



New record of *Allium ursinum* L. in the Crimea

Yury V. Plugatar, Vladislav V. Korszhenevsky, V.P. Isikov

Yury V. Plugatar*
e-mail: plugatar.y@gmail.ru

V.V. Korszhenevsky
e-mail: herbarium.47@mail.ru

V.P. Isikov

Nikitsky Botanical Gardens – National Scientific Center RAS, Nikita, Yalta, Republic of Crimea, Russia

* corresponding author

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ABSTRACT

New record of *Allium ursinum* L. in Crimea considerably extends the current view on distribution of this species. The relict populations are well adapted to the Crimean habitats. Therefore, the only threat to the species is not a change in the environmental conditions, but its active collection by the local population. Considering the rarity of *A. ursinum* in Crimea, its relict character and threats, we recommend to include this species in the new edition of the Red Data Book of Crimea.

Keywords: *Allium ursinum*, Crimea, relict, rare species, treats, ecological niche

РЕЗЮМЕ

Плаугатарь Ю.В., Корженевский В.В., Исиков В.П. Находка *Allium ursinum* L. в Крыму. Находка *Allium ursinum* L. в Крыму значительно расширяет нынешний взгляд на распространение этого вида. Реликтовые популяции хорошо адаптированы к крымским эколого-климатическим условиям. Единственной угрозой для вида является не изменение условий окружающей среды, а его активный сбор местным населением. Учитывая редкость *A. ursinum* в Крыму, его реликтовый характер и угрозы, мы рекомендуем включить этот вид в новое издание Красной книги Крыма.

Ключевые слова: *Allium ursinum*, Крым, реликт, редкий вид, угрозы, экологическая ниша

Allium ursinum L. is widely distributed in Eastern, Middle and Atlantic Europe, Scandinavia, the Western Mediterranean, the Balkan-Asia regions and in the Caucasus, but, until recently, it has never been recorded in Crimea. In 2014 we found two populations that considerably extend the distribution range of this species.

The Crimean flora have Neogene origin (Wulf 1944) and, according to different estimates, about a half of its species have Mediterranean links (Rubtsov et al. 1979, Golubev 1996), with another half related to the Circumboreal Floristic Region (Ena 2012). Alternating warm and cool periods in the Pleistocene and Holocene (Velichko 1973) in the south of Eastern Europe were accompanied by transformation of environmental conditions and corresponding changes of floras, respectively, towards the ancient Mediterranean (rich in heat loving species) and the boreal (rich in cold-resistant species). Modern Crimean flora in this respect appears to be incomplete and relict at the same time (Ena 2012).

The problem of incompleteness of the Crimean flora was repeatedly discussed in the last century (Ageenko 1897, Ena et al. 1997, Ena 2012), and lack of *A. ursinum* in it was a focal point in those discussions. Finding this species in the Crimea considerably changes the contemporary views on the origin of regional flora. This paper focuses at origin of the Crimean *A. ursinum* population in order to demonstrate if the appearance of this species here is accidental or this is an element of Circumboreal flora, remained in Crimea after Pleistocene migrations.

Allium ursinum was found in two isolated locations (Figs 1, 2) on the Southern macroslope of the Main Ridge of the Crimean Mountains, in the ravines near the village of Verkhnee Zaprudnoe, Alushta district. The first population is located north of village, on the right side of the road heading to the tourist park Turquoise Lake, in the ravine 20 m deep and 40–50 m wide. The population of *A. ursinum*, of about 400 individuals, occurs in three isolated localities at distances of 100–120 m from each other within the plant community belonging to the class Alnetea glutinosae Br.-Bl. et Tx. ex Westhoff et al. 1946. The second population is



Figure 1 *Allium ursinum* population in the course of the Ayan-Uzen River, Crimea



Figure 2 Specimens of *Allium ursinum*: Crimea, Alushta; Location: Main Ridge of Crimean Mountains between cordon Mindal'nyi and village Verkhnee Zaprudnoe; Biotope: valley of Ann-Uzen' River, alder forest, alt. 489 m a.s.l.; Date 05.05.2017; Coll. Korzhenevsky V.V.

Table 1. Plant community with *Allium ursinum*

Species	Cover	Distribution	Growth form
<i>Alnus glutinosa</i> (L.) P.Gaertn.	3	West Palearctic	tree
<i>Acer campestre</i> L.	1	European-Mediterranean-Persian-Asian	tree
<i>Fraxinus excelsior</i> L.	1	European-Mediterranean	tree
<i>Corylus avellana</i> L.	2	European-Mediterranean	shrub
<i>Sambucus nigra</i> L.	2	European-Mediterranean	shrub
<i>Hedera taurica</i> (Hibberd) Carrière	2	Crimean-Balkanian	shrub
<i>Brachypodium pinnatum</i> (L.) P. Beauv.	r	Palaeartic	polycarpic herb
<i>Carex digitata</i> L.	+	West Palearctic	polycarpic herb
<i>Allium flavum</i> L. subsp. <i>tauricum</i> (Besser ex Rchb.) K. Richt.	+	European-Mediterranean	polycarpic herb
<i>Allium ursinum</i> L.	1	European-Mediterranean-Persian-Asian	polycarpic herb
<i>Anthriscus sylvestris</i> (L.) Hoffm.	+	European	polycarpic herb
<i>Arum elongatum</i> Steven	1	Mediterranean-Asiatic	polycarpic herb
<i>Clematis vitalba</i> L.	1	European-Mediterranean	polycarpic herb
<i>Clinopodium vulgare</i> L.	r	Palaeartic	polycarpic herb
<i>Crocus angustifolius</i> Weston	1	Mediterranean-Eurasian steppe	polycarpic herb
<i>Cardamine quinquefolia</i> (M. Bieb.) Schmalh.	3	European-Mediterranean-Persian-Asian	polycarpic herb
<i>Galanthus plicatus</i> M. Bieb	1	Crimean endemic	polycarpic herb
<i>Galium mollugo</i> L.	r	West Palearctic	polycarpic herb
<i>Heracleum sphondylium</i> subsp. <i>sibiricum</i> (L.) Simonk.	1	West Palearctic	monocarpic
<i>Lactuca muralis</i> (L.) Fresen	+	European-Mediterranean	polycarpic herb
<i>Ornithogalum orthophyllum</i> subsp. <i>kochii</i> (Parl.) Zahar	+	Crimean endemic	polycarpic herb
<i>Ornithogalum ponticum</i> Zahar.	+	Crimean-Caucasian	polycarpic herb
<i>Myrrhoides nodosa</i> (L.) Cannon	+	Mediterranean-Asiatic	winter annual
<i>Physospermum cornubiense</i> (L.) DC.	r	Mediterranean-Eurasian steppe	polycarpic herb
<i>Primula vulgaris</i> Huds.	r	European-Mediterranean	polycarpic herb
<i>Sanicula europea</i> L.	1	European-Mediterranean	polycarpic herb
<i>Scilla bifolia</i> L.	r	European-Mediterranean	polycarpic herb
<i>Scrophularia umbrosa</i> Dumort.	r	West Palearctic	polycarpic herb
<i>Sium sisarum</i> L.	1	Front Asian and Eurasian steppe	polycarpic herb
<i>Smyrniium perfoliatum</i> L.	p	c	monocarpic
<i>Veronica hederifolia</i> L.	p	South Palearctic	winter annual
<i>Viola alba</i> Besser	p	European-Mediterranean	polycarpic herb
<i>Viola mirabilis</i> L.	p	Palaeartic	polycarpic herb

located in the riverside of the Ayan-Uzen River, between cordon Mindalny and the Northern border of the village of Verhnee Zaprudnoye, on the bottom of moist ravines. The population consists of three isolated localities with about 700 individuals. Totally, the Crimean population of *A. ursinum* includes more than 1000 plants. The local residents pick and use *A. ursinum* as seasoning that makes the population threatened and suggests urgent actions to preserve it.

The plant community that accommodates the population of *Allium ursinum* is represented by *Alnus glutinosa* forest with a mix of *Fraxinus excelsior* and *Acer campestre*, rich in herbs with a large portion of ephemeral species (Table 1) with no signs of significant anthropogenic influence.

Ecological analysis of species composition of the host community (Fig. 3) by comparing the fundamental and realized niches on the gradients of environmental factors (Korzhenovsky 1990, 1999, Zhukova et al. 2010) showed that the *Allium ursinum* occupies the optimal parts of ecological gradients with some exceptions for gradients 10 (Crimean habitat has a lower content of carbonates) and 12 (it

occupies substrates with low humus content avoiding the aerated substrates, preferring gleyed, wet ones).

The analysis of the distribution ranges of species that constitute the whole plant community showed that 18.75 % of them link this plant community to a relic Mediterranean flora. 37.5 % of species represent European-Mediterranean floral elements, 12.5 % – European–Asiatic steppe element, and the rest of species combination (31.25 %) have a Holarctic distribution.

In conclusion, it worth to note that *Allium ursinum* in the Crimea is represented by unstable populations that have alternate periods of dormancy and growth. It is likely a reason why this species has never been recorded in existing floristic reports. At the same time, it is well adapted to the Crimean ecotopes. Therefore, the only threat to the species is not a change in the environmental-climatic parameters of its habitat, but its active collection by the local population. Considering the rarity of *A. ursinum* in Crimea, its relict character and threats, we recommend to include this species in the new edition of the Red Book of Crimea.

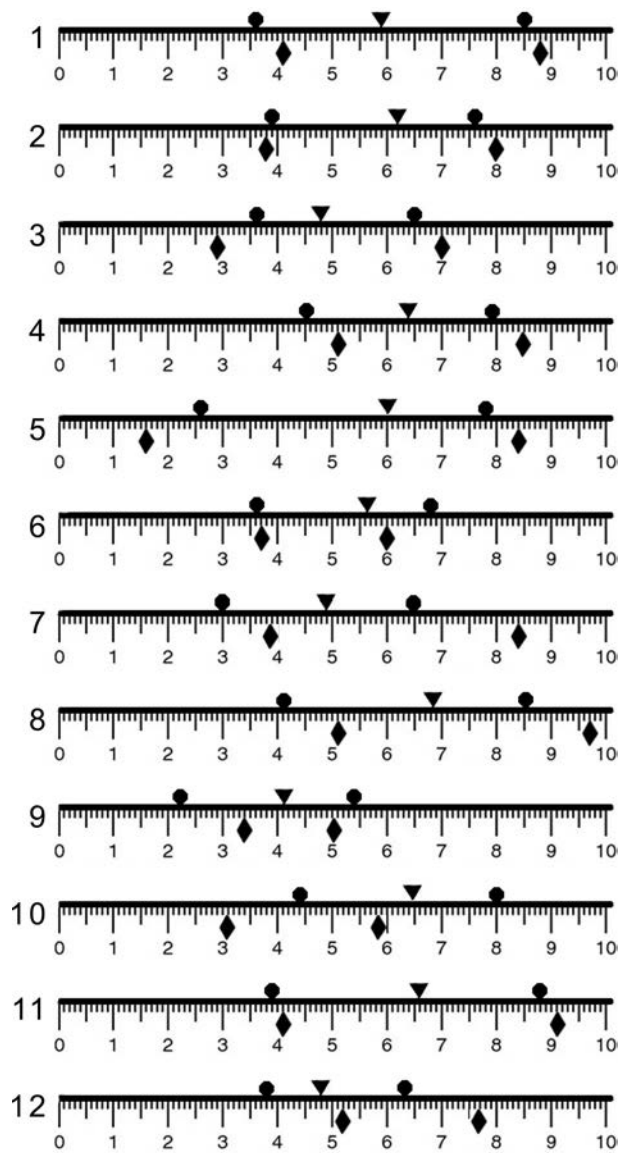


Figure 3 Realized niches on the gradients of the environment factors (at the top of the ruler, the black circles are the boundaries of niches and the optimal value is indicated with a black triangle) and the fundamental niche for *Allium ursinum* (the lower part of the ruler, boundaries are shown with rhombs). Titles of axes: 1 – shadow tolerance, 2 – air temperature, 3 – aridity–humidity, 4 – cryo-regime, 5 – climate continentality, 6 – moisture, 7 – moisture stability, 8 – substrate acidity, 9 – salt regime (anion composition), 10 – carbonate content, 11 – nitrogen content, 12 – humus content

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