

# SŁUPSKIE PRACE GEOGRAFICZNE

Nr 15

ss. 5-18

2018

ISSN 1641-8468

© Instytut Geografii i Studiów Regionalnych Akademii Pomorskiej w Słupsku

Przyjęto: 7.11.2017

Zaakceptowano: 9.01.2018

## **Oleksandr Lukash**

T.G. Shevchenko National University "Chernihiv Colehium"

Chernihiv, Ukraine

lukash2011@ukr.net

## **Ivan Kirvel**

Pomeranian University

Słupsk

kirviel@yandex.ru

## **THE GEOGRAPHICAL STRUCTURE OF THE FLORA OF THE EASTERN POLESYE VASCULAR PLANTS**

### **STRUKTURA GEOGRAFICZNA FLORY ROŚLIN NACZYNIOWYCH POLESIA WSCHODNIEGO**

**Abstract:** The geographical structure of the flora of the Eastern Polesye vascular plants have been investigated. The results of the research showed that the basis of the flora of the vascular plants of the Eastern Polesye is European, Euro-West-Asian, Euro-Asian and circumpolar species, which are distributed mainly in the temperate and submeridional zones of the Holarctic. It was determined that the far southern locations of 4 arcto-boreal and 8 boreal species. The main ways of modern changes in the borders of the habitats and species migration in the Eastern Polesye (the regressive northeastern, progressive eastern, northwestern, western and northern) has been shown.

**Key words:** Eastern Polesye, geographical element, flora, physico-geographical region

**Słowa kluczowe:** Polesie Wschodnie, element geograficzny, flora, region fizycznogeograficzny

## **Introduction**

The main concept in the geography of plants is the habitat under which we understand the territory or water area where a definite taxon is distributed (Diduh 2007). Due to the fact that the range of each species is unique it is impossible to create a unique generally accepted classification of habitats. A.I. Tolmačev (1974) notes, that a planetary classification of habitats can be hardly created, by the way it

is hardly necessary. Â.P. Diduh (2007) emphasizes, that the range system is quite complex and diffuse, therefore it is impossible to find the basis for the division and, accordingly, to classify the habitats according to the existing rules of formal logic. One can agree with the idea of E.A. Glazkova (2001) that each author, based on the specifics of the flora studied and the tasks assigned, works out his own system of geographical elements always relying on the experience of the previous studies. The goal of our study was to find out, based on the chorological positions, the peculiarities of the flora of the Eastern Polesye on the whole and its physiographic regions, and also to establish modern migration paths of the flora of the region.

## **Materials and methods of the research**

To study the geographical structure the flora of the vascular plants of the Eastern Polesye was analyzed, the area of which is 3.25 million hectares. Its territory is on the left bank of the Dnieper within Gomel region (Belarus), Briansk region (Russia), Chernigov and Sumy regions (Ukraine). The boundaries of the Eastern Polesye are determined by comparing the schemes of physical and geographical regionalization of Belarus (*Priroda Belorussii...* 1989), Ukraine (Marinič et al. 2003) and Briansk region of Russia (*Krasnaâ kniga...* 2004). The Dnieper forms the natural western boundary of the Eastern Polesye. In the north the border of the Eastern Polesye runs along the Rzhavka, Chechera, Lipa, Uza, Sozh rivers and covers the lower part of the Sozh – Besed and Besed – Iput interfluves. In the south and south-west the border of the research region corresponds to the border with the Forest-Steppe, in the east it is confined by the spurs of the Central Russian Plain and includes the Revna – Snov and Desna – Nerussa interfluves.

For the geographical analysis of the flora of the Eastern Polesye we used the database Flora-SchidPol created by us. We used the biogeographic coordinates method (Ûrcev and Kamelin 1987). The analysis is based on the scheme of botany-geographical zoning of the globe worked out by H. Meusel, E. Jäger and E. Weinert (1992). The information on the range of species is taken from different literary sources. The geographic analysis was carried out for the spontaneous flora of the vascular plants in the Eastern Polesye (1,307 species) without division into aboriginal and spontaneous fractions (Lukaš 2008).

## **Results and their discussion**

According to the maximum belonging of species ranges to a particular latitudinal zone, we divided them into 19 groups, as well as to the plurizonal group of geographic elements (fig. 1: 2). According to the extent of the ranges on these or those longitude sections, 9 longitude groups of geographic elements are distinguished (fig. 1: 1).

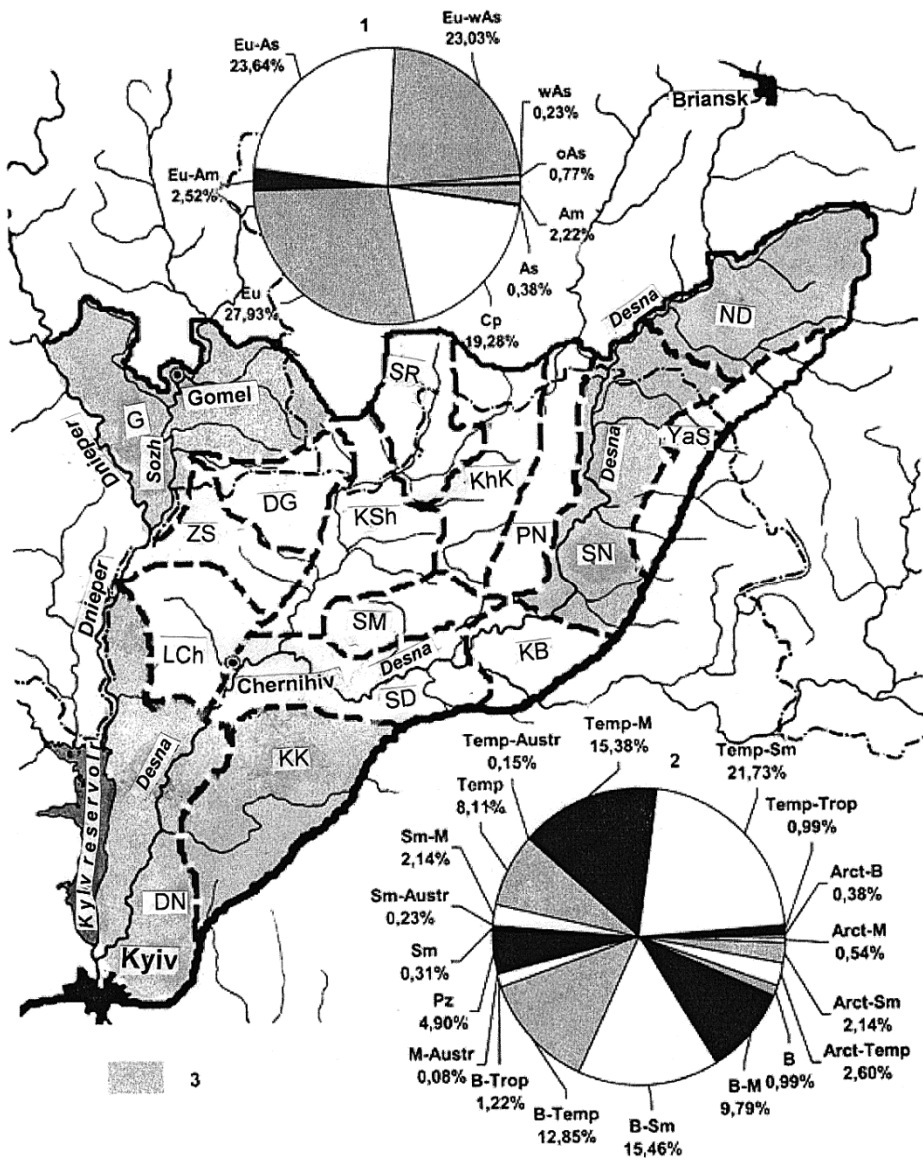


Fig. 1. Physico-geographical regions of the Eastern Polesye  
Ryc. 1. Regiony fizycznogeograficzne Polesia Wschodniego

G – Gomel, SR – Snovsko-Revninsky, KhK – Kholminko-Kostrobobrinsky, PN – Ponomitsko-Novgorod-Seversky, ND – Nerussko-Desnansky, SN – Srednedesnansko-Nizhneshostkinsky, YaS – Yampolsko-Seredino-Budsky, ZS – Zamglyaysko-Sednevsky, DG – DoBriansko-Gorodnansky, KSh – Korukovsko-Shchorsky, SM – Sosnitsko-Mensky, KB – Koropsko-Baturinsky, LCh – Lubech-Chernigov, SD – Sredne-Desnansky, DN – Dneprovsko-Nizhnedesnansky, KK – Kozeletsko-Kulikovsky.

The distribution of flora species of the vascular plants in the Eastern Polesye according to the longitude (1) types of the habitats: Cp – circumpolar, Eu – European, Eu-wAs – Euro-West Asian, Eu-As – Euro-Asian, Asiatic, oAs – East Asian, wAs – West Asian, Eu-Am – Euro-American, Am – American.

The distribution of flora species of the vascular plants of the Eastern Polissya according to the latitudinal (2) types of the habitats: Arct-B – arcto-boreal, Arct-Temp – arcto-temperate, Arct-Sm – arcto-submeridional, Arct-M – arcto-meridional, B – boreal, B-Temp – boreal-temperate, B-Sm – boreal-submeridional, BM – boreal-meridional, B-Trop – boreal-tropical, Temp – temperate, Temp-Sm – temperate-submeridional, Temp-M – temperate-meridional, Temp-Trop – temperate-tropical, Temp-Austr – temperate-austral, Sm – submeridional, Sm-M – submeridional-meridional, Sm-Austr – submeridional-austral, M – meridional, M-Austr – meridional-austral, Pz – plurizonal.

Regional effect: 3 – physico-geographical areas with the largest number of species (general and according to the leading horological groups).

The comparison of the latitudinal geographical elements indicates that the temperate-submeridional species predominate in the flora of the Eastern Polesye (284; 21.73%). However, the percentage of the temperate-submeridional species in each individual physiographic region varies from 15.89 to 22%. This testifies to the territorial “scatteredness” of the species of the temperate-submeridional group in the Eastern Polesye. The largest absolute number of the temperate-meridional species is in Gomel (182 species), Kozeletsko-Kulikovskiy (181 species) and Dnieper-Nizhnednansky (174 species) PhGR.

The number of the boreal-submeridional and temperate-meridional species in the Eastern Polesye is 202 and 201 respectively. The boreal-submeridional species are 15.46% of the investigated flora of the vascular plants. At the same time, the representation of species of this group in all physical and geographical regions exceeds this figure by 3-5%. The greatest number of the boreal-submeridional species is in Gomel (179), Srednednansko-Nizhneshostkinsky and Dneprovsko-Nizhnednansky (for 175 species) PhGR. In comparison with the percentage of the temperate-meridional species in the Eastern Polesye on the whole (15.38%), only in the Lubech-Chernigov and Kozeletsko-Kulikovskiy PhGR it is 1-2% more. The absolute number of temperate-meridional species is occupied by Kozeletsko-Kulikovskiy (158 species), Srednednansko-Nizhneshostkinsky (135 species) and Gomel (127 species) PhGR (fig. 2).

Thus, the species with the range which mainly covers the temperate and submeridional zones of the Holarctic predominate in the flora of the Eastern Polesye. This is fully in keeping with the geographical location of the region studied. Within the limits of the Eastern Polesye we did not find the changes in the number of the leading groups of species identified by the zonal distribution, in the latitudinal or longitude directions.

The insignificant latitudinal range of the territory of the Eastern Polesye allows us to take into account the small values of the indices of influence on the modern flora of the investigated region of the southern and northern florogenetic centers. However, it can be noted that the advancement of the northern species in the submeridional direction occurs along the Dnieper valley. The total percentage of the submeridional, submeridional-meridional and submeridional-austral species (2.68%, an absolute number is 35) is almost 2 times higher than the percentage of the boreal and arcto-boreal species (1.37%; 18).

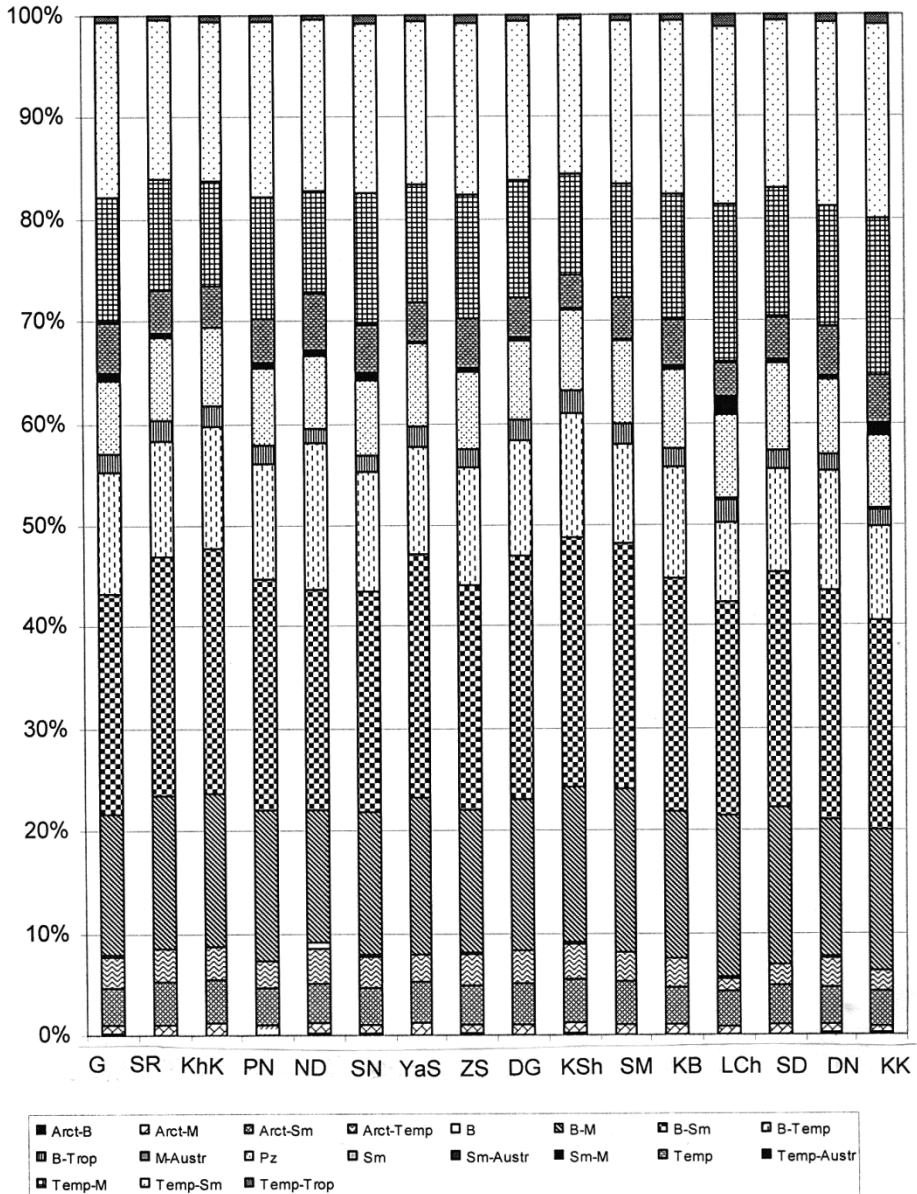


Fig. 2. The correlation of flora species by the zonal types of the habitats in the physico-geographical regions of the Eastern Polesye

Ryc. 2. Zależności pomiędzy gatunkami flory i strefowymi typami siedlisk a regionami fizycznogeograficznymi Polesia Wschodniego

The greatest index of the “boreal nature” of the flora is observed in the north-eastern part of the Eastern Polesye. The total percentage of the arcto-boreal and bo-

real species in the Nerussko-Desnansky PhGR is 1.83%, in the Srednedesnansko-Nizhneshostkinsky – 0.87%, while for half of the PhGR of the Eastern Polesye this index does not exceed 0.16%.

The revealed arcto-boreal (*Avenella flexuosa* (L.) Drejer, *Calamagrostis langsdorffii* (Link) Trin., *Carex chordorrhiza* Ehrh., *Salix lapponum* L.) and boreal (*Carex aquatilis* Wahlenb., *Carex brunescens* (Pers.) Poir., *Carex disperma* Dew., *Carex globularis* L., *Carex vaginata* L., *Chamaedaphne calyculata* (L.) Moench, *Corallorhiza trifida* Chatel., *Dactylorhiza traunsteineri* (Saut. Ex Rchb.) Soó, *Listera cordata* (L.) R. Br., *Malaxis monophyllos* (L.) Sw.) species are at the extreme southern positions of their range. Here, only their individual locations in the northern PhGR of the Eastern Polesye are known. The absence and disappearance of the boreal species in the more southern areas of the Eastern Polesye can be explained both by the influence of the climatic conditions and by the consequences of the anthropogenic influence – the destruction of the growth site. The boreal species *Larix decidua* Mill. and *L. sibirica* Ledeb., identified in the region, are the introductions that occur among the forest cultures.

The southern boundary of the continuous range of the arcto-temperate (*Andromeda polifolia* L., *Arctostaphylos uva-ursi* (L.) Spreng., *Huperzia selago* (L.) Bernh. ex Schrank et Mart., *Lycopodium annotinum* L., *Linnaea borealis* L., *Pedicularis sceptrum-carolinum* L., *Salix myrsinifolia* Salisb., *Trollius europaeus* L.) and boreo-temperate (*Betula humilis* Schrank, *Calla palustris* L., *Carex limosa* L., *Cypripedium calceolus* L., *Daphne mezereum* L., *Diphasiastrum complanatum* (L.) Holub, *Diphasiastrum zeilleri* (Rouy) Holub, *Drosera rotundifolia* L., *Eremogone saxatilis* (L.) Ikonn., *Goodyera repens* (L.) R. Br. L., *Phegopteris connectilis* (Michx.) Watt, *Polystichum braunii* (Spenn.) Fee, *Salix vinogradovii* A.K. Skvortsov, *Salix myrtilloides* L.) species, as well as *Juniperus communis* L., *Pyrola chlorantha* Sw. (B-Sm), *Ledum palustre* L. (Arct-Sm), *Drosera intermedia* Hayne (Temp-Sm) runs along the territory of the Eastern Polesye.

The greatest influence of southern floras is observed in the Lubech-Chernigov and Kozeletsk-Kulikovskiy PhGR, where the total percentage of the submeridional, submeridional-meridional and submeridional-austral species is 2.42%, 2.37% and 2.09% respectively. The enrichment of the flora with the southern elements is mainly done due to the cultural species becoming wild in the ored localities, and which at low frequency can be met near cottage houses, kitchen gardens, gardens, parks and forest parks in the central and southern parts of the Eastern Polesye. Such species include agricultural crops (*Armoracia rusticana* P.Gaertn., B.Mey & Schreb., *Fagopyrum esculentum* Moench, *Lycopersicon esculentum* Mill. s. l., *Lens culinaris* Medik., *Lupinus luteus* L., *Panicum miliaceum* L.), as well as fruit and decorative wood species (*Aesculus hippocastanum* L., *Cerasus tomentosa* (Thumb.) Wall., *Chaenomeles japonica* (Thumb.) Lindl., *Hippophaë rhamnoides* L., *Morus alba* L., *Morus nigra* L., *Syringa vulgaris* L., *Ulmus pumila* L.).

During recent decades in the Eastern Polesye, primarily in the southern part of it, along the maximum transport routes (primarily the main valley of the Dnieper River) from the southern areas a range of the weed species, in particular *Bromus*

*japonicus* Thunb., *Ceratocarpus arenarius* L., *Corispermum declinatum* Stephan ex Iljin, *C. hyssopifolium* L., *Erucastrum armoracioides* (Czern. ex Turcz.) Cruchet, *Isatis tinctoria* L., *Kochia scoparia* (L.) Schrad, *Ornithopus sativus* Brot., *Potentilla orientalis* Juz., *Salsola tragus* L. s. str., *Symphytum asperum* Lepech. has spread. On the steppe areas of the region we observe the spread of such steppe species as *Allium rotundum* L., *Stipa pennata* L. On the weakly saline sand formations of an anthropogenic origin in the suburbs of Chernigov *Typha laxmanii* Lepech. appeared here in 2003 is actively spread.

In the region studied the temperate-meridional species such as *Aster amellus* L., *Centaureum pulchellum* (Sw.) Druce, *Cerasus fruticosa* (Pall.) Woronow, *Linum flavum* L., the temperate-submeridional (*Phlomis tuberosa* L *Carex disticha* Huds., *Prunus spinosa* L., *Secale sylvestre* Host., *Scorzonera purpurea* L.) and the temperate-tropical species (*Lemna gibba* L.) are on the southern border of the range *Dentaria bulbifera* L., *D. quinquefolia* M.Bieb., *Galanthus nivalis* L., *Thesium linophylon* L., *Prunella grandiflora* (L.) Scholl. are on the north-eastern border of the range.

Our studies confirmed the conclusion of Â.P. Diduh (2007) that under the influence of climate changes, global warming, the species, located on the southern border of the range, expand it due to the favorable environmental factors (in our case, xerophytization of the growth site in the southern and central regions of the Eastern Polesye).

The analysis of the longitude ranges of the habitats of species of the Eastern Polesye flora (Fig. 1: 1) indicates that the previous positions are occupied by the European species (365; 27.93%). At the same time, their participation in the floras of certain physico-geographical regions is reduced to 24.74-19.1%. The highest absolute indices of the European species are in Gomel (234), Srednedesnansko-Nizhneshostkinsky (221) and Kozeletsk-Kulikovskiy (217) PhGR (fig. 3).

Thus, a significant number of the European species are represented both in the northern and southern physico-geographical regions of the Eastern Polesye. Probably, the enrichment of the flora of the region, as well as in the Belarusian Polesye (Parfenov 1983), occurred both in the western and southwestern migration ways. Such species as *Picea abies* (L.) Karst., *Tofieldia calyculata* (L.) Wahlenb., *Laserpitium latifolium* L., *Cruciata glabra* (L.) Ehrend., *Hypericum montanum* L., *Corydalis cava* (L.) Schweigg. et Körte, *Dactylozhiza sambucina* (L.) Soó got to the Eastern Polesye by the south-western ways (along the valleys of the right-bank tributaries of the Dnieper River).

On the eastern border of the range there are the Eueuropean species *Alnus incana* (L.) Moench, *Aquilegia vulgaris* L., *Carex brizoides* L., *Carpinus betulus* L., *Genista germanica* L., *Sedum sexangulare* L., *Scilla bifolia* L., *Peucedanum cervaria* (L.) Lapeyr, on the eastern – *Scilla siberica* Haw. Also the Eastern European endemic species such as *Dianthus fischeri* Spreng., *Dianthus pseudosquarrosus* (Novák) Klok., *Dianthus stenocalyx* Juz. can be met in the region.

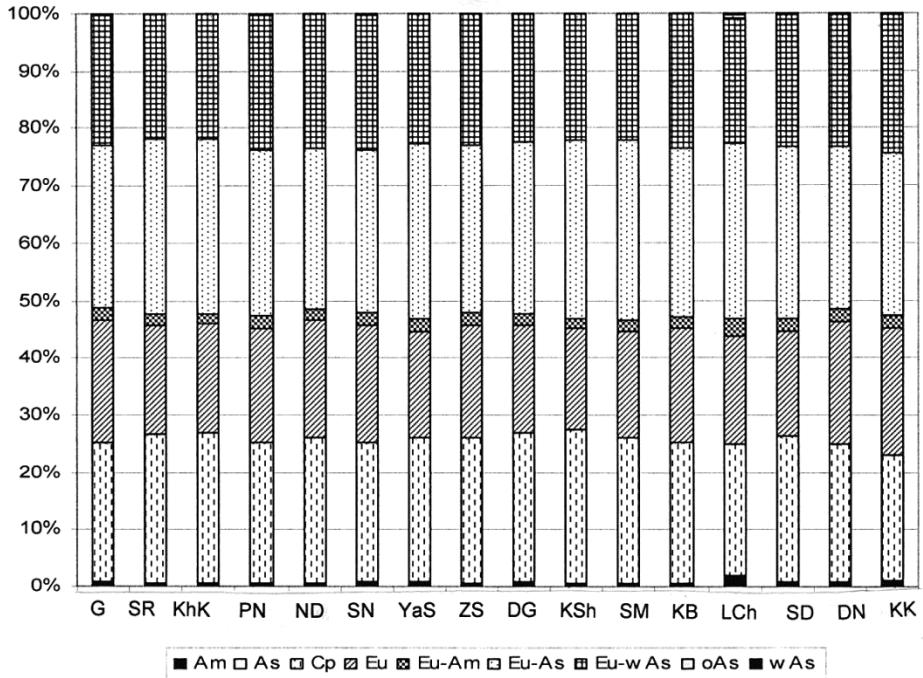


Fig. 3. The correlation of flora species by the regional types of the habitats in the physico-geographical regions of the Eastern Polesye  
 Ryc. 3. Zależności pomiędzy gatunkami flory i regionalnymi typami siedlisk a regionami fizycznogeograficznymi Polesia Wschodniego

The significant participation of the European-Asian (301; 23.03%) species in the flora of the Eastern Polesye is. For each individual PhGR the percentage of European-Asian species increases to 25.52-29.84%. *Corydalis marschalliana* (Pall. Ex Willd.) Pers., located on the northwestern boundary of the range, is especially rare of this group of species. Concerning the European-West Asian species, there are insignificant deviations in their participation (in percents) in certain PhGR relatively to the index for the Eastern Polesye on the whole. The greatest number of the species of these groups is in Gomel, Kozeletsko-Kulikovsky and Srednedesnansko-Nizhneshostkinsky PhGR. 251 circumpolar species is 19.28% of the species of the Eastern Polesye flora. The largest number of them is in the Nerussko-Desnansky (208), Gomel (207) and Srednedesnansko-Nizhneshostkinsky (205) PhGR.

The predominance of certain groups of species, identified by the maximum belonging of their ranges to a particular latitudinal or longitude region, and the total number of species in the “far” (Gomel, Dneprovsko-Nizhnedesnansky, Kozeletsko-Kulikovsky and Nerussko-Desnansky) PhGR are an example of the marginal effect that in our case is manifested in the tendency of increasing the number of species on the borders between the Forest and Forest-steppe zones, as well as between the Southern and Eastern subprovinces of the Polesye Province (fig. 1: 3). The marginal effect emphasizes the naturalness of the Eastern subprovince.

The participation of the species of the American and Asian origin in the flora of the Eastern Polesye is insignificant (47; 3.6%). However, the fact of their presence is associated with the process of natural florogenesis and this is the evidence of anthropogenic influence on the flora. Among the North American species that begin to be naturalized into disturbed phytocenoses, we recorded decorative tree species (*Acer saccharinum* L., *Amorpha frutcosa* L., *Aronia melanocarpa* (Michx.) Elliot, *Catalpa bignonioides* Walter, *Fraxinus pennsylvanica* Marshall, *Gleditsia triacanthos* L., *Padus serotina* (Ehrh.) Ag., *Padus virginiana* (L.) Roem., *Parthenocissus quinquefolia* (L.) Planch., *Pinus banksiana* Lamb., *Pinus strobus* L., *Populus deltoides* Marshall, *Ptelea trifoliata* L., *Quercus rubra* L., *Rhus typhina* L., *Physocarpus opulifolius* (L.) Maxim.), as well as decorative vegetable and decorative herbs (*Cuscuta campestris* Yunck., *Echinocystis lobata* (Michx) Torr. & A.Gray, *Epilobium pseudorubescens* A.K. Skvortsov, *Fragaria virginiana* Duchensne, *Lycopersicon esculentum* Mill. s. l., *Nicandra physaloides* (L.) P. Gaertn., *Nicotiana rustica* L., *Phacelia tanacetifolia* Benth., *Phlox paniculata* L., *Physalis ixocarpa* Brot. ex Hornem., *Phytolacca americana* L., *Sisyrinchium septentrionale* Bicknell).

We observe an active invasion into disturbed natural phytocenoses of the North American species that were previously naturalized in the Eastern Polesye: *Acer negundo* L., *Ambrosia artemisifolia* L., *Asclepias syriaca* L., *Bidens frondosa* L., *Galinoga urticifolia* (Kunth) Benth., *Grindelia squarrosa* (Pursh) Dunal, *Helianthus subcanescens* (A.Gray) E.E.Watson, *Helianthus tuberosus* L., *Iva xanthiifolia* Nutt., *Lepidium densiflorum* Schrad., *Lupinus polyphyllus* Lindl., *Oenothera rubricaulis* Klebahn., *Phalacrolooma annuum* (L.) Dumort., *Phalacrolooma septentrionale* (Fernald & Wiegand) Tzvelev, *Phalacrolooma strigosum* (Muehl. ex Willd.) Tzvelev, *Robinia pseudoacacia* L., *Rudbeckia laciniata* L., *Silphium perfoliatum* L., *Sinaps alba* L., *Solidago canadensis* L., *Stellaria alsine* Grimm., *Veronica agrestis* L. Due to the significant modern spread in Europe, we included them into the group of the Euro-American species.

Among the spontaneous flora species of the Asian origin the cultivated herbs (*Fagopyrum esculentum* Moench, *Lens culinaris* Medik., *Panicum miliaceum* L., *Reynoutria japonica* Houtt., *R. sachalinensis* (F. Schmodt ex Maxim.) Nakai) and the woody-shrub species (*Cerasus tomentosa* (Thumb.) Wall., *Chaenomeles japonica* (Thumb.) Lindl., *Juglans mandshurica* Maxim., *Lycium barbatum* L., *Morus alba* L., *Morus nigra* L., *Phellodendron amurense* Rupr., *Rosa rugosa* Thunb., *Spiraea japonica* L. f., *Spiraea salicifolia* L., *Sorbaria sorbifolia* (L.) A. Braun, *Ulmus pumila* L., *Vitis amurensis* Rupr.) can be often met in the anthropogenically disturbed ecosystems.

The correlation of the latitudinal (zonal) and longitude (regional) groups of species ranges (Table 1,2) indicates that the most numerous in the flora of the Eastern Polesye is the temperate-meridional European group of species (138; 10.56%). The following positions in the geographical spectrum are occupied by the temperate-submeridional Euro-West Asian (72; 5.51%) and temperate-meridional Euro-West-Asian (70; 5.36). These data emphasize the temperate and European type of flora studied.

Table 1

The correlation of the Eastern Polesye flora species amount by the zonal and regional types of the habitats

Tabela 1

Zależność gatunków flory Polesia Wschodniego i strefowych oraz regionalnych typów areałów

Zonal (latitudinal) types of the habitats	Regional (longitude) types of the habitats								
	Am	As	Cp	Eu	Eu-Am	Eu-As	Eu-wAs	oAs	wAs
Arct-B	–	–	2	–	–	1	2	–	–
Arct-M	–	–	5	1	–	1	–	–	–
Arct-Sm	–	–	14	–	–	9	5	–	–
Arct-Temp	–	–	23	2	–	8	1	–	–
B	–	–	7	–	–	5	1	–	–
B-M	–	–	28	9	2	56	33	–	–
B-Sm	–	–	38	35	2	74	54	1	–
B-Temp	1	1	44	35	6	42	37	2	–
B-Trop	–	–	10	–	1	5	–	–	–
M-Austr	1	–	–	–	–	–	–	–	–
Pz	–	–	48	1	2	12	1	–	–
Sm	–	–	–	2	–	2	–	–	–
Sm-Austr	3	–	–	–	–	–	–	–	–
Sm-M	–	3	1	8	–	6	5	2	3
Temp	6	1	3	77	4	8	8	–	–
Temp-Austr	–	–	1	–	1	–	–	–	–
Temp-M	9	–	13	57	9	40	72	3	–
Temp-Sm	9	–	9	141	6	37	83	2	–
Temp-Trop	–	–	6	1	–	5	1	–	–

The lack of the unified approach to the classification of the habitats makes it difficult to compare the results of the chorological structure of the flora of the Eastern Polesye with such other floras (Agahfnânc, Kirvel' 2005). However, the comparison of the results of the chorological analysis of the Eastern Polesie flora with such data for the Northern (Belorussian) (Parfenov 1983) and Southern (Ukrainian) Polesye (Andrienko, Šelâg-Sosonko 1983) indicates less participation of the arcto-boreal, boreal, submeridional, as well as Western European species in the flora of the region studied. For example, in the flora of the Eastern Polesie there are no such European species as *Quercus petraea* Liebi., *Staphylea pinnata* L., *Hepatica nobilis* Schreb., *Helianthemum grandiflorum* (Scop.) DC., *Isopyrum thalictroides* L., *Trifolium spadiceum* L., *Melampyrum sylvaticum* L., *Melittis sarmatica* Klokov, *Ribes alpinum* L., *R. lucidum* Kit., *Aruncus dioicus* (Walter) Fernald etc.

Table 2

The correlation (%) of the Eastern Polesye flora species amount by the zonal and regional types of the habitats

Tabela 2

Zależności procentowe gatunków flory Polesia Wschodniego wobec strefowych i regionalnych typów arealów

Zonal (latitudinal) types of the habitats	Regional (longitude) types of the habitats								
	Am	As	Cp	Eu	Eu-Am	Eu-As	Eu-wAs	oAs	wAs
Arct-B	–	–	0,15		–	0,08	0,15	–	–
Arct-M	–	–	0,38	0,08	–	0,08	–	–	–
Arct-Sm	–	–	1,07		–	0,69	0,38	–	–
Arct-Temp	–	–	1,76	0,15	–	0,61	0,08	–	–
B	–	–	0,54		–	0,38	0,08	–	–
B-M	–	–	2,14	0,69	0,15	4,28	2,52	–	–
B-Sm	–	–	2,91	2,68	0,15	5,51	4,13	0,08	–
B-Temp	0,08	0,08	3,37	2,68	0,46	3,21	2,83	0,15	–
B-Trop	–	–	0,77		0,08	0,38	–	–	–
M-Austr	0,08	–	–		–	–	–	–	–
Pz	–	–	3,67	0,08	0,15	0,92	0,08	–	–
Sm	–	–	–	0,15	–	0,15	–	–	–
Sm-Austr	0,23	–	–		–	–	–	–	–
Sm-M	–	0,23	0,08	0,61	–	0,46	0,38	0,15	0,23
Temp	0,46	0,08	0,23	5,81	0,31	0,61	0,61	–	–
Temp-Austr	–	–	0,08		0,08	–	–	–	–
Temp-M	0,69	–	0,99	4,36	0,69	3,06	5,36	0,23	–
Temp-Sm	0,69	–	0,69	10,56	0,46	2,83	6,35	0,15	–
Temp-Trop	–	–	0,46	0,08	–	0,38	0,08	–	–

We applied the schemes of types of species migrations developed for the Belorussian Polesye (Parfenov 1983) to the Eastern Polesye that contribute to the change (impoverishment or enrichment) of the flora composition and the ways of modern changes in the range borders and species migration. Our studies also encompass population (disappearance or appearance of individual sites), local (changes in the borders of the ranges in certain localized areas) and regional (throughout the Eastern Polesye) migration. The modern ways of changing the borders of species ranges and species migration in the Eastern Polesye are: regressive northeastern (the boreal species), progressive eastern (the central European species), progressive northwestern and western (the Euro-West Asian and adventive species), progressive northern (the forest-steppe and adventive species).

## Conclusion

The basis of the flora of the vascular plants of the Eastern Polesye is European, Euro-West-Asian, Euro-Asian and circumpolar species, which are distributed mainly in the temperate and submeridional zones of the Holarctic. This is fully conformed

to the physico-geographical location of the region studied. The correlation of the latitudinal and longitude groups of the species ranges showed that the investigated flora had a temperate-submeridional European character, which was connected with the location of the region on the left bank of the Dnieper.

At the same time, the development of the spontaneous flora is in the direction of its replenishment with the adventive species of the American and Asian origin through the primary naturalization and active invasion.

We have identified the far southern locations of 4 arcto-boreal and 8 boreal species. It is determined that 43 species (including 8 arcto-temperate and 14 boreal-temperate) are located in the investigated region on the southern boundary of the habitat, 13 species are on the northern border, 8 are on the eastern one.

To a certain extent, an increase in the number of physico-geographical regions occurs in the Eastern Polesye.

The main ways of modern changes in the borders of the habitats and species migration in the Eastern Polesye are the regressive northeastern, progressive eastern, northwestern, western and northern.

## References

- Agahfnânc O.E., Kirvel' I.I., 2005, *Biogeografiâ s osnovami èkologii* (Biogeography with the basics of ecology), Minsk (in Russian)
- Andrienko T.L., Šelâg-Sosonko Ū.R., 1983, *Rastitel'nyj mir Ukraïnskogo Poles'â v aspekte ego ohrany* (The flora of the Ukrainian Polesye in the aspect of its protection), Kiev (in Russian)
- Glazkova E.A., 2001, *Flora ostrovov Vostočnoj časti Finskogo zaliva: sostav i analiz* (Flora of the Islands of Eastern Part of the Gulf of Finland: Composition and Analysis), Sankt-Peterburg (in Russian)
- Diđuh Â.P., 2007, *Geografičnij analiz flori: minule, sučasne, majbutnê* (The geographical analysis of the flora: the past, the present, the future), Ukraïns'kij botaničnij žurnal, 64, 4, p. 485-507 (in Ukrainian)
- Ūrcev B.A., Kamelin R.V., 1987, *Očerk sistemy osnovnyh ponâtij floristiki* (The essay on the system of basic concepts of floristics). In: *Teoretičeskie i metodičeskie problemy sravnitel'noj floristiki*, ed. B.A. Ūrcev, Leningrad, p. 242-266 (in Russian)
- Lukaš O.V., 2008, *Flora sudinnih roslin Shidnogo Polissâ: istoriâ doslidžennâ, konspekt* (The flora of the Eastern Polissia vascular plants: the history of the study, summary), Kiïv (in Ukrainian)
- Meusel H., Jäger E., Weinert E., 1992, *Vergleichende Chorologie der Zentraleuropäischen Flora*, Bd. 3, Jena (in German)
- Parfenov V.I., 1983, *Flora Belorusskogo Poles'â. Sovremennoe sostoânie i tendencii razvitiâ* (The flora of the Belarusian Polesye. The current state and development trends), Minsk (in Russian)
- Marinič A.M., Parhomenko G.O., Petrenko O.M., Šišenko P.G., 2003, *Udoskonalena shema fiziko-geografičnogo rajonuvannâ Ukraïni* (The improved scheme of the physico-geographical regioning of Ukraine), Ukraïns'kij geografičnij žurnal, 1, 41, p. 21-32

- Priroda Belorussii. Populârnaâ ênciklopediâ* (The nature of Belarus. Popular Encyclopedia), 1989, ed. I.P. Šamâkin, Minsk (in Russian)
- Krasnaâ kniga Brânskoj oblasti. Rasteniâ. Griby* (The Red Book of the Briansk Region. Plants. Mushrooms), 2004, ed. O.I. Evstigneev, Ū.P. Fedotov, N.M. Panasenko et al., Brânsk (in Russian)
- Tolmačev A.I., 1974, *Vvedenie v geografîu rastenij* (Introduction to geography of plants), Leningrad (in Russian)

## Summary

The basis of the flora of the vascular plants of the Eastern Polesye is European, Euro-West-Asian, Euro-Asian and circumpolar species, which are distributed mainly in the temperate and submeridional zones of the Holarctic. The development of the spontaneous flora is in the direction of its replenishment with the adventive species of the American and Asian origin through the primary naturalization and active invasion. The 43 species are located in the investigated region on the southern boundary of the habitat, 13 species are on the northern border, 8 are on the eastern one. To a certain extent, an increase in the number of physico-geographical regions occurs in the Eastern Polesye. The main ways of modern changes in the borders of the habitats and species migration in the Eastern Polesye are the regressive north-eastern, progressive eastern, northwestern, western and northern.

## Streszczenie

Podstawą flory roślin naczyniowych wschodniego Polesia są gatunki europejskie, euro-zachodnioazjatyckie, euroazjatyckie i okołobiegunowe, rozmieszczone głównie w strefach umiarkowanych i submerydionalnych Holarctyki. Rozwój flory spontanicznej jest ukierunkowany na jej uzupełnianie gatunkami zawleczonymi pochodzenia amerykańskiego i azjatyckiego, poprzez naturalizację pierwotną i aktywną inwazję. W badanym regionie 43 gatunki znajdują się na południowej granicy siedliska, 13 gatunków znajduje się na granicy północnej, a 8 gatunków na granicy wschodniej. Do pewnego stopnia, we wschodniej części Polesia, obserwowany jest wzrost liczby regionów fizyczno-geograficznych. Główne kierunki współczesnych zmian w granicach siedlisk i migracji gatunków na Polesiu Wschodnim obejmują zmiany regresywne północno-wschodnie, progresywne wschodnie, północno-zachodnie, zachodnie i północne.

