COCHLEARIA PYRENAICA DC. (BRASSICACEAE) IN PLANT COMMUNITIES OF NOTHERN PODILLIA NATIONAL NATURE PARK

© Yurechko R.Yu.

Northern Podillia (Pivnichne Podillia) National Nature Park, Pidhirtsi village, Zolochiv district, Lviv Oblast

yurechko1994@gmail.com

https://doi.org/10.34142/2708-5848.2021.23.2.03

Plant communities, which include the population of *Cochlearia pyrenaica* DC. (Brassicaceae), were studied by Braun-Blanqe method. The single known population of this species, situated outside its main range, was studied. This population is situated in the Verkhobuzkyi Landscape Reserve (zakaznyk) near Koltiv village (Zolochiv district, Lviv Oblast). Nowadays this area is included in Northern Podillia National Nature Park. During the last years, the number of individuals in the locality was decreasing, so the population is under the threat of extinction. The results of our research are based on literature data as well as on the field investigation, carried out in the 2015–2018 seasons. We propose to refer the plant communities, which include *C. pyrenaica*, to two classes (*Molinio-Arrhenatheretea* R.Tx. 1937, *Phragmitetea* R. Tx. et Prsg 1942), 2 orders (*Molinietalia caeruleae* W. Koch 1926, *Phragmitetalia* Koch 1926), 2 alliances (*Calthion palustris* R.Tx. 1936 em. Oberd. 1957, *Magnocaricion* Koch 1926), and 2 associations (*Deschampsietum caespitosae* Horvatić 1930, *Caricetum appropinquatae* (Koch 1926) Soó 1938). The detailed relevés of the habitat of *Cochlearia pyrenaica* and the influence of the community structure on the development of *Cochlearia* are presented in the paper. The plant community determination of the *C. pyrenaica* communities is rather ambiguous. In recent years there were registered significant changes in the community structure of the habitat of *Cochlearia pyrenaica*. There is a much smaller number of *Cochlearia* in the association *Deschampsietum caespitosae* Horvatić 1930 than in *Caricetum appropinquatae* (Koch 1926) Soó 1938. We have identified 53 plants species in the habitat of *Cochlearia*, 2 species of them are mosses, 4 are tree species, 6 are shrub species, and 41 are herbaceous species. The detailed field investigations of the locality's area revealed differences in the species composition of plots, but typical, constant species are *Carex appropinquata* Schumach., *Deschampsia cespitosa* (L.) P.Beauv. There are 11 registered species in site no. 1, and 53 species in site no. 2. We observe the present post-drainage plant transformation, due to spring and summer droughts. These processes become more intensive over the last several years. As a result, the degradation of the wetland ecosystems seems to be irreversible.

Kea words: *Cochlearia pyrenaica, population, plant communities, rare plants, Red Data Book of Ukraine, Landscape Reserve "Verkhobuzkyi", Ukraine.*

Cochlearia pyrenaica DC. (Brassicaceae) (Fig. 1) – species of herbaceous plants of the family Brassicaceae. It is a single species of the genus in the flora of Ukraine. The plant is a semi-rosette biennial hemicryptophyte (sometimes a perennial monocarpic), hygrophyte, hydrocontrastophobe, paludant [3]. *C. pyrenaica* occurs in limestone areas with an ecological preference for cold and carbonated rich water springs and has a disjunct distribution from the Pyrenees to eastern Austria, Slovakia, and Ukraine. The populations of this species occur in Spain, France, Belgium, Germany [1], Great Britain, Switzerland [14], Ireland [11].

C. pyrenaica is listed in the Red Data Book of Ukraine (2009) as an endangered species [4]. The only locality of this species in Ukraine outside its main range is in Verkhobuzkyi Landscape Reserve (zakaznyk) of local significance near Koltiv village (Lviv Region). At present this area is being included in Northern Podillia (Pivnichne Podillia) National Nature Park.

The population of Cochlearia in Ukraine (at that time in Poland) was discovered by polish botanist W. Tymrakiewicz in 1929 [13].

During the last years, the number of individuals in the locality was decreasing, most probably, the population is under threat of extinction. Because of that, it is necessary to monitor its state, this will promote the organization of management of the bog ecosystem that is the habitat of *Cochlearia* [17]. The aim of our research was to identify plant species and communities on the territory of the Ukrainian locality. Earlier this problem was investigated by A. Iljinska, Ya. Didukh, I. Korotchenko, V. Brovdiy, O. Kagalo, N. Sytschak [3, 4].

Fig. 1. *Cochlearia pyrenaica* in the blooming phase, 25.04.2015 (near Verkhobuzh village, Lviv Region, Ukraine).

MATERIALS AND RESEARCH METHODS

Geographic coordinates of the Ukrainian locality of *C. pyrenaica* are N 49°50'..."; E 25°06'...". The common feature of this territory is drying because of the drainage channels.

As of 2018, the population was divided into two parts (that we name site no. 1 – west and site no. 2 – east), with a high possibility, it was not divided in the last century. The distance between sites is 270 m, the total area of population, including both sites, is 1350 м² [17].

Using conventional field and relevé methods we have completed full phytosociological research of the locality of *C. pyrenaica*. All its area was divided into 12 plots. Plot no. 1 was on the west site of the locality, others – on the east site. The altitude of the locality about sea level is about 300 m. Exposure for all plots is flat, inclination – 0°, rocks, and stones are absent. Soil type – alluvial meadow carbonate gley medium-loam on peat lined with meadow marl [10]. Devastated area – 0%.

Field investigations were conducted in 2015-2018 years. Relevés methods were based on the principles of the Braun-Blanquet school [9; 15; 8].

Investigations were performed in the standard plots of 100 м² and covered all variants of *C. pyrenaica* phytocoenoses. Every plot has the shape of a square of 10×10 m except plot no. 4 which has the shape of a rectangle of 8×2 m.

All relevés are united in the table (Table 1). The number of relevé is identical to the number of plots. The community layers are measured by type and height: tree layer (T), shrub layer from 2 to 5 m in height (S1), shrub layer from 0,3 to 2 m in height (S2), herbaceous layer above 30 cm height (H1), a medium-tall herbaceous layer from 10 to 30 cm height (H2), low herbaceous layer to 10 cm height (H3), moss layer (M). The approximate cover of every layer is presented.

There is a list of plants in every relevé, in order from higher to lower layers and percentage of cover. To obtain unified results in determining the cover (cover – c) was used extended Braun-Blanquet cover-abundance scale [15].

The nomenclature of syntaxa is based on Matuszkiewicz [8].

RESULTS

The population of *C. pyrenaica* is separated by forest vegetation. The first layer of this forest consists of *Betula pendula* Roth and *Alnus glutinosa* (L.) Gaertn. The second layer includes *Carpinus betulus* L. and *Acer pseudo-platanus* L. The undergrowth consists of *Salix cinerea* L., *Frangula alnus* Mill., *Prunus padus* L., *Sorbus aucuparia* L., *Euonymus europaea* L., *Viburnum opulus* L., *Rhamnus cathartica* L., *Ribes nigrum* L., *Rubus idaeus* L. [17]. The density of tree crowns is approximately 0.4.

Table 1

Plant communities with *Cochlearia pyrenaica* DC. in the Ukrainian locality

No. of relevé	1	7	9	2	3	4	5	6	8	10	11	12	Constancy
Cover of tree layer (T, %)	.	.	.	.	2-5	.	2-5	.	.	.	.	.	
Cover of shrub layer (S1, %)	1-5	1-3	.	5-10	2-5	.	1-3	.	.	.	.	1-5	
Cover of shrub layer (S2, %)	1-5	1-3	1-5	5-10	1-5	3-5	1-3	1-3	1	1-2	1-2	1-3	
Cover of herbaceous layer (H1, %)	40-45	40-50	70-75	60-70	60-70	40-45	70-75	55-60	70-80	50-65	50-60	55-60	
Cover of herbaceous layer (H2, %)	40-45	10-20	10-20	30-35	10-15	15-20	20-30	40-45	25-30	30-35	30-35	35-40	
Cover of herbaceous layer (H3, %)	3-5	5-10	5-10	1-5	5-10	1-5	3-5	5-10	5-10	5-10	2-4	5-10	
Cover of moss layer (M, %)	.	1	1-3	1	1	1	1	1	1-3	3-5	1-3	3-5	
Number of species	20	26	19	24	29	16	25	19	24	18	17	25	
Cochlearia pyrenaica	+	r	r	+	2m	r	+	r	r	r	r	r	V
Betula pendula	.	.	.	.	1	.	1	.	.	.	.	.	I
Carpinus betulus	.	.	.	.	r	.	.	.	.	.	.	.	I
Populus tremula	.	.	.	.	r	.	.	.	.	.	.	.	I

Frangula alnus	1	+	+	+	+	.	+	+	.	+	+	+	V
Salix cinerea	.	+	+	2a	+	.	.	.	.	.	.	.	II
Quercus robur	.	+	.	r	r	+	+	r	.	.	.	.	III
Salix rosmarinifolia	.	.	.	.	.	+	.	.	.	.	.	.	I
Betula humilis	.	.	+	.	.	.	.	.	.	.	.	.	I
Rhamnus cathartica	.	.	.	.	.	.	.	.	r	.	.	.	I
Rubus idaeus	.	.	.	.	r	.	.	.	.	.	.	.	I
Carex appropinquata	.	.	.	1	2m	2a	1	2m	1	1	1	1	IV
Deschampsia cespitosa	2a	2b	+	3	3	2m	2m	2b	2b	+	+	2a	V
Urtica dioica	2a	3	3	2b	2b	2b	3	2b	3	3	2b	2b	V
Galium mollugo	2b	3	2b	2b	3	2b	2b	3	2b	2b	2b	2b	V
Geum rivale	3	2a	2a	2a	2a	2a	2b	2a	2a	2m	2a	2b	V
Poa trivialis	3	1	1	2a	+	.	.	.	2m	2a	+	+	IV
Veronica chamaedrys	1	1	1	2a	1	.	2a	.	2m	1	2m	2a	V
Festuca rubra	2b	.	+	+	.	+	+	+	+	.	r	.	IV
Galium aparine	.	1	+	1	2m	.	1	.	.	.	.	.	III
Veronica longifolia	+	+	+	1	+	+	+	+	+	.	.	+	V
Silene flos-cuculi	.	+	+	.	+	.	+	.	+	+	+	+	IV
Polemonium caeruleum	.	+	.	r	+	+	+	.	+	+	.	+	IV
Campanula patula	.	+	.	+	+	+	+	+	.	+	.	.	III
Cirsium rivulare	.	+	+	+	.	.	+	+	+	.	.	+	III
Ranunculus acris	+	+	.	+	+	.	.	.	r	+	.	.	III
Valeriana officinalis	r	.	+	.	.	.	r	.	+	+	r	+	III
Molinia caerulea	.	+	.	+	+	r	r	.	r	.	.	r	III
Carduus crispus	.	+	+	.	.	.	.	+	+	.	.	+	III
Lysimachia vulgaris	+	+	.	+	r	.	+	.	.	r	.	.	III
Rumex acetosa	+	.	.	+	+	.	.	r	r	.	.	.	III
Carex nigra	r	.	.	.	.	.	.	+	+	.	+	.	II
Epilobium palustre	.	r	r	.	.	.	.	.	+	r	.	+	III
Selinum carvifolia	.	+	.	.	.	.	+	.	.	.	r	+	II
Equisetum palustre	.	+	.	.	.	+	+	.	.	.	.	.	II

Geranium robertianum	.	+	.	.	+	.	+	.	.	.	.	.	II
Sanguisorba officinalis	.	.	.	.	+	.	+	.	.	+	.	.	II
Helictotrichon pratense	.	.	.	.	r	+	.	+	.	.	.	.	II
Achillea millefolium	.	.	.	+	.	.	.	.	.	.	.	+	I
Bistorta officinalis	+	.	.	.	.	.	.	.	.	.	.	+	I
Erigeron annuus	.	r	.	r	.	.	.	r	.	.	.	r	II
Cardaminopsis arenosa	.	.	.	.	.	.	.	r	+	.	.	.	I
Taraxacum officinale agg.	.	.	.	.	.	.	.	.	r	.	+	.	I
Anthoxanthum odoratum	.	.	.	.	.	.	.	.	.	.	+	.	I
Artemisia vulgaris	.	.	.	.	.	.	.	.	.	.	.	+	I
Cardamine pratensis	+	.	.	.	.	.	.	.	.	.	.	.	I
Centaurea jacea	.	.	.	.	.	.	.	.	.	.	.	+	I
Equisetum fluviatile	+	.	.	.	.	.	.	.	.	.	.	.	I
Ficaria verna	+	.	.	.	.	.	.	.	.	.	.	.	I
Galium uliginosum	+	.	.	.	.	.	.	.	.	.	.	.	I
Pimpinella saxifraga	.	.	.	.	.	.	.	.	.	.	.	+	I
Ceratodon purpureus	.	+	+	+	+	+	+	+	1	2m	1	2m	V
Plagiomnium cuspidatum	.	.	.	.	r	.	.	.	.	.	.	.	I
Valeriana officinalis	r	.	+	.	.	.	r	.	+	+	r	+	III
Molinia caerulea	.	+	.	+	+	r	r	.	r	.	.	r	III
Carduus crispus	.	+	+	.	.	.	.	+	+	.	.	+	III
Lysimachia vulgaris	+	+	.	+	r	.	+	.	.	r	.	.	III
Rumex acetosa	+	.	.	+	+	.	.	r	r	.	.	.	III
Carex nigra	r	.	.	.	.	.	.	+	+	.	+	.	II
Epilobium palustre	.	r	r	.	.	.	.	.	+	r	.	+	III

Selinum carvifolia	.	+	.	.	.	.	+	.	.	.	r	+	II
Equisetum palustre	.	+	.	.	.	+	+	.	.	.	.	.	II
Geranium robertianum	.	+	.	.	+	.	+	.	.	.	.	.	II
Sanguisorba officinalis	.	.	.	.	+	.	+	.	.	+	.	.	II
Helictotrichon pratense	.	.	.	.	r	+	.	+	.	.	.	.	II
Achillea millefolium	.	.	.	+	.	.	.	.	.	.	.	+	I
Bistorta officinalis	+	.	.	.	.	.	.	.	.	.	.	+	I
Erigeron annuus	.	r	.	r	.	.	.	r	.	.	.	r	II
Cardaminopsis arenosa	.	.	.	.	.	.	.	r	+	.	.	.	I
Taraxacum officinale agg.	.	.	.	.	.	.	.	.	r	.	+	.	I
Anthoxanthum odoratum	.	.	.	.	.	.	.	.	.	.	+	.	I
Artemisia vulgaris	.	.	.	.	.	.	.	.	.	.	.	+	I
Cardamine pratensis	+	.	.	.	.	.	.	.	.	.	.	.	I
Centaurea jacea	.	.	.	.	.	.	.	.	.	.	.	+	I
Equisetum fluviatile	+	.	.	.	.	.	.	.	.	.	.	.	I
Ficaria verna	+	.	.	.	.	.	.	.	.	.	.	.	I
Galium uliginosum	+	.	.	.	.	.	.	.	.	.	.	.	I
Pimpinella saxifraga	.	.	.	.	.	.	.	.	.	.	.	+	I
Ceratodon purpureus	.	+	+	+	+	+	+	+	1	2m	1	2m	V
Plagiomnium cuspidatum	.	.	.	.	r	.	.	.	.	.	.	.	I

Explanations: Number of relevé – Geographic coordinates (Latitude – N, Longitude – E). 1 – 49.847471, 25.107575; 2 – 49.846645, 25.110802; 3 – 49.846634, 25.110918; 4 – 49.846733, 25.110841; 5 – 49.846577, 25.111104; 6 – 49.846673, 25.110984; 7 – 49.846531, 25.111252; 8 – 49.846645, 25.111242; 9 – 49.846500, 25.111411; 10 – 49.846585, 25.111450; 11 – 49.846666, 25.111468; 12 – 49.846563, 25.111676.

Date: relevé 1 – 22.04.2018, 19.06.2018, relevés 2-12 – 19.06.2018

Plant community: relevés 1, 7, 9 – ChAss. *Deschampsietum caespitosae* Horvatić 1930, ChAll. *Calthion palustris* R.Tx. 1936 em. Oberd. 1957, ChO. *Molinietalia caeruleae* W. Koch 1926, ChCl. *Molinio-Arrhenatheretea* R.Tx. 1937; relevés 2-6, 8, 10-12 – ChAss. *Caricetum appropinquatae* (Koch 1926) Soó 1938, ChAll. *Magnocaricion* Koch 1926, ChO. *Phragmitetalia* Koch 1926, ChCl. *Phragmitetea* R. Tx. et Prsg 1942.

According to the results of the survey, there are such layers on the territory of *C. pyrenaica* habitat: tree layer (height to 10-12 m), shrub layer (0,3-5 м), herbaceous layer (1-130 см), moss layer (0,1-20 мм).

Tree layer is located in a small area in the part of population no. 2, which is surrounded by the forest. But tree layer is absent in the part of population no. 1. Tree specious – *Betula pendula*, *Carpinus betulus* L., *Populus tremula* L., *Quercus robur* L. (height only 0,3-0,5 м, probably, was seeded from the near forest). Shrubs occupy a small area as well and grow solitary. Generally, it positively affects the development of *C. pyrenaica*, giving the necessary shade. Especially it is very important during the hot days of April and May during its blooming. Analogical influence is from trees and near forests. Because of the partial shade from *Betula pendula* and shrubs, it is the largest cover of *Cochlearia* in plot no. 3. The shrub layer is formed by *Frangula alnus*, *Salix cinerea*, *Salix rosmarinifolia* L., *Betula humilis* (in one relevé), *Rhamnus cathartica* (in one relevé) and *Rubus idaeus* (in one relevé).

The herbaceous layer cover approximately 90-95% of the locality area, the average height equals 30-50 cm, maximal – 130 cm. During our field research was found that *C. pyrenaica* does not grow in the tall grass and dense turf of grass, seedlings can not compete with other species in such conditions.

The herbaceous vegetation is dominated by *Urtica dioica* L., *Deschampsia cespitosa* (L.) P.Beauv., *Galium mollugo* L., *Geum rivale* L., *Poa trivialis* L., *Veronica chamaedrys* L., *Festuca rubra* L. (especially in the site no. 1), *Carex appropinquata* Schumach., *Galium aparine* L. The following taxa were found: *Veronica longifolia* L., *Silene flos-cuculi* (L.) Greuter & Burdet, *Polemonium caeruleum* L., *Campanula patula* L., *Cirsium rivulare* (Jacq.) All., and others. Rarely were found *Pimpinella saxifraga* L., *Galium uliginosum* L., *Equisetum fluviatile* L., *Centaurea jacea* L., *Cardamine pratensis* L., *Artemisia vulgaris* L., *Anthoxanthum odoratum* L., and others. Generally, most area of the locality is covered with meadow vegetation (Table 1).

C. pyrenaica takes the largest cover in plots no. 2, 3, 5 (where it is the shade from the trees and shrubs during the larger part of the day, besides, there is less cover of expansive species), less cover in plot no. 1, solitary individuals – in other plots.

The moss layer covers 1-3% but is absent in site no. 1. It includes 3 species. Two of them were identified by Y. A. Drach. These are *Ceratodon purpureus* (Hedw.) Brid. and *Plagiomnium cuspidatum* (Hedw.) T.J.Kop.

There is rarely found the transformer specious *Erigeron annuus* (L.) Pers. in site no. 2

DISCUSSION

According to the literature data, the syntaxonomy of the Ukrainian population of C. pyrenaica is class Phragmiti-Magnocaricetea Klika in Klika et Novák 1941 (community of wet and swampy meadows on sod gleyed silty-swamp and meadow-swamp soils), order Mag-nocaricetalia Pign. 1953, alliance Magnocari-cion elatae W. Koch 1926 [3]. This plant com-munity of this locality was formed as a result of the perennial problem of water shortage be-cause of the drainage of local swamps and the building of channels on the Western Bug. For example, the syntaxonomy of now non-exist natural locality Cochlearia polonica A. Fröhl. in Poland was: class Montio-Cardaminetea Br.-Bl. et Tüxen 1943, order Montio-Cardaminetalia Pawł. 1928, alliance Cratoneurion commutati Koch 1928, association Cochlearietum polonicae Kwiatk. 1957 [3; Kwiatkowska, 1957, cited according to Kaźmierczakowa, 2004 [5]]. In Slovakia, the syntaxonomy of C. pyrenaica was classified similarly, into class Montio-Cardaminetea Br.-Bl. et Tüxen 1943, order Montio-Cardaminetalia Pawł. 1928, alliance Cratoneurion commutati Koch 1928, association Cratoneuro-Cochlearietum pyrenaicae (Oberd. 1957) Th. Müller. 1961 [14; 7]. The syntaxonomy of the rediscovered historical site of C. pyrenaica near Tatranská Kotlina Settlement is class Montio-Cardaminetea Br.-Bl. et R. Tx. ex Klika 1948, order Montio-Cardaminetalia Pawł. 1928, alliance

Lycopodo europaei-Cratoneurion commutati Hadač 1983, association Cochleario pyrenaicae-Cratoneuretum commutati Th. Müler 1961 [2]. The syntaxonomy of Cochlearia tatrae Borbás in the Western Carpathians is quite different: class Mulgedio-Aconitetea Hadač et Klika in Klika et Hadač 1944, order Calamagrostion villosae Pawłowski et al. 1928, alliance Trisetion fusci Krajina 1933 [6].

The detailed field investigations of the locality's area revealed differences in the flora of plots, but typical constant species are *Carex appropinquata, Deschampsia cespitosa, Geum rivale*. We propose to refer the plant community of site 1 (plot no. 1) to association *Deschampsietum caespitosae* Horvatić 1930, alliance *Calthion palustris* R.Tx. 1936 em. Oberd. 1957, order *Molinietalia caeruleae* W. Koch 1926, class *Molinio-Arrhenatheretea* R.Tx. 1937. We identified the plant communities of plots no. 7 and no. 9 of site no. 2 to the same association as well. Regarding other plots of site no. 2, we propose to refer them to association *Caricetum appropinquatae* (Koch 1926) Soó 1938, alliance *Magnocaricion* Koch 1926, order *Phragmitetalia* Koch 1926, class *Phragmitetea* R. Tx. et Prsg 1942. We refer plant communities to these syntaxons rather conditionally, as in recent years there were significant changes in the floristic composition and in the cover of the species of the habitat of *C. pyrenaica*. There is a process of ecological succession – the process of long-term changes in biocenoses due to the influence of internal and external factors [16]. In this case, there is a transition from coastal and marsh vegetation to the meadow one (mesophytic meadow vegetation) with subsequent afforestation of *Betula pendula, Betula pubescens* Ehrh., *Alnus glutinosa*. Such a forest is completely formed already between sites no. 1 and no. 2.

According to the literature data [3], the locality of *C. pyrenaica* belonged to the alliance *Magnocaricion elatae* W. Koch 1926. In 2018, as a result of 12 relevés, there are identified two classes in the area of habitat. In addition, there is a much smaller number of *Cochlearia* in the association *Deschampsietum caespitosae* Horvatić 1930, than in *Caricetum appropinquatae* (Koch 1926) Soó 1938. This is particularly noticeable in plot no. 1 (site no.1). Because of that, we can presume that the first association formed recently and is unfit for the development of *Cochlearia*.

It is worth noting that during observation in 2015-2018 there was no flooding in the area of the survey. As of October 2018, there is no water in the canal that is near the *Cochlearia* habitat. This factor causes a negative influence on the number not only of *C. pyrenaica*, but other coastal and wetland plants such as *Betula humilis, Carex appropinquata, Galium uliginosum* L., *Bistorta officinalis* Delarbre, *Carex nigra* (L.) Reichard, *Ranunculus acris* L., *Ficaria verna* Huds., etc.

V. Solomakha referred the association *Caricetum appropinquatae* to communities of swamps of north-western Ukraine, and *Deschampsietum caespitosae* – to the communities of floodplain and wet meadows on peat soils [12].

In general, there is post-drainage plant transformation, due to spring and summer droughts, these processes become more intense last years. As a result, wetland ecosystems are irreversibly degraded, and ecological succession is visible. Physicochemical properties of peat soils and the structure of phytocoenoses and species are continuously changing.

In conclusion, there are identified 53 species of plants in the habitat of *Cochlearia*, 2 species of them are mosses, 4 – trees, 6 – shrubs, 41 – herbaceous species. There are 11 species in site no. 1, 53 species in site no. 2.

Acknowledgments. I thank Prof. Lydia Tasenkevich for the idea of this research.

References

1. Cires E., Samain M.-S., Goetghebeur P., Fernández Prieto J.A. (2011) Genetic structure in peripheral Western European populations of the endangered species *Cochlearia pyrenaica* (Brassicaceae). Plant Systematics and Evolution 297: 75–85. https://DOI 10.1007/s00606-011-0500-9

2. Daniel Dítě, Sedláková B., Dítětová Z. (2016) Lyžičník pyrenejský (*Cochlearia pyrenaica* DC.) –

staronový druh podhoria Belianskych Tatiera poznámky k jeho výskytu na Slovensku. *Cochlearia pyrenaica* DC. – notes to the occurrence of a rediscovered species from the foothills of the Belianske Tatry Mts, Slovakia. Acta Carpathica Occidentalis 7: 15–19 (in Slovak).

3. Iljinska A. P., Didukh Ya. P., Korotchenko I. A., Brovdiy V. M. (2007) *Cochlearia polonica*. In: Ecoflora of Ukraine. Vol. 5. Ed. Ya. P. Didukh. Kyiv: Phytosociocentre, p. 512–513 (in Ukrainian).

4. Kagalo O. O., Sytschak N. M., Iljinska A. P. (2009) *Cochlearia pyrenaica*. In: Chervona knyha Ukrainy. Roslynnyi svit (Red Data Book of Ukraine. Plant Kingdom). Ed. Ya.P. Didukh. Kyiv: Globalconsulting, p. 357 (in Ukrainian).

5. Kaźmierczakowa R. (2004) *Cochlearia polonica* E. Fröhlich. Warzucha polska. In: Gatunki roślin. Poradnik ochrony siedlisk i gatunków Natura 2000 – podręcznik metodyczny. Vol. 9. Eds. B. Sudnik-Wójcikowska, H. Werblan-Jakubiec. Warszawa: Ministerstwo Środowiska, p. 100–103 (in Polish).

6. Kliment J., Šibík J., Šibíková I., Jarolímek I., Dúbravcová Z. et Uhlířová J. (2010). High-altitude vegetation of the Western Carpathians – a syntaxonomical review. Biologia 65(6): 965–989. https://DOI:10.2478/s11756-010-0109-4

7. Kochjarová J. et Valachovič M. (2002) Cochlearia L. Lyžičník. In: Flóra Slovenska. Vol. 4. Eds. K. Goliášová, H. Šipošová. Bratislava: Veda, p. 549–561 (in Slovak).

8. Matuszkiewicz W. (2001) Przewodnik do oznaczania zbiorowisk roślinnych Polski. Warszawa: PWN (in Polish).

9. Mueller-Dombois D., Ellenberg H. (1974) Aims and Methods of Vegetation Ecology. New York: John Wiley and Sons.

10. Nakonechniy Yu. I. (2017) Doslidzhennia gruntovoho pokryvu dolyny riky Zakhidnyi Buh (vid vytokiv v seli Verkhobuzh do sela Sasiv Zolochivskoho raionu Lvivskoi oblasti) na terytorii NPP "Pivnichne Podillia". In: Litopys pryrody Natsionalnoho pryrodnoho parku "Pivnichne Podillya". Vol. 5. Brody: NPP Pivnichne Podillia, p. 67–105 (manuscript, in Ukrainian).

11. Online Atlas of the British and Irish Flora [online]. Available from: https://www.brc.ac.uk/plantatlas/plant/cochlearia-pyrenaica [Accessed 15.12.2021].

12. Solomakha V. A. (2008) The syntaxonomy of vegetation of Ukraine. The third approximation. Kyiv: Phytosociocentre (in Ukrainian).

13. Tymrakiewicz W. (1930) Reliktowe stanowisko warzuchy pirenejskiej *Cochlearia pyrenaica* DC. var. *eupyrenaica* Thell. u źródeł Bugu. Kosmos. Series A 55: 732–733 (in Polish).

14. Valachovič M., Kochjarová J. (2000) *Cochlearia pyrenaica* DC. – nový druh contre Západných Karpatoch. Preslia 72: 475–493 (in Slovak).

15. Van der Maarel E. (Ed.). (2005) Vegetation Ecology. Oxford: Blackwell Publishing.

16. Yakubenko B. Ye., Popovych S. Yu., Hryhoriuk I. P., Melnychuk M. D. (2011) Heobotanika: tlumachnyi slovnyk. Kyiv: Fitosotsiotsentr (in Ukrainian).

17. Yurechko R.Yu. (2019) Current state of the population of *Cochlearia pyrenaica* (Brassicaceae) in Northern Podillya National Nature Park. Ukrainian Botanical Journal 76 (3): 243–251 (in Ukrainian). https://doi.org/10.15407/ukrbotj76.03.243

УДК 58.006

COCHLEARIA PYRENAICA DC. (BRASSICACEAE) В РОСЛИННИХ УГРУПОВАННЯХ НАЦІОНАЛЬНОГО ПРИРОДНОГО ПАРКУ «ПІВНІЧНЕ ПОДІЛЛЯ»

Юречко Р. Ю.

У статті представлено результати дослідження різноманіття рослинних угруповань з популяцією *Cochlearia pyrenaica* DC. (Brassicaceae) з використанням методу Браун-Бланке. Досліджено єдине в Україні місцезростання цього виду за межами основного ареалу, яке знаходиться у ландшафтному заказнику місцевого значення «Верхньобузький» поблизу с. Колтів (Львівська обл., Золочівський р-н). Наразі ця територія входить до складу національного природного парку «Північне Поділля». Протягом останніх років кількість особин на місцевості зменшувалася, ймовірно, популяція знаходиться під загрозою зникнення. Результати дослідження базуються на літературних даних, а також на польових дослідженнях, проведених у 2015-2018 роках. Угруповання місць існування *Cochlearia pyrenaica* пропонуємо відносити до 2 класів (*Molinio-Arrhenatheretea* R.Tx. 1937, *Phragmitetea* R. Tx. et Prsg 1942), 2 порядків (*Molinietalia caeruleae* W. Koch 1926, *Phragmitetalia* Koch 1926), 2 союзів (*Calthion palustris* R.Tx. 1936 em. Oberd. 1957, *Magnocaricion* Koch 1926) та 2 асоціацій (*Deschampsietum caespitosae* Horvatić 1930, *Caricetum appropinquatae* (Koch 1926) Soó 1938) рослинності. Також представлено детальні відомості про екотопи *Cochlearia pyrenaica* та вплив складу флори на її розвиток. До цих синтаксонів ми відносимо досліджені рослинні угруповання досить умовно. В останні роки було зафіксовано значні зміни у складі рослинності місць зростання *Cochlearia pyrenaica*. В асоціації *Deschampsietum caespitosae* Horvatić 1930 чисельність *Cochlearia* є значно менша, ніж у *Caricetum appropinquatae* (Koch 1926) Soó 1938. У підсумку, в місцях зростання *Cochlearia* виявлено 53 види рослин, з них 2 види – мохи, 4 – деревні рослини, 6 – чагарники, 41 – трав'янисті види. Встановлено, що флора угруповань з *Cochlearia pyrenaica* може відрізнятись, проте константами майже

завжди виступають *Carex appropinquata* Schumach., *Deschampsia cespitosa* (L.) P.Beauv. На ділянці № 1 зафіксовано зростання 11 видів, на ділянці № 2 – 53 видів. Загалом спостерігається постмеліоративна трансформація рослинного покриву, через весняно-літню посуху в останні роки ці процеси стають інтенсивнішими. В результаті цього водно-болотні екосистеми незворотно деградують.

Ключові слова: *Cochlearia pyrenaica DC., популяція, рослинні угруповання, рідкісні види, Червона книга України, ландшафтний заказник «Верхобузький», Україна.*