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THE PECULIARITIES OF VEGETATION FORMATION PROCESSES IN THE UKRAINIAN PART OF ROZTOCZE

OSOBLIWOŚCI FORMOWANIA SZATY ROŚLINNEJ UKRAIŃSKIEJ CZĘŚCI ROZTOCZA

Słowa kluczowe: Roztocze, szata roślinna, wskaźniki bioróżnorodności, metoda Braun-Blanqueta

Key words: Roztocze, vegetation, biodiversity indicators, Braun-Blanquet method

Abstract. The high level of biodiversity is one of the most attractive features of nature of Roztocze region. Ukrainian part covers only 1/3 of the total area of Roztocze, but still is characterized by high variability of habitats and biodiversity. On the Ukrainian Roztocze there are found 1,344 plant species, 146 plant communities (identified with the Braun-Blanquet method), including 23 protected habitats belonging to the Natura 2000 network. The great variety of Roztocze is caused by the interaction of natural factors, primarily climate and soils, but also anthropogenic influence. All of these factors operate simultaneously enabling the creation of unique vegetation of Roztocze.

INTRODUCTION

High level of biological diversity is one of the most attractive features of the nature of Roztocze region. Ukrainian part of this region represents only 1/3 of the area of the whole Roztocze but is still characterised by large variability of habitats and biodiversity. This is the result of the geographical situation of Roztocze through which pass rivers originating in neighbouring regions of Polesia and western Podolia. There are ecologically valuable wetlands which shape the hydrological conditions of the region. Despite its structural integrity, region's sub-components: Western Roztocze (Goraj Roztocze), Central Roztocze (Tomaszow Roztocze) and Southern Roztocze (Rawa Roztocze) can be distinguished by specific botanical and geographical features [Buraczyński 1997]. Also Ukrainian part of Southern Roztocze can be distinguished by its individual features. In this area distribution

range boundaries of many plant species overlap which is the result of the large influence of continental climate on the region. Other interesting feature of Ukrainian Roztocze is integrity of natural ecosystems with artificial ones. Next to well preserved natural broadleaved woodlands are forests modified by human activities and also artificially created plantations with large component of exotic tree species. The same can be said about non-woodland ecosystems. They form a kind of mosaic of natural wetlands and marshes, meadows and dry grasslands together with marshes and mires transformed by irrigation.

Scientific research about flora and vegetation of Ukrainian Roztocze has been conducted for more than 200 years. Unique plant resources of the region have been drawing attention of many generations of botanists. The region was the background for scientific work and publications of: W. Besser (1809-1820), W. Gajewski (1930-1937), A. Grzegorzek (1868-1872), A. Zawadzki (1824-1836), A. Tomaszek (1859-1868), F. Herbich (1860-1866), A. Rehman (1869-1893), J. A. Knapp (1872-1893), B. Błocki (1881-1912), E. Turczyński (1878-1880), E. Wołoszczak (1874-1908), Ż. Król (1875-1878), S. Trusz (1879-1894), R. Schupp (1905-1911), J. Mądalski (1930-1941), H. Zapałowicz (1904-1914), W. Szafer (1910-1964), M. Koczwara (1915-1939), W. Tyniecki (1875-1905), Sz. Wierdak (1923-1938), M. Raciborski (1908-1911), J. Motyka (1937-1947), D. Zerov (Зеров 1934-1946), M. Kosets (Косець, 1937-1947), F. Święs (1999-2001), S. Shevchenko (Шевченко, 1957-1970), G. Koziy (Козій, 1959-1961), S. Stoyko (Стойко, 1963-2014), K. Malinovskiy (Малиновський 1974-2001). Worth mentioning are also rich herbaria preserved in the Ivan Franko University in Lviv, National University of Forest Technology in Lviv and in Natural History Museum of National Academy of Sciences of Ukraine [Soroka 2002].

The aim of the research presented below was assessment of biodiversity of vegetation cover of Ukrainian part of Roztocze and factors influencing its individual character.

METHODOLOGY OF RESEARCH

Scientific investigation of the vegetation of Roztocze was being conducted between years 1985-2015 using the methods adopted by phytosociology [Braun-Blanquet 1964]. Scientific names of vascular plants were given in line with Flora Europaea [Tutin et al. 1964-1980], and synonyms of names after Tasiienkevich [1998]. Analysis of the structure of the flora was conducted using method of Tolmachowa [1986]. Geographical structure of flora was assessed after Malynovs'kyi [1980]. Sozological (environmental conservation aspect) analysis of flora and vegetations was performed with method proposed by Čeřovský [1997]. Plant communities have been assessed syntaxonomically and phytosociologically using the method of Braun-Blanquet [1964]. Scientific names of mosses were assigned after Corley et al. [1981], liverworts – after Grolle and Long [2000]. The structure and names for plant community syntaxonomical units were adopted from

Matuszkiewicz [2001]. Characteristics of climatic conditions was presented in climatic diagram (Fig. 1) elaborated with use of Walter and Lieth [1967] method.

RESULTS

The mosaic of natural and anthropogenic habitats of Roztocze is characterised by high level of biodiversity [Soroka 1992, 2002, 2008]. According to Fijałkowski [1994 a,b] and Soroka [1992, 2004, 2006, 2009] in the whole area of Roztocze there are present 1564 plant species of 568 genera, 122 families, 72 orders and 6 classes. Ukrainian Roztocze has got 1344 plant species identified of which 288 (16.9%) would require protection of various forms, 88 species are listed in Ukrainian Red Book [2009], 2 species are in European Red List of Plants and Animals, 13 species in Appendix I to Bern Convention [Soroka 1992, 2004, 2006, 2009, 2011]. In the territory of Ukrainian Roztocze there were 146 plant communities identified with Braun-Blanquet method including 23 biotopes protected under *Natura 2000* network and 5 plant species figuring in Annex IV of EEC Directive - 92/43: *Aldrovanda vesiculosa* L., *Agrimonia pilosa* Ledeb., *Cypripedium calceolus* L., *Ostericum palustre* Bess., *Thesium ebracteatum* Hayne. [Soroka 2006, 2009, 2011; Soroka, Woźniak 2013; Rozporządzenie... 2005].

Sozological analysis of flora and vegetation of Ukrainian part of Roztocze conducted with Čeřovský [1997] method has shown that species of the highest autfitosozological indexes (AFI, max 18.8) are *Betula obscura* A. Kotula (15.2), *Corallorhiza trifida* Chatel. (12.8), *Staphylea pinnata* L. (12.7), *Salvinia natans* (L.) All. (12.4), *Crocus heuffelianus* Herb. (12.0), *Anacamptis pyramidalis* (L.) Rich. (11.9). Syntaxons with high values (SFI, max 11.4) of these indexes are: *Caricetum davallianae* Dutoit 1924 em. G6rs 1963 (9.91), *Spirodello-Salvinietum natantis*



Picture 1. *Phyllitido-Aceretum* Moor 1952 – a plant community known only from Ukrainian part of Roztocze (nearby the village Fiyna).

Source: M. Soroka and A. Woźniak.

Slavnić 1956 (8.03), *Phyllitido-Aceretum* Moor 1952 (7.93) (Picture 1), *Betulo-Salicetum repentis* Oberd. 1964 (7.72), *Nupharo-Nymphaeetum albae* Tomasz. 1977 (7.49) [Soroka and Woźniak 2013].

Original feature of vegetation in Ukrainian part of Roztocze is the presence of such plant communities as *Dentario glandulosae-Fagetum* W.Mat.1964 et Guzikowa et Kornaś 1969 var. *Allium ursinum*, *Phyllitido-Aceretum*, *Ricciocarpetum natantis* Segal 1963 em. R.Tx. 1974 and *Asplenio viridis-Cystopteridetum* (Oberd. 1936) 1949, which are not present in Polish part of the region [Soroka 2008]. Additionally there are present species which have not been found in the Polish part of Roztocze, namely: *Symphytum cordatum* Waldst. et Kit. ex Willd., *Salvinia natans*, *Pulsatilla grandis* Wend., *Adonis flammeus* Jacq., *Viola alba* Bess., *Aldrovanda vesiculosa*, *Leucojum vernum* L., *Dactylorhiza traunsteineri* (Saut.) Soo., *Arum maculatum* L., *Lunaria rediviva* L., *Telekia speciosa* (Schreb.) Baumg [Soroka 2002].

The plant communities of Roztocze are being shaped by synergy of many factors, both natural and artificial, hence they comprise of components of various age and origin. [Soroka 1992]. The factors which to the highest degree determine botanical features of Ukrainian Roztocze are:

1. Geographical situation of Roztocze in the “crossroads” of three various major natural regions: Carpathians, Podolia and Polesia [Buraczyński 1997]. Heterogenic characteristics of vegetation cover are visible in combination of upland species genetically connected to mountain regions of Europe - especially Carpathians (*Lunaria rediviva*, *Chamaerion dodonaei* (Vill.) Holub, *Gentiana asclepiadea* L., *Symphytum cordatum*, *Leucojum vernum*, *Crocus heuffelianus*, *Colchicum autumnale* L., *Knautia dipsacifolia* Kreutzer) with species characteristic to steppe vegetation of Podolia (*Adonis flammeus*, *Scleranthus uncinatus* Shur, *Spergula pentandra* L., *Erysimum durum* J. et C. Presl, *Trifolium pannonicum* Jacq., *Anthyllis schiwereckii* (DC.) Blocki, *Leopoldia comosa* (L.) Parl.) and boreal species of Polesia (*Oxycoccus microcarpus* Turcz. ex Rupr., *Viola uliginosa* Bess., *Polemonium caeruleum* L.). The same characteristics can be noticed among plant communities developed within the region. In Ukrainian part of Roztocze are found upland plant communities of *Asplenio viridis-Cystopteridetum*, *Luzulo pilosae-Fagetum* W. Mat. et A. Mat. 1973, *Dentario glandulosae-Fagetum*, *Phyllitido-Aceretum*, as well as characteristic for Podolia meadow-steppe communities of *Thalictro-Salvietum pratensis* Medw.-Korn. 1959, *Origano-Brachypodietum* Medw.-Korn. et Kornaś 1963 (fot. 2) and plant communities of northern areas like *Caricetum diandrae* Jon. 1932 em. Oberd. 1957, *Ledo-Sphagnetum magellanici* Sukopp 1959 em. Neuhäusl. 1969, *Cladonio-Pinetum* Juraszek 1927 [Soroka 2008].



Picture 2. Characteristic for Podolia meadow-steppe community of *Origano-Brachypodietum* Medw.-Korn. et Kornas 1963 var. *Veronica spicata* in Ukrainian Roztocze (near village of Vereshchytsya, Gavrilova Gora)
 Source: M. Soroka and A. Woźniak.

2. Long history of geological development of the region allowed the development of elements of flora and vegetation characteristic for different geological ages. It can be noticed in the geographical structure of flora and each element which is a stage of its development.

3. The role of the region as a barrier for Atlantic air masses. The continentality of climate increases towards the east along the main ridge of Roztocze which can be noticed through characteristics of flora in Ukrainian part of the region. Here there are no records of presence of Atlantic plant species known from western and central part of Roztocze: *Carex punctata* Gaudin, *Drosera intermedia* Hayne, *Hydrocotyle vulgaris* L., *Osmunda regalis* L., *Rhynchospora fusca* (L.) Aiton, *Schoenoplectus setaceus* (L.) Palla, *Spergula morisonii* Boreau, *Teesdalea nudicaulis* (L.) R.Br. [Fijalkowski 1994]. Also in comparison with Polish part of Roztocze there is much smaller presence of species from families of *Rosaceae*, *Brassicaceae*, *Fabaceae*, *Chenopodiaceae* and genera of *Potentilla*, *Rubus*, *Trifolium*, *Vicia*, *Geranium*. At the same time reported was an increased role of species from families of *Cyperaceae*, *Ranunculaceae*, *Scrophulariaceae*, *Caryophyllaceae* and genera *Galium*, *Dianthus*, *Orobanche*, *Festuca*, *Rosa*, *Senecio*, *Ranunculus*, *Juncus*. In addition it is possible to find the evidence of transition from Central to Eastern European flora in the flora of Ukrainian Roztocze [Soroka 1992, 2002]. As well in the species composition of plant communities it is possible to see decreasing influence of maritime air masses on the climate. In the Ukrainian part of Roztocze the community of *Dentario glandulosae-Fagetum* (Carpathian fertile beech woodland) almost entirely lacks the presence of Norway spruce and Silver fir, though these tree species are common in the same plant community in the central Roztocze (Picture 3).



Picture 3. Differences in the composition of species in *Dentario glandulosae-Fagetum* (left – Central Roztocze (Bukowa Góra, Zwierzyniec), right – Ukrainian part of Roztocze (near the village of Vereshchytsya)

Source: M. Soroka and A. Woźniak.

4. The role of main European watershed – seen in simultaneous presence of species from different floristic provinces – Baltic and Black Sea.

5. Gradual increment of land elevation from the Western towards Ukrainian Roztocze. In the western part of Roztocze the land elevation reaches 290m a.s.l., 350m in the central part and in 390m in the southern areas. The lowest point of the whole region is 200m [Buraczyński 1997]. The amplitude of elevation in Roztocze reaches 190 m which results in “land form correction” of plant distribution. Because of that Ukrainian part of Roztocze, despite the distance and relative isolation from Carpathians has got more upland plant species present than the Polish part- for example rare species of ferns: *Phyllitis scolopendrium* (L.) Newm., *Asplenium viride* Huds. (fot. 4), *Blechnum spicant* (L.) Roth, *Polystichum braunii* (Spenn.) Fee., as well as unique upland plant communities like *Phyllitido-*



Picture 4. *Asplenium viride* Huds. – very rare fern species in Ukrainian part of Roztocze (near the village of Vereshchytsya)

Source: M. Soroka and A. Woźniak.

Aceretum, which in Ukraine was found only in Carpathians and is not present in Polish part of the region. This shows that land elevation factor is the most important one in shaping the flora of Roztocze. Its influence can partially explain the similarity between floras of various parts of Roztocze (Table. 1).

Tab. 1. Comparison of indicators for floras of various parts of Roztocze (1 - Ukrainian, 2 - Goraj, 3 - Central, 4 – Polish part of Rava Roztocze)

Part of Roztocze	2	1	2	3	2	4	3	4	3	1	4	1
Indicator												
Number of species	987	1344	987	1237	987	823	1237	823	1237	1344	823	1344
Number of common species	897		953		750		802		1037		758	
Number of characteristical species	90	447	34	284	237	72	435	21	200	307	65	586
Total number of plant species in compared parts of Roztocze	1434		1271		1059		1258		1544		1409	
Jaccard similarity coefficient (KJ)	0,62		0,75		0,71		0,64		0,67		0,54	

Source: Own work

6. Mosaic of soils and gradual improvement of soil fertility from west to east. In western and central part of Roztocze the largest area is covered with soils built on sand or loess while in Ukrainian part dominant soils are podzolic and grey-brown forest soils [Buraczyński 1997; Herenchuk 1972]. This has influence on diversity of forest communities in various parts of Roztocze.

7. Increase of annual precipitation and decrease of mean annual temperature from west to east. Varying climatic conditions influence shaping

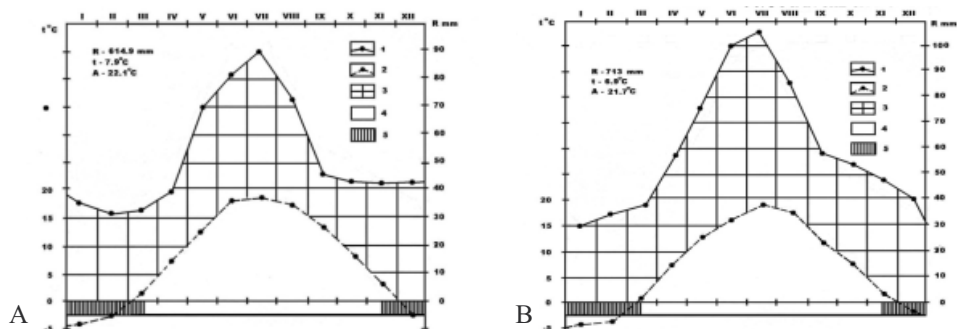


Figure 1. Climatic diagram of research area: A – Meteo station in Kraśnik, B – Meteo station Rava-Rus'ka. 1 – mean monthly precipitation, 2 – monthly mean air temperatures, 3 – wet season 4 – growing season , 5 – winter season, R – mean annual precipitation, t – mean annual air temperature, A – annual temperature amplitude.

Source: Own work.

of vegetation and hydrological balance of the region. In lower areas, especially in river flood beds occurs presence of various wetland plant communities including fens and mires. (Figure 1).

Composition and structure of vegetation of Ukrainian Roztocze are determined also by phytohistorical factors:

1. Post-glacial and modern migration of species has contributed in Roztocze to the presence of many plant relics belonging to various geological periods. Above all, there are present species the age of which is estimated to be tertiary. These in the Ukrainian part of Roztocze would be mainly post-glacial migrants such as: *Cimicifuga europaea* Schipcz., *Hedera helix* L., *Melittis sarmatica* Klok., *Pulmonaria mollissima* Kern., *Salvinia natans*. Glacial period relics are preserved in the area nearby lakes of glacial origin (e.g. Staw Janowski): *Betula humilis* Schrank, *Carex cinerea* Poll., *Oxycoccus palustris* Pers., *Parnassia palustris* L., *Pedicularis sceptrum-carolinum* L., *Polemonium caeruleum*. From the time of Pleistocene some boreal species are preserved - *Ledum palustre* L., *Trientalis europaea* L., *Vaccinium* L., *Calluna vulgaris* (L.) Hull. The Holocene period migrations brought majority of upland species, among them: *Aposeris foetida* (L.) Less., *Galanthus nivalis* L., *Polygonatum verticillatum* (L.) All., *Polystichum aculeatum* (L.) Roth, *Asplenium viride*, *Dryopteris austriaca* (Jacq.) Woyнар ex Schinz et Thell., *Dentaria glandulosa* Waldst. et Kit. [Soroka 1992, 2002].

2. Proximity to the centres for formation of endemic species of Volhynia and Podolia. The postglacial flora of Roztocze includes species endemic to the regions of Volhynia and Podolia. Emergence of these species in the region is connected to migration of plants in the post-glacial times. Example species are *Dianthus pseudoserotinus* Błocki, *Galium polonicum* Błocki, *Euphorbia klokovii* Dubovik [Zaverukha 1985]. These species are not present in Polish part of Roztocze [Fijałkowski 1994 a,b].

3. Overlapping of distribution areas and boundaries of species belonging to various floristic provinces: Baltic and Black Sea. Through the region run north-eastern boundaries of distribution of: *Abies alba* Mill. and *Juniperus communis* L., northern ones for: *Alnus incana* (L.) Moench, *Picea abies* (L.) Karst. (Carpathian distribution zone), *Gentiana asclepiadea* L., *Viola alba*; south-eastern distribution range boundary of *Arabis gerardii* (Bess.) Koch, *Corydalis cava* (L.) Schweigg. et Koerte, *Fagus sylvatica* L.; southern one for: *Ledum palustre*, *Festuca trachyphylla* (Hack.) Krajina, *Oxycoccus palustris*, *Salix myrsinifolia* Salisb. In neighbouring regions run north-western boundaries of distribution for: *Aconitum moldavicum* Hacq., *Cotoneaster melanocarpus* Fisch. ex Blytt., *Aposeris foetida*, *Clematis recta* L. and *Dianthus pseudoserotinus* Błocki, western ones: *Botrychium virginianum* (L.) Sw., eastern: *Equisetum telmateia* Ehrh., *Herniaria hirsuta* L. and *Lotus uliginosus* Schkuhr., northern: - *Acer campestre* L., *Geranium phaeum* L. and *Hedera helix*, southern: *Carex dioica* L., *Salix myrtilloides* L. and *S. lapponum* L. [Meusel, Jager, Weinert 1965].

4. Zonal (latitudinal), vertical (altitudinal) and longitudinal (meridional) diversity of vegetation diversity. Geographical situation of the region resulted in development of zonal vegetation complexes in syntaxonomical classes of *QUERCO-FAGETEA*, *VACCINIO-PICEETEA*, *FESTUCO-BROMETEA* and *TRIFOLIO-GERANIETEA SANQUINEI*. Intrazonal vegetation types belong to classes of *OXYCOCCO-SPHAGNETEA* and *ASPLENIETEA RUPESTRIA*. In the geographical longitudinal gradient from western to south-eastern Roztocze the plant groups of subatlantic climate gradually give place to upland and xerothermic types. This is particularly visible in areas of „Gavrylova Gora”, „Yaryna”, „Vosmashi”, in which important role is played by eastern European species: *Aster amellus* L., *Dracocephalum austriacum* L., *Linum flavum* L. To large extent the altitudinal diversity of vegetation present in Ukrainian Roztocze occurs due to highest land elevations present in this part of the region. The plant diversity is accompanied by altitudinal diversity of soils. Along the latitudinal gradient vegetation of Ukrainian Roztocze creates well distinguished zones. Above 350m a.s.l. are present beech woodlands of *Dentario glandulosae-Fagetum* community, in stream valleys it is possible to encounter *D. g.-F. var. Lunaria rediviva* and *D. g.-F. var. Allium ursinum*, and on the tops of hills *D. g.-F. var. Carex pilosa*, which is a geographical substitute to Carpathian community of *Dentario glandulosae-Fagetum* var. *Festuca drymeia* Mert. et Koch. The zone below beech forests consists of central European woodlands *Tilio cordatae-Carpinetum betuli* of many varieties. In higher parts there are woodlands of *T. c.-C. b. var. Fagus sylvatica*, than - *T. c.-C. b. var. typicum*, *T. c.-C. b. var. Carex pilosa*. Lower parts of slopes are occupied by *T. c.-C. b. var. Stachys sylvatica*. On the south-western slopes of Ukrainian Roztocze grow oak woodlands of *Potentillo albae-Quercetum*, below that: *Quercus roboris-Pinetum*.

5. Eye-hole type distribution of vertical vegetation zones in Polish and Ukrainian part of Roztocze is clearly visible when comparing vertical vegetation zones of Central Roztocze [Izdebski 1992] with ones of Ukrainian Roztocze [Soroka 2008]. It was found that south-western slopes of Polish Roztocze correspond with north – eastern slopes of Ukrainian Roztocze which is caused by land form peculiarities of the region. In its Polish part the south-western boundary is clearly visible and slope is steep while north-eastern boundary is unclear. In the Ukrainian part the situation is opposite (fig. 2).

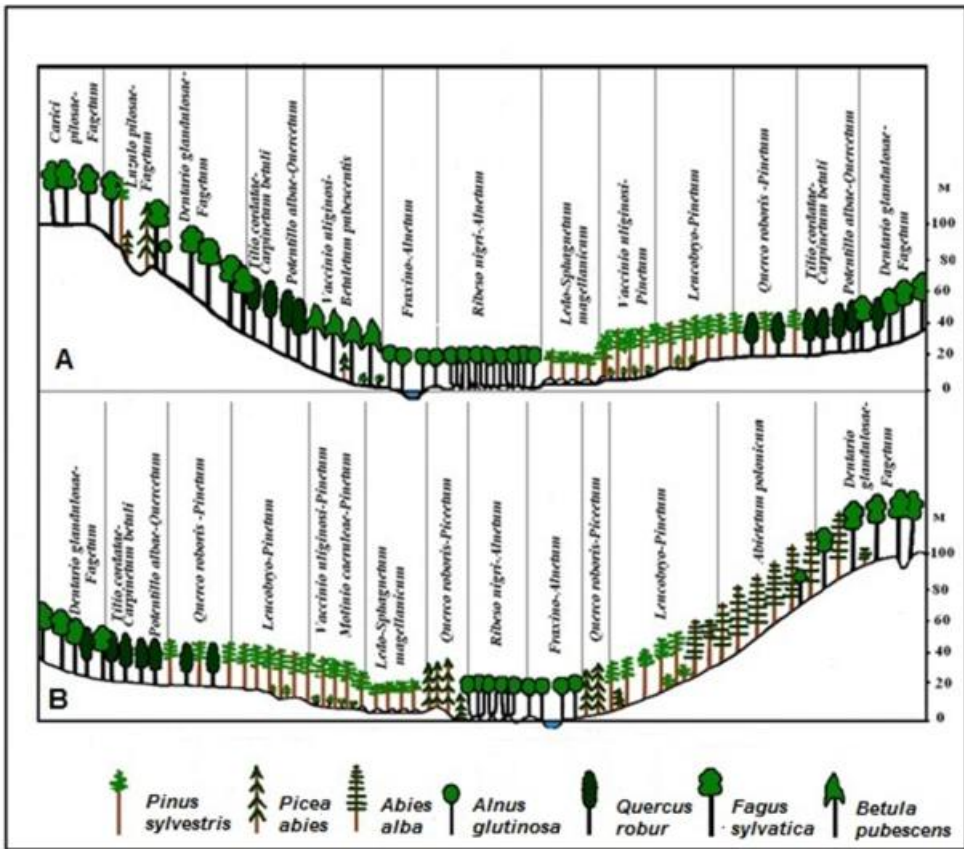


Figure 2. Eye-hole type of distribution of vertical vegetation zones in Roztocze: A – in Ukrainian part, B – in Polish part, Source: Izdebski 1992.

6. Shaping of plant objects in line with “plant prevention rule” of Valter-Alekhin [Alekhin 1951]. North – eastern slopes of Ukrainian Roztocze are covered with mixed woodlands and pine forests with high component of boreal plant species while south western slopes with beech woodlands accompanied mainly by central European upland plant species forming the core of these plant communities. Meadow-steppe communities with eastern European species have survived only in south-eastern fringes of the region on warmth-absorbing subsoils developed of limestone bedrock. Wide river flood beds, hollows and surroundings of glacial lakes are occupied by peat lands, some of which are glacial relics. All factors acting simultaneously allowed formation of unique vegetation of Roztocze. Protection of region's biological and landscape diversity would be feasible only by implementation of uniform strategy which could be developed by designation of international biosphere reserve “Roztocze”.

SUMMARY

Polish and Ukrainian parts of Roztocze despite similar structure and environmental conditions distinguish by large species diversity of floras and structure of vegetation. This is caused by the influence of natural factors, mainly land form, geological structure, climate, soil mosaic, hydrology and anthropogenic factors. All these elements acting together allowed the shaping of unique vegetation of Roztocze. The most important factors determining botanical features of Ukrainian Roztocze are: situation in the crossing of differing natural areas - Carpathian, Podolia and Polesia; geological background of the region, soil-climatic conditions and region's hydrology and phytohistorical factors.

REFERENCES

- Alekhin V.V. (1951). *Rastitel'nost' SSSR v osnovnykh zonakh*. Izd. Sov. nauka, 512 s.
- Braun-Blanquet J. (1964). *Pflanzensoziologie, Grundzuge der Vegetationskunde*. Wien-New York: Springer, 3 Aufl., 865 s.
- Buraczyński J. (1997). *Roztocze*. Wyd. UMCS Lublin, 189 s.
- Chervona kniha Ukraïni. Roslinniy svit* (2009). Wyd. Globalkonsalting, Kyiv, 900 s.
- Čerovský J. (1997). *Ochrana roslinneho prirodniho bohatstvi v kulturni krajine*. Pamatky priroda, 2, 97-103.
- Corley M.F.V., Grundwell A.C., Dull R., Hilland M.O., Smith A.J.E. (1981). *Mosses of Europa and the Azores; an annotated list of species, with synonyms from the recent literature*. J. Bryol. 11, 609-689.
- Fijałkowski D. (1994 a). *Flora roślin naczyniowych Lubelszczyzny*. Wyd. Lubelskie Towarzystwo Naukowe, T. 1, 389 s.
- Fijałkowski D. (1994 b). *Flora roślin naczyniowych Lubelszczyzny*. Wyd. Lubelskie Towarzystwo Naukowe, T. 2, 868 s.
- Grolle R., Long D.G. (2000). *An annotated check-list of the Hepaticae and Anthocerotae of Europe and Macaronesia*. J. Bryol. 22: 103-140.
- Herenchuk K.I. (red.) (1972). *Pryroda L'vivs'koyi oblasti*. Wyd. L'viv, 151 s.
- Izdebski K. (1992). *Zbiorowiska roślinne Roztoczańskiego Parku Narodowego na tle warunków siedliskowych*. Wyd. UMCS Lublin, 268 s.
- Matuszkiewicz W. (2001). *Przewodnik do oznaczania zbiorowisk roślinnych Polski*. Wyd. PWN Warszawa, 536 s.
- Malynovskiy K.A. (1980). *Roslynnist' vysokohir'ya Ukrayins'kykh Karpat*. Wyd. Nauk. dumka, 280 s.
- Meusel H., Jager E., Weinert E. (1965). *Wergleichende Chorologie der zentraleuropaischen Flora*. Fischer, Jena. 583 p.
- Ochyra R., Żarnowiec J., Bednarek-Ochyra H. (2003). *Census catalogue of Polish mosses. Biodiversity of Poland*. — Vol. 3./Mirek Z. — Kraków: Pol. Acad. Sci.
- Rozporządzenie Ministra Środowiska z dnia 16 maja 2005 r. w sprawie typów siedlisk przyrodniczych oraz gatunków roślin i zwierząt, wymagających ochrony w formie wyznaczenia obszarów Natura 2000. Dz. U. Nr 94/2005, poz. 795, z dnia 30 maja 2005 r.
- Soroka M.I. (1992). *Flora Roztoczcza, jeje ochrana i ispol'zovanye*: Awtoref. ... kand. s'ch nauk. L'viv, 17 s.
- Soroka M.I. (2002). *Flora sudynnych roslyn Ukrajins'koho Roztoczcza*. Wyd. UkrDLTU, L'viv, 155 s.
- Soroka M.I. (2004). *Flora ta roslynnist' Pryrodnoho zapovidnyka „Roztochchya”*. Naukovyy visnyk UkrDLTU, Vyp. 14.8., 170-179.

- Soroka M. (2006). *Flora ta roslynnist' terytoriyi, zarezerovanoi pid stvorenniya mizhnarodnoho biosferneho rezervatu „Roztochchya”*. Materialy do proektu ta nominatsiyanoi formy, Vyd. NLTU Ukrainy, L'viv, 115 s.
- Soroka M. (2008). *Roslynnist' Ukrainy koho Roztochchya*. Vyd. Svit, L'viv, 432 s.
- Soroka M.I. (2009). *Ridkisini vydy roslyn terytoriyi proektovanoho Mizhnarodnoho biosferneho rezervatu „Roztochchya”*. Naukovyy visnyk NLTU Ukrainy, zb. nauk.-tekhn. prats', L'viv, 19.4, 21-29.
- Soroka M.I. (2011). *Obyekty okhorony merezhi NATURA 2000 na terytoriyi Pryrodnoho zapovidnyka „Roztochchya”*. Naukovyy visnyk NLTU Ukrainy, zb. nauk.-tekhn. prats', L'viv, 21.15, 13-17.
- Soroka M., Woźniak A. (2013). *Sozolahichna otsinka rarytetnykh vydiv roslyn ukrayins'koyi chastyny biosferneho zapovidnyka „Roztochchya”*. Visnyk L'vivs'koho Universytetu, Seriya biolohichna, 63, 75-85.
- Tasenkevych L.O. (1998). *Pryrodna flora Karpat. Spysok vydiv sudynnykh roslyn*. L'viv: Derzh. pryrod. muz. NAN Ukrainy, 610 s.
- Tolmachov A.I. (1986). *Metody sravnitel'noy floristiki i problemy florogeneza*. Izd. Nauka, 200 s.
- Tutin, T.G., Heywood, V.H., Burges, N.A., Moore, D.M., Valentine, D.H., Walters, S.M., Webb, D.A., 1964, 1968, 1972, 1980. *Flora Europaea 1964-1980*. Cambridge Univ. Press, Cambridge, pp. 1-5.
- Walter H., Lieth H. (1967). *Klimadiagram-Weltatlas. Handbuch*. VEB Gustav Fischer Verlag, Jena. 253 p.
- Zaverukha B.V. (1985). *Flora Volyno-Podolyi y ee henezys*. Vyd. Nauk. dumka, 192 s.

STRESZCZENIE

Bioróżnorodność zbiorowisk roślinnych, siedlisk i krajobrazu jest jedną z najbardziej charakterystycznych cech ukraińskiej części Roztocza. Występują tutaj granice zasięgu wielu gatunków roślin oraz jedność naturalnych i sztucznych ekosystemów. Wraz z dobrze zachowanymi naturalnymi lasami liściastymi obecne są tutaj modyfikowane przez człowieka lasy i sztucznie utworzone plantacje z dużym udziałem gatunków obcych. Również obecna jest tutaj mozaika naturalnych obszarów podmokłych i bagiennych, łąkowo-stepowych oraz muraw kserotermicznych wraz z przekształconymi przez melioracje torfowiskami i łąkami. Spośród czynników, które w największym stopniu determinują botaniczne cechy ukraińskiego Roztocza należą: położenie na skrzyżowaniu obszarów przyrodniczych – Karpat, Podola i Polesia; geologiczny rozwój regionu; warunki glebowo-klimatyczne i hydrologiczne, a także czynniki fitohistoryczne.

SYNOPSIS

The diversity of plant communities, habitats and landscapes is the most characteristic feature of the Ukrainian part of Roztocze. There are the distribution area boundaries of many species of plants as well as the unity of natural and artificial ecosystems. Along with the well-preserved natural forests there are artificially created forests and plantations, modified by humans, with a large proportion of exotic species. There is also a mosaic of natural wetlands and marsh, meadow-steppe and sandy grasslands along with, transformed by drainage, peat bogs and meadows. The factors which most determine the botanical features of the Ukrainian part of Roztocze among others include: location at the crossroads of natural areas - the Carpathians, Polesie and Podolia; geological development of the region; soil and climatic and hydrological conditions.