centaurea rupestris* subsp. *athoa* (DC.)

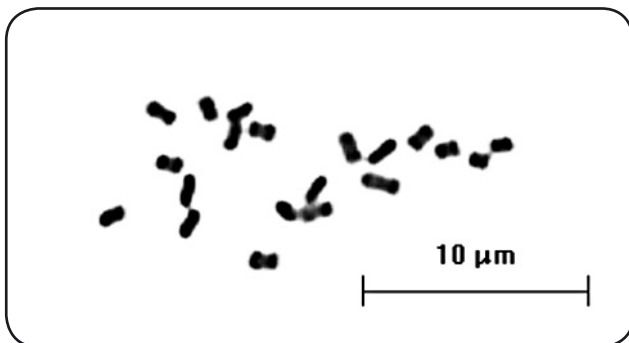
Gugler. The authors mention *Centaurea finazzeri* as a synonym to that taxon. According to Dostál (1976), *C. rupestris* subsp. *finazzeri* occurred in Bulgaria. The same taxonomic combination was used by Ninova (1984), Peev (1992) and Assyov & al. (2002). Greuter in the developed *Euro+Med Plant Base* (unpubl.) accepts the combination *Centaurea finazzeri*. The present article also supports its species status, but in *Colymbada*.

**Description.** Hemicryptophyte. Stems 5–25 (–30) cm, simple or sparingly branched above. Leaves sublanate, (1-)2-pinnatisect; segments up to 2 mm wide, acute, numerous. Involucre 12–15 mm in diameter; bracts ovate; phyllaries lanceolate or prolonged-triangular, sublanate; appendages brown, often with an apical spine 1–2 mm long. Florets yellow, the outer slightly longer than the inner. Achenes c. 4 mm; pappus 1/3 1/2, as long as achene (Fig. 1).

**Phenology.** Flowering June–July, fruiting July–August.

**Chromosome number.**  $2n=2x=20$  (Fig. 2). The karyotype consists of small chromosomes, about 1  $\mu$ m in size. The submetacentric type prevails. Kuzmanov & Georgieva (1983, 1990) reported the same chromosome number for *Centaurea rupestris* subsp. *finazzeri* from the Zemen Gorge, near Zemen village, 15.09.1979, vouchers no. BK-79909 & 79209 deposited in SOM. A revision of the specimens has shown that they were erroneously determined and belong to *Colymbada salonitana* (Vis.) Holub. (*Centaurea salonitana* Vis.). Thus, the data on the chromosome number and the karyotype based on material of Bulgarian origin for the species, are reported here for the first time.

**Habitat and ecology.** The species inhabits dry, rocky and stony places and rock crevices, at altitudes of 480–510 m. The accompanying species are: *Achillea ageratifolia* (Sm.) Boiss., *Acinos suaveolens* (Sm.) G. Don, *Allium moschatum* L., *A. rotundum* L., *Asperula cynanchica* L., *A. purpurea* (L.) Ehrend., *Carlina vulgaris* L., *Carpinus orientalis* Mill., *Chrysopogon gryllus* (L.) Trin., *Dianthus petraeus* Waldst. & Kit., *Fraxinus ornus* L., *Fumana procumbens* (Dunal) Gren. & Godr., *Gypsophyla glomerata* Pall. ex M. Bieb., *Hypericum rumeliacum* Boiss., *Inula aschersoniana* Janka, *I. ensifolia* L., *Juniperus oxycedrus* L., *Koeleria penzesii* Ujhelyi, *Micromeria cristata* (Hampe) Griseb., *Minuartia attica* (Boiss. & Spruner) Vierh., *Morina persica* L., *Odontites*

Fig.1. *C. finazzeri*.Fig. 2. Microphotograph of mitotic metaphase plate of *C. finazzeri*,  $2n = 2x = 20$ .

*lutea* (L.) Clairv., *O. serotinus* (Lam.) Dumort., *Onosma heterophylla* Griseb., *Quercus polycarpa* Schur, *Rhodax canus* (L.) Fuss, *Satureja montana* L., *Scutellaria orientalis* L., *Sedum album* L., *S. ochroleucum* Chaix, *Seseli rigidum* Waldst. & Kit., *Silene flavescens* Waldst. & Kit., *Sorbus umbellata* (Desf.) Fritsch, *Stipa capillata* L., *Teucrium polium* L., *Vincetoxicum hirundinaria* W. Medicus.

**Distribution in Bulgaria.** Valley of Strouma River, northern part, Zemen Gorge, between the villages Polska Skakavitsa and Gurbino, Kyustentil district, 503 m, 42°42'55" N, 22°42'43" E.

**General distribution.** Balkan Peninsula (Bulgaria, Greece, R Macedonia, Serbia and Montenegro).

**Conservation status.** According to the IUCN Criteria (IUCN 2001) the species was evaluated by the au-

thor as **Critically Endangered** [CR B1ab(iii)+2ab(ii)] within the framework of the *Red Lists of the Bulgarian Vascular Plants and Fungi* project.

**Population status.** The area of distribution of the unique population of *C. finazzeri* in Bulgaria is about 2 km<sup>2</sup>. Some 300 individuals have been counted out. The population has a mosaic structure. The mature achenes fell close to the mother plant owing to their poor flying abilities. The population consists predominantly from outcrossed and insect-pollinated individuals. Seed reproduction mainly takes place. The individuals are vital, in a good state, which, however, could easily deteriorate after incoming changes of the habitat. A very positive step will be to declare protected the area in the Zemen Gorge and a procedure for this is under way. By the moment, the railway tunnels dug across the gorge for the Sofia-Gyueshevo rail compositions are the limiting factor for a more effective distribution of the individuals.

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## References

- Assyov, B., Dimitrov, D., Vassilev, R. & Petrova, A. 2002. Conspectus of the Bulgarian vascular flora. Distribution maps and floristic elements. Bulgarian Swiss Biodiversity Programme, Sofia.
- Bancheva, S. & Greilhuber, J. 2006. Genome size in Bulgarian *Centaurea* s.l. (*Asteraceae*). – *Plant Syst. Evol.*, **257**: 95-117.
- Dostál, J. 1976. *Centaurea* L. – In: Tutin, T.G. & al. (eds), *Flora Europaea*. Vol. 4, pp. 254-301. Cambridge Univ. Press, Cambridge.
- Garcia-Jacas, N., Susanna, A., Garnatje, T. & Vilatersana, R. 2001. Generic delimitation and phylogeny of subtribe *Centaureinae* (*Asteraceae*): a combined nuclear and chloroplast DNA analysis. – *Ann. Bot. (London)*, **87**: 503-515.
- Hellwig, F.H. 2004. *Centaureinae* (*Asteraceae*) in the Mediterranean – history of ecogeographical radiation. – *Plant. Syst. Evol.*, **246**: 137-162.
- IUCN. 2001. IUCN Red List Categories and Criteria. Version 3.1. IUCN Species Survival Commission. IUCN, Gland & Cambridge.
- Kuzmanov, B.A. & Georgieva S.B. 1983. Reports [in Löve, A. (ed.), *IOPB Chromosome numbers reports, LXXXI*]. – *Taxon*, **32**: 665.
- Kuzmanov, B.A. & Georgieva, S.B. 1990. Cytotaxonomy of Bulgarian *Centaurea* species. – *Razpr. Slov. Akad. Znan. Umetn., Razr. Prir. Vede*, **31**(7): 105-125.
- Melander, Y. & Wingstrand, K.G. 1953. Gomori's haematoxylin as a chromosome stain. – *Stain Technol.*, **28**: 217.
- Meusel, H. & Jäger, E.J. 1992. *Vergleichende Chorologie der zentraleuropäischen Flora*. Vol. 3. G. Fischer, Jena, Stuttgart, New York.
- Ninova, D. 1984. *Centaurea* L. – In: Velchev, V. (ed.), *Red Data Book of the RP Bulgaria*. Vol 1. Plants. Pp. 376-382. Publishing House Bulg. Acad. Sci., Sofia (in Bulgarian).
- Peev, D. 1992. *Centaurea* L. – In: Kozhuharov, S. (ed.), *Field Guide to the Vascular Plants in Bulgaria*. Pp. 170-186. Naouka & Izkoustvo, Sofia (in Bulgarian).
- Stojanov, N., Stefanov, B. & Kitanov, B. 1967. *Flora of Bulgaria*. Ed. 4, vol. 2. Naouka & Izkoustvo, Sofia (in Bulgarian).
- Susanna, A., Garcia-Jacas, N., Soltis, D.E. & Soltis, P.S. 1995. Phylogenetic relationships in tribe *Cardueae* (*Asteraceae*) based on ITS sequences. – *Amer. J. Bot.*, **82**: 1056-1068.
- Velchev, V. 1984. *Red Data Book of the RP Bulgaria*. Vol. 1. Plants. Sofia.
- Velchev, V., Kozhuharov, St. & Anchev M. (eds). 1992. *Atlas of the Endemic Plants in Bulgaria*. Publishing House Bulg. Acad. Sci, Sofia (in Bulgarian).
- Wagenitz, G. 1986. *Centaurea* in South-West Asia: patterns of distribution and diversity. – *Proc. Roy. Soc. Edinburgh*, **89B**: 11-21.