

Synanthropic flora and vegetation of the national nature park „Hutsulshchyna” (Ukrainian Carpathians)

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Abstract: The synanthropic flora of the national nature park “Hutsulshchyna” is represented by 214 species (24,4% of the total vascular species number for this area), including 130 apophytes and 84 alien plant species. Among the alien species there are 34 kenophytes and 50 archaeophytes. The euapophytes consist of 48 species, hemiapophytes – 46 species, and occasional apophytes – 36 species. Synanthropic vegetation of the national nature park “Hutsulshchyna” is represented by 6 classes (*Stellarietea mediae* Tüxen et al. ex von Rochow 1951, *Polygono arenastri-Poëtea annuae* Rivas-Martínez 1975 corr. Rivas-Martínez et al. 1991, *Artemisietea vulgaris* Lohmeyer et al. ex von Rochow 1951, *Galio-Urticetea* Passarge ex Kopecký 1969, *Epilobietea angustifolii* Tüxen et Preising ex von Rochow 1951, and *Bidentetea tripartitae* Tüxen et al. ex von Rochow 1951), 9 order, 10 alliance, 17 associations and some communities.

Keywords: national nature park “Hutsulshchyna”, syntaxonomy, vegetation, flora, alien plants

Introduction

The problem of phyt invasion becomes more and more significant in global scale and should be considered as one of the priorities of environmental activities in protected areas (KORNAŚ 1990; VITOUSEK 1990; RICHARDSON et al. 2000). The negative impact of alien invasive species in the natural flora of Ukraine is considerable (PROTOPOPOVA et al. 2002). In Ukraine, alien species consist about 16% of the total number of species (PROTOPOPOVA 1991). However, in different regions the processes of the flora's synanthropization occur with varying intensity. The most negative impact of invasive species on biodiversity evident in regions with highly fragmented habitats. As the mountain regions of Ukraine (the Eastern Carpathians in this case) suffered less intensive anthropogenic impact than planar areas, more favorable conditions for biodiversity preservation created here.

The degree of synanthropization is an indicator of potential threats to specific floral components of the area. In Ukraine, some reviews, articles, book chapters, theses etc. devoted to the synanthropic flora and plant communities on protected areas appear recently (DUBYNA & ZHMUD 2003; PANCHENKO 2005; DANYLIUK 2009; KRAMARETS' et al. 2011, etc.). However, there is still not enough generalized data about synanthropization of plant cover on protected areas. The aim of our paper is to establish current state of the synanthropic flora and vegetation of the national nature park „Hutsulshchyna”.

Study area

The study area is a part of the Eastern Carpathians. The national nature park (NNP) „Hutsulshchyna” is situated in the Kosiv district of Ivano-Frankivsk region in the western part of Ukraine and occupied an area of 32271 ha. There is a large diversity on landscapes: the NNP is located in foothill, low-mountain, and middle-mountain geomorphologic parts. The average elevation is 350-500 m a.s.l., the highest point is Gregit mountain (1472 m a.s.l.) (DERZHYPILSKY et al. 2011). The area of the NNP is fragmented, the patches are situated on the different climatic-vegetation zones from piedmont hills to subalpine peaks with various soils and vegetation types. According to various anthropogenic impact and land-use history, processes of the synanthropization of plant cover differ in intensity and direction.

Material and methods

The study was carried out from 2006 to 2008 as a part of the broader researches of the vegetation cover. A total of about 50 phytosociological reléves were sampled in the synanthropic habitats within the borders of NNP according to the Braun-Blanquet approach (WESTHOFF & VAN DER MAAREL 1973). The vegetation classification was conducted by TWINSPAN protocol (HILL 1979) using JUICE 6.5 software (TICHÝ 2002). The classification of the geographical-historical groups of the floristic synanthropic elements follows KORNAŚ (1977) with additions by MIREK (1981) and PROTOPOPOVA (1991). Nomenclature of the

vascular plants species follows MOSYAKIN & FEDORONCHUK (1999), the names of syntaxa follows SOLOMAKHA (2008) with some corrections according to the International Code of Phytosociological Nomenclature (WEBER et al. 2000).

Results

Flora of the NNP „Hutsulshchyna” consists of 878 vascular plants species (DERZHYLSKY et al. 2011). Among them 214 species (24.4%) are synanthropic, e.g. 130 apophytes (14.8%) and 84 anthropophytes (9.6%). By the level of synanthropization 48 species are euapophytes (22.4%), 46 – hemiapophytes (21.5%), and 36 species (16.8%) are accidental apophytes. Within alien species 34 are kenophytes (15.9%) and 50 – archaeophytes (23.4%).

Studies conducted in NNP "Hutsulshchyna" showed that the proportion of alien species here is 9.6%. The proportion of the alien species in the flora of the different national nature parks and reserves differs considerably: in the NNP Skolivski Beskydy – 7.1% (KRAMARETS' et al. 2011), in the Polis'kyi natural reserve – 15.2% (ANDRIENKO et al. 1986), in the Desnians'ko-Starohuts'kyi NNP – 16.8% (PANCHENKO 2005), and in the Danube Biosphere Reserve – 19.0% (DUBYNA & ZHMUD 2003).

Analysis of the alien species by their origin showed that among them species with Mediterranean origin prevail (23 species). Over time the influence of different centers entry changed. Thus, the species with Mediterranean origin consist 61.6% of archaeophytes and only 23.2% of kenophytes. Significant part of kenophytes has American origin (33.5%).

By the degree of naturalization in the flora of NPP "Hutsulshchyna" the largest part forms the epekophytes (61 species in total). Within archaeophytes (50 species) 47 are epekophytes, 2 – hemiepekophytes, and 1 – agriophyte. Within kenophytes 14 species are epekophytes, 11 – agriophytes, 7 – ergasyophytes, and 2 – ephemerophytes. In the alien fraction of the NNP flora, the annual plants prevail within archaeophytes (34 species), the perennials are represented by 16 species. Among kenophytes there are 20 perennial species and 14 annuals.

In the alien fraction of the NNP flora prevail species with a wide ranges: holarctic (18 species), palaeoarctic (7 species), cosmopolitan and hemi-cosmopolitan (represented by 24 species) ranges. The largest part of the synanthropic species of the NNP has solid or diffuse spatial structure of the populations. However, among archaeophytes species with solid spatial structure predominate, but within kenophytes the species with diffuse structure prevail.

The penetration and spreading of the alien species into natural and semi-natural habitats generally observed after their concentration and distribution in some anthropogenic habitats (BURDA 1991; RICHARDSON et al. 2000). In protected areas, the main centers of distribution of the synanthropic alien species are neighbor areas: settlements, roads, railways, fields, farms and gardens. The most intensive ways following river valleys and roads. However, the significant part of these species occur in anthropogenic habitats and only some of them able successfully influence the natural plant communities.

The main threats to phytodiversity of the NNP "Hutsulshchyna" are some dominating adventive species with the highest degree of naturalization, which penetrate the natural or semi-natural habitats and change partially the environment, namely the level of light ability, soil moisture and undercanopy humidity, etc. Particularly intense these processes occur in vicinities of the settlements on foothills, in the middle altitudes they are less apparent.

Among the alien species found on the NNP area there are 23 species belong to highly expansive in Ukraine (*Juncus tenuis* Willd., *Coryza canadensis* (L.) Crong., *Galinsoga parviflora* Cav., *G. urticifolia* (Kunth) Benth., etc.) and considered as transformers (PROTOPOPOVA et al. 2010): *Acer negundo* L., *Heracleum montegazzianum* Sommier et Levier., *Impatiens parviflora* DC., *Phalacrolooma annuum* (L.) Dumort., *Reynoutria japonica* Houtt., etc.

Acer negundo occurs sporadically on the forest edges and along the roadsides; quickly occupies new areas. An aggressive *Heracleum montegazzianum* recently becomes widespread on roadsides and abandoned fields.

Impatiens parviflora enters the different forest communities, mainly stands dominated by *Fagus sylvatica* L. (*Symphyto cordati-Fagion* (Vida 1963) Tauber 1982) or by *Quercus robur* L. and *Carpinus betulus* L. (*Carpinion betuli* Issler 1931), as well as in the derivatives spruce communities sparse due to root rot impact.

Cultivated species *I. glandulifera* Royle occurs sporadically on ruderal habitats and roadsides, but recently begun to spread spontaneously in natural habitats. With high probability species could penetrate rapidly semi-ruderal nitrophilous margins. Communities from the class *Galio-Urticetea* Passarge ex Kopecký 1969 become a reservoir for the *I. glandulifera* invasion to the *Alnion incanae* Pawłowski et al. 1928 and *Salicion albae* Tüxen ex Moor 1958 communities formed along streams and rivers.

Galinsoga parviflora and *G. urticifolia* often occur in segetal (*Stellarietea media* Tüxen et al. ex von Rochow 1951) and ruderal (*Galio-Urticetea*, *Artemisietea vulgaris* Lohmeyer et al. ex von Rochow 1951) communities, rarely penetrate the disturbed forests located near settlements and places of recreation.

Oenothera biennis L. grows on dry open roadsides and abandoned fields (*Dauco carotae-Mellilotion* Görs ex Rostański et Gutte 1971 and *Convolvulo arvensis-Elytrigion repentis* Görs 1966), the expansion to the slightly transformed semi-natural habitats is eventual too. *Coryza canadensis* occurs sporadically in the open habitats with disturbed soils, on the fields, abandoned fields, and nitrophilous ruderal communities (*Artemisietea vulgaris*). *Bromus commutatus* Schrad. occurs sporadically in semi-natural communities on mesic and dry meadows, also along roadsides and other ruderal habitats.

Salix fragilis L. often occurs on the riversides (Pistyn'ka river, Liuchka river and its tributaries) in the communities of the association *Salicetum albo-fragilis* Tüxen 1955 (class *Salicetea purpurea* Moor 1958). Also occurs occasionally in

wet meadows and along roads. This species competing successfully with the native *S. alba* L.

Within synanthropic vegetation on the studied area a total of 6 classes (*Stellarietea mediae*, *Polygono arenastris-Poëetea annuae* Rivas-Martínez 1975 corr. Rivas-Martínez et al. 1991, *Artemisietea vulgaris*, *Galio-Urticetea*, *Epilobietea angustifolii* Tüxen et Preising ex von Rochow 1951, and *Bidentetea tripartitae* Tüxen et al. ex von Rochow 1951), 9 orders, 10 alliances, 17 associations and some communities were distinguished. All of them are widespread on the surrounding areas.

The most interesting for nature conservation purposes are communities from the alliance *Impatienti noli-tangere-Stachyion sylvaticae* Görs ex Mucina in Mucina et al. 1993 (association *Stachyo sylvaticae-Impatientetum noli-tangere* Hilbig 1972) formed on shaded habitats with wet nutrient-rich clay soils on fringes and roadsides in the beech forests. Also communities of the association *Calystegio sepium-Epilobietum hirsuti* Hilbig et al. 1972 (alliance *Senecionion fluviatilis* Tüxen ex Moor 1958) are vulnerable by the tall kenophytes penetration on the moist and wet linear habitats along slow streams and ditches.

As a result of our study revealed that the level of synanthropization of the NPP „Hutsulshchyna" is moderate, the synanthropic fraction in the flora consist in 24.4%. Alien fraction of the flora is a stable component of the spontaneous flora of the NNP and is characterized by relatively high species richness, especially in artificial habitats. Invasive vascular plants species characterized by a high level of naturalization, 23 invasive species are spread in almost all natural floristical complexes within plant communities on different transformation stages. Thus, the negative impact of the invasive species on the rare vascular plant species and protected natural plant communities should be taken into account.

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