

Phytocenotic features of *Calluna vulgaris* (L.) Hill. in Ukrainian Polesie

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**The article is dedicated to the memory of the tireless researcher
of the Ukrainian Polesie flora and vegetation
Professor Tetiana Andrienko (1938-2016)**

Abstract. Middle-aged pine and birch-pine forests of the *Dicrano-Pinenion* suballiance are the most common biotopes of *Calluna vulgaris* (L.) Hill. in Ukrainian Polesie. This species occurs mostly as solitary plants in forest phytocenoses; rarely its projective coverage can reach 40-45%. *C. vulgaris* has the highest constancy in phytocenoses of the *Peucedano-Pinetum* association in Right-bank Polesie. The forests of the *Piceo-Vaccinienion uliginosi* Seibert in Oberd. (ed.) 1992 suballiance and the *Piceion excelsae* Pawłowski et al. 1928 alliance are rare habitats of *C. vulgaris*; they occur only in Right-bank Polesie of Ukraine. Heathlands are rare ecosystems for Ukrainian Polesie, their vegetation is represented by plant communities of the *Calluno-Ulicetea* Br.-Bl. et Tx. ex Klika et Hadač 1944 and the *Nardetea strictae* Rivas Goday et Borja Carbonell in Rivas Goday et Mayor Lopez 1966 classes. They are forming in the significantly anthropogenically disrupted territories (e.g. areas after wildfires) or in the areas with intensive human activities, firstly in the military training areas. The phytocenoses of the *Calluno-Genistetum pilosae* R. Tx. 1937 association occur only in Right-bank Polesie and are the largest heathlands of Ukrainian Polesie in general. For example, in the Rivne region, their area is up to 20 km². The area of heathlands, belonging to the *Calluno-Nardetum strictae* Hrync. 1959 association, does not exceed several hectares. The phytocenoses of the *Scabioso canescentis-Genistetum* Balcerk. et Brzeg 1993 association are represented with small plots in landscapes of pine forests and less frequently in mixed forests on upland terraces of Left-bank Polesie rivers. The characteristic feature of *Calluna vulgaris* spreading in Right-bank Polesie of Ukraine is its large participation (sometimes with the projective cover up to 80%) and high constancy (92,7%) in phytocenoses of oligotrophic bogs of the *Ledo-Sphagnetum magellanici* (Malc. 1929) Kästner et Flössner 1933 association. The populations of *Calluna vulgaris*, explored in the forest phytocenoses of the *Cladonio-Pinetum* Juraszek 1927 association on the territory of Ukrainian Polesie, are incomplete. Their age spectrum maximum falls on generative individuals. The “Right-bank” population of *Calluna vulgaris* are characterized by more active proliferation of plants and spreading on new territories. Aging processes dominate among the “left-bank” populations. Generally, environmental conditions of Ukrainian Right-bank Polesie are more favorable to *Calluna vulgaris*, than conditions of Left-bank Polesie.

Keywords: *Calluna vulgaris* (L.) Hill., Polesie, plant communities, syntaxonomy, population.

1. Introduction

Calluna vulgaris (L.) Hill., European Boreo-temperate element of flora, has a large geographic distribution and is dominating in many heath ecosystems. Such a type of vegetation prevails in many heathlands of northern and western Europe. In Ukrainian Polesie *Calluna vulgaris* is at the southern border of its distribution. That is what causes the affect on the species distribution in the region. The purpose of our study was to investigate the cenotic features of the *Calluna vulgaris* habitats and its population structure in Ukrainian Polesie.

Heathlands are highly dynamic habitats, with strong biotic and abiotic interactions affected by external drivers, despite their appearance as a homogeneous, stable ecosystem. All of the factors studied influence diversity patterns, community structure and general quality of the habitat (Fagúndez, 2013). As experience of European (in particular, Polish) scientists shows (Adamska et al., 2015), study of main heath formations and accompanying plant communities is very important for management, treatment and also conservation of the *Calluna vulgaris* ecological systems.

2. Study area

Ukrainian Polesie is the southern part of the Polessian lowland within Ukraine (Fig. 1). Poorly defined relief, considerable distribution of water-ice deposits of sand, and high marshiness are characteristic features of Polesie land-

scapes. Poor sandy soils and marshiness favored the conservation of natural vegetation, which occupies here about 2/3 of the area (Andrienko et al., 2006). During the maximum glaciations most of Ukrainian Polesie was covered by glacier. In modern relief glacial forms are most noticeable in the west of Polesie.

The Dnieper is the main waterway of Ukrainian Polesie. The Dnieper divides Ukrainian Polesie into Right-bank (Fig.1: 1a) and Left-bank Polesie (Fig.1: 1b). There are no significant differences between Right-bank Polesie and Left-Bank Polesie in the amount of weather elements. However, Left-bank Polesie has more continental climate in comparison with Right-bank Polesie. Karst processes are observed in some regions of Right-bank Polesie. So-called loess “islands” are available in Left-bank Polesie, where erosion processes take place (Lukash et al., 2018, 2019). Soils of Polesie are highly pattern structured. Rise of the ground level by only a few decimeters in Polesie usually causes major changes in soil-forming processes and vegetation. Sod-podzolic soils are most common. They occupy about 70% of the territory of Ukrainian Polesie. The sod-podzolic soils vary greatly in mechanical composition, humidity and trophicity. Sandy-loam and clayish sandy-loam soils dominate by mechanical composition. Both pine and deciduous forests are forming on those types of soils. Gray forest soils are common on loamy loessial sediments, mainly in Left-bank Polesie.

According to various literature sources, forest areas occupy 26-29% of the territory of Ukrainian Polesie (Andrienko et al., 2006). The considerable distribution of sand deposits in Ukrainian Polesie causes large areas of pine forests. Climatic conditions of Polesie are favorable for the



Figure 1. Schematic map of Polesie. Map symbols: 1 – Ukrainian Polesie (1a – Right-bank, 1b– Left-bank), 2 – Lublin Polesie, 3 – Belarusian Polesie, 4 – Nerissa and Desna Polesie

growth of deciduous forests, which are local climax zonal communities. However, there are differences in distribution of deciduous forests between Right-bank and Left-bank Polesie. For example, the areal of the Carpinion betuli Issler 1931 alliance forests includes all Right-bank Polesie and only part of Left-bank Polesie (within the boundaries of the Chernihiv region) (Andrienko et al., 2006).

A high groundwater level and its slow motion favor spreading of wetland vegetation here. The climate conditions of Polesie contributed to the development of mires and in combination with mineral deficiency of the surface formations, have led to sphagnum mires formation (Fijałkowski et al., 2002). However, Left-bank Polesie is characterized by less quantity of bogs. In addition, Left-bank Polesie, compared to Right-bank Polesie, was more affected by the drainage reclamation in 1970s-1980s.

Obviously, the regularities of *Calluna vulgaris* distribution in these two regions of Ukrainian Polesie were affected by some differences in natural conditions (including vegetation cover) of Right-bank and Left-bank Polesie.

3. Material and methods

The materials for the article were collected during the field research of the Polesie vegetation in 1995-2019. The field study of the vegetation was carried out by geobotanical methods (Korchahin & Lavrenko, 2012). The vegetation descriptions were taken during the optimum of vegetation period in the areas of 400-625 m² (in forest phytocenoses) and 100-125 m² (in herb and dwarf shrub phytocenoses). The projective coverage of plant communities' layers and coverage of all the species was noted. Cover abundance scale is the following: + – up to 1%, 1 – 1 – 5%, 2 – 6 – 15%, 3 – 16 – 25%, 4 – 26 – 50%, 5 > 50%. The tables of the floristic structure of the plant communities for *Calluna vulgaris* include the percentage share.

366 phytosociological authors relevés were done. 297 geobotanical relevés from Professor Tatiana Andrienko's field books 1972-1985, which had been transferred to the first author of this article during her lifetime, were analyzed. 30 published geobotanical relevés, taken on the territory of Desniansko-Starogutskyi National Nature Park, were also used (Panchenko, 2013). In total, 693 relevés were analyzed.

The documentation has been compiled separately for Right-bank Polesie (total number of relevés 391 including 247 relevés with *Calluna vulgaris*) and Left-bank Polesie (total number of relevés 302 including 195 relevés with *Calluna vulgaris*). Phytocenotic tables include the relevés with the projective coverage of *Calluna vulgaris* equal to or more than 1%.

Syntaxa were identified according to W. Matuszkiewicz (2019), Chojnacka et al. (2010a, 2010b), Bulokhov & So-

lomesch (2003). Syntax names are ordered according to Mucina et al. (2016).

The field populations studies were carried out according to Rabotnov (1964). The *Calluna vulgaris* ontogenetic stages and evaluation indexes of the general ontogenetic status of populations (*Index innovation* (I_{inn}), *Index senilis* (I_{sen}), *Index generative* (I_{gen}), *Index aetas* (I_{aet})) were determined according to Kovalenko (2015). The evaluation indexes of the general ontogenetic status of the populations are measured in per cent and defined as ratio of individuals quantity in different ontogenetic stages to the total quantity of plants: seedlings (p), juvenile (j), immature (im) and virginile (v) individuals – I_{inn} ; old generative individuals (g_3) and senile plants (s) – I_{sen} ; young generative (g_1) and mature generative individuals (g_2) – I_{gen} . *Index aetas* is the ratio of *Index senilis* to *Index innovation*: $I_{aet} = I_{sen} / I_{inn}$.

4. Results and discussion

In Ukrainian Polesie *Calluna vulgaris* grows mainly in the intrazonal boreal-temperate grasslands and heath plant communities, in swamps and also in pine, mixed and spruce forests. The general scheme of the Ukrainian Polesie plant communities with *Calluna vulgaris* is the following (note: * – only in Right-bank Polesie, ** – only in Left-bank Polesie):

Class: *Calluno-Ulicetea* Br.-Bl. et Tx. ex Klika et Hadač 1944

Order: *Vaccinio myrtilli-Genistetalia pilosae* Schubert ex Passarge 1964

Alliance: *Calluno-Genistion pilosae* P. Duvigneaud 1944

*Association: *Calluno-Genistetum pilosae* R.Tx. 1937

Alliance: *Calluno-Arctostaphylyon uvae-ursi* Tx. et Preising in Preising 1949

**Association: *Scabioso canescentis-Genistetum* Balcerk. et Brzeg 1993

Class: *Nardetea strictae* Rivas Goday et Borja Carbonell in Rivas Goday et Mayor López 1966

Order: *Nardetalia strictae* Preising 1950

Boreo-temperate group of alliances

Alliance: *Violion caninae* Schwickerath 1944

Association: *Calluno-Nardetum strictae* Hrync. 1959

Class: *Oxycocco-Sphagneteta* Br.-Bl. et Tx. ex Westhoff et al. 1946

Order: *Sphagnetalia medii* Kästner et Flössner 1933

Alliance: *Sphagnion medii* Kästner et Flössner 1933

*Association: *Ledo-Sphagnetum magellanici* (Malc. 1929) Kästner et Flössner 1933

Class: *Vaccinio-Piceetea* Br.-Bl. in Br.-Bl. et al. 1939

Order: *Pinetalia sylvestris* Oberd. 1957

Alliance: *Dicrano-Pinion sylvestris* (Libbert 1933) W. Matuszkiewicz 1962

Suballiance: *Dicrano-Pinenion* Seibert in Oberd. (ed.) 1992

Association: *Cladonio-Pinetum* Juraszek 1927

Association: *Peucedano-Pinetum* W. Matuszkiewicz (1962) 1973

**Association: *Veronico incanae-Pinetum* Bulokhov et Solomeshch 2003

Association: *Molinio-Pinetum* W. Matuszkiewicz et J. Matuszkiewicz 1973

Association: *Quercu-Piceetum* (W. Matuszkiewicz 1952) W. Matuszkiewicz et Polak 1955

Suballiance: *Piceo-Vaccinienion uliginosi* Seibert in Oberd. (ed.) 1992

*Association: *Vaccinio uliginosi-Pinetum* Kleist 1929

Order: *Piceetalia excelsae* Pawłowski et al. 1928

Alliance: *Piceion excelsae* Pawłowski et al. 1928

*Association: *Sphagno girgensohnii-Piceetum* Polak 1962

The intrazonal boreo-temperate heath vegetation is represented by plant communities of the *Calluno-Ulicetea* (Table 1) and the *Calluno-Nardetum strictae* classes (Table 2).

Relevés 1-3 (Table 1) belong to the *Calluno-Genistetum pilosae* association (the *Calluno-Ulicetea pilosae* class). The cenoses of the *Calluno-Genistetum pilosae* association, which are present only in Right-bank Polesie, occupy the largest areas (up to 20 km²). *Calluno-Genistetum pilosae* encompasses dry heaths represented, as well as in Poland (Adamska et al., 2015), by the anthropogenic communities, developing on poor sandy soils, as a degeneration phase of pine and mixed forests.

The heathlands of the *Calluno-Genistetum pilosae* association are common on large territories of the artillery shooting range in Hoshchansk, Kostopil and Rivne districts of the Rivne region and on the northern outskirts

of Volodymyr-Volynskiy (the Volyn region). A shrub layer is formed with *Sarothamnus scoparius* (L.) W.D.J. Koch (the projective cover of 40-60%). *Calluna vulgaris* dominates in a herb layer and has the projective cover of 50-80%. *Sarothamnus scoparius* is a diagnostic species of the *Calluno-Genistetum pilosae* association and the *Calluno-Genistion pilosae* alliance. Moss layer is formed with *Pleurozium schreberi* (Brid.) Mitt. Polesian communities with *Sarothamnus scoparius* differ in composition from the plant communities, described in Poland near the city of Toruń. The community dominated by common groom – *Sarothamnus scoparius* covers the areas adjacent to heathlands *Pohlio-Callunetum* Shimwell 1973 em. Brzeg 1981 and *Arctostaphylo-Callunetum* R.Tx. et Prsg 1940, as well as with grasslands of the gray clubawn grass *Spergulo vernalis-Corynephorretum* (R.Tx. 1928) Libb. 1933 (Chojnacka et al., 2010a).

The low-altitude heaths of the Atlantic and subcontinental regions of temperate Europe, belonging to the *Scabioso canescentis-Genistetum* association (Table 1, relevés 4-8), are represented only in Left-bank Polesie. They are rare and occupy small areas (up to 200 m²) among pine forests on the upland river terraces. The characteristic (*Genista tinctoria* L., *Scabiosa ochroleuca* L.) and differential (*Polygonatum odoratum* (Mill.) Druce, *Solidago virgaurea* L., *Vincetoxicum hirundinaria* Medik.) species of the association are present in all the described phytocenoses. *Calluna vulgaris* grows in curtains; its projective coverage does not exceed 10%. The plant communities have a moss layer (with the projective cover of 25-90%). *Pleurozium schreberi* dominates in the layer.

The heathlands of Ukrainian Polesie are represented by the plant communities of the *Calluno-Nardetum strictae* association (the *Nardetea strictae* class). They occupy the

Table 1. Floristic structure of the Ukrainian Polesie heath plant communities of the *Calluno-Ulicetea* class: the *Calluno-Genistetum pilosae* (relevés 1-3) and the *Scabioso canescentis-Genistetum* (relevés 4-8) associations

Region	Right-bank Polesie			Left-bank Polesie				
	1	2	3	4	5	6	7	8
Shrub layer (b) cover [%]	60	40	5	1	5	<1	0	15
Herb and dwarf shrub layer (c) cover [%]	80	50	90	40	35	45	50	25
Mosses layer (d) cover [%]	10	0	30	25	70	80	90	85
Lichens layer (e) cover [%]	0	0	0	0	10	5	0	5
Ch., D. Ass. <i>Calluno-Genistetum pilosae</i> and All. <i>Calluno-Genistion pilosae</i>								
<i>Sarothamnus scoparius</i>	5	4	+	.	.	.	.	.
<i>Genista germanica</i>	+	+	+	.	.	.	.	.

Region	Right-bank Polesie			Left-bank Polesie				
	1	2	3	4	5	6	7	8
<i>Briza media</i>	+	1	.	.	.	.	.	.
<i>Carex hirta</i>	.	+
<i>Festuca rubra</i>	.	.	1	2	.	.	.	.
<i>Holcus lanatus</i>	.	1	.	.	.	.	.	.
<i>Ranunculus acris</i>	.	+
<i>Sieglingia decumbens</i>	.	.	3	.	.	.	.	.
Cl. Nardetea strictae								
<i>Genista germanica</i>	+
<i>Luzula campestris</i>	+	+	+
<i>Lycopodium clavatum</i>	.	.	+	.	+	+	+	.
<i>Nardus stricta</i>	.	.	+
<i>Pilosella officinarum</i>	+	+	+	+	+	+	.	+
<i>Potentilla erecta</i>	.	+	.	.	+	.	.	+
<i>Veronica officinalis</i>	+	.	.	+	+	+	+	.
Cl. Koelerio-Coryneporetea canescentis								
<i>Chamaecytisus ruthenicus</i>	.	.	+
<i>Festuca ovina</i>	.	.	.	2	3	3	3	.
<i>Jasione montana</i>	+	+
<i>Koeleria glauca</i>	2	3	3	.
<i>Potentilla argentea</i>	+	1	.	.	.	.	.	.
<i>Rumex acetosella</i>	.	.	.	+
<i>Solidago virgaurea</i>	.	.	+
Cl. Crataego-Prunetea								
<i>Crataegus monogyna</i>	+	+
<i>Galeopsis bifida</i>	.	.	+
<i>Prunus spinosa</i>	.	+
<i>Rosa canina</i>	+	+
Cl. Epilobietea angustifolii								
<i>Calamagrostis epigeios</i>	+	1	.	+	.	.	.	.
<i>Rubus idaeus</i>	+	.	.	.
<i>Sambucus racemosa</i>	+	.	.	.
Cl. Festuco-Brometea								
<i>Centaurea scabiosa</i>	.	+
<i>Euphorbia cyparissias</i>	+	1	.	.	.	.	.	.
Cl. Trifolio-Geranietea sanguinei								
<i>Anemone sylvestris</i>	+
<i>Galium verum</i>	+	+

Region	Right-bank Polesie			Left-bank Polesie				
	1	2	3	4	5	6	7	8
Cl. Erico-Pinetea								
<i>Daphne cneorum</i>	+
Cl. Papaveretea rhoeadis								
<i>Viola arvensis</i>	.	+
Other species								
<i>Betula pendula</i> (b)	+	+	.	+
<i>Betula pendula</i> (c)	.	+
<i>Calamagrostis arundinacea</i>	2
<i>Cerasus mahaleb</i>	+
<i>Genista tinctoria</i>	.	.	+
<i>Holcus mollis</i>	+	+
<i>Hypericum perforatum</i>	+	+	.	2	.	.	.	.
<i>Populus tremula</i> (b)	.	+	1	.	.	.	.	.
<i>Populus tremula</i> (c)	.	+	+
<i>Pteridium aquilinum</i>	.	.	.	+
<i>Pyrus communis</i> (b)	+	1	.	.	.	.	.	.
<i>Quercus robur</i> (b)	.	.	1	.	.	.	.	.
<i>Veronica chamaedrys</i>	.	.	+

Notes. Dates, localities and authors of relevés:

- 1 – 12.08.2013, the Rivne shooting range, the Hoshchansk, Kostopil and Rivne districts, Rivne region; V. Melnyk.
- 2 – 21.07.2014, the shooting range near the northern outskirts of the Volodymyr-Volynskyi city, Volyn region; V. Melnyk.
- 3 – 21.08.1972, the Dubivka forestry, (sq. 36), Volodymyrets district, Rivne region; T. Andrienko.
- 4 – 15.06.2003, the outskirts of the Lubenets village, Korop district, Chernihiv region; Yu. Karpenko.
- 5 – 10.06.2018, the Liubetskyi Masyv tract, Liubech forestry (sq. 20), Ripky district, Chernihiv region; O. Lukash, V. Popruha.
- 6 – 10.06.2018, the Liubetskyi Masyv tract, Liubech forestry (sq. 25), Ripky district, Chernihiv region; O. Lukash.
- 7 – 10.06.2018, the Liubetskyi Masyv tract, Liubech forestry (sq. 25), Ripky district, Chernihiv region; O. Lukash.
- 8 – 05.07.1980, the Chudivka forestry, (sq.30), Ripky district, Chernihiv region; T. Andrienko.

areas of 0.5-2 ha, and are distributed on sandy soils. Sometimes they represent a stage of a post-pyrogenic succession. The relevés in Table 2 give the idea of full composition and structure of the heathlands. *Calluna vulgaris* is a diagnostic species of the association. Its projective coverage varies from 15% to 90%. *Nardus stricta* is a characteristic species of the *Nardetea strictae* class. Its role in phytocenoses is much smaller if compared with *Calluna vulgaris*. The qualitative and quantitative characteristics of these phytocenoses are different in Right-bank Polesie and Left-bank Polesie. *Viola canina* L. (the diagnostic species of the *Calluno-Nardetum strictae* association) in Right-bank Polesie, unlike in Left-bank Polesie, is not a constant component of phytocenoses. The characteristic species of the *Violion*

caninae alliance are represented by *Juncus squarrosus* L. (in Right-bank Polesie) or *Pimpinella saxifraga* L. (in Left-bank Polesie). Right-bank heathlands are characterized by high constancy of *Sieglingia decumbens* (L.) Bernh, but it does not dominate. For comparison, this species dominates in communities of the *Calluno-Nardetum strictae* association in Poland (W. Matuszkiewicz, 2019), but it is absent in the relevés of Left-bank Polesie. The left-bank heathlands are characterized by high constancy of a number of characteristic species of the *Molinio-Arrhenatheretea* Tx. 1937 class and its syntaxons. For example, *Gentiana pneumonanthe* L., a regionally rare species of the Chernihiv region, is present in all the relevés.

Table 2. Floristic structure of the Ukrainian Polesie heath plant communities of the *Nardetea strictae* class: the *Calluno-Nardetum strictae* association

Region	Right-bank Polesie														Left-bank Polesie							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
Relevé number	60	30	0	1	0	80	50	5	15	60	70	50	70	40	50	70	40	15	0	0	2	
Shrub layer (b) cover [%]	70	75	55	40	60	70	70	75	80	40	15	45	40	55	45	80	80	80	95	90	90	
Herb and dwarf shrub layer (c) cover [%]	10	50	50	30	70	2	10	50	10	60	80	35	60	50	30	<1	30	0	0	0	10	
Mosses layer (d) cover [%]																						
D. Ass Calluno-Nardetum strictae																						
<i>Calluna vulgaris</i>	15	15	15	15	15	35	30	40	40	35	10	20	25	20	15	60	40	60	5	30	40	
<i>Viola canina</i>	+	.	+	.	.	+	.	.	.	.	+	.	+	.	.	+	.	1	+	2	+
Ch. All. Violion caninae																						
<i>Hypochaeris uniflora</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.
<i>Juncus squarrosus</i>	+	+	+	2	+	+	1	+	+	+	+	+	+	+	+	+	+	.	.	.	.
<i>Pimpinella saxifraga</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	+
Ch. O. Nardetalia strictae																						
<i>Hypericum maculatum</i>	.	.	.	.	+	+	.	+	.	+	+	.	.	.	.	.	.	+	+	+	+
<i>Nardus stricta</i>	2	4	+	1	+	+	1	+	4	+	+	+	+	+	4	2	+	3	5	4	4	
Ch.Cl. Nardetea strictae																						
<i>Antennaria dioica</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	+
<i>Carex pilulifera</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	+
<i>Luzula campestris</i>	.	+	+	+	+	.	+	.	.	.	.	.	+	.	.	1	+	+	+	.	+
<i>Lycopodium clavatum</i>	+	.	.	.	.	+	.	.	.	+	+	.	.	.	+	.	+	+	.	+	+
<i>Pilosella officinarum</i>	.	+	+	.	+	.	.	+	+	+	+	+	+	.	+	.	+	.	.	.	.
<i>Potentilla erecta</i>	+	1	+	+	.	+	+	+	1	+	+	+	.	+	+	+	+	+	+	.	+	
<i>Veronica officinalis</i>	+	.	+	.	.	+	.	.	+	.	.	+	+	+	.	+	.	+	+	2	+	
Accompanying species																						
Cl. Molinio-Arrhenatheretea																						
<i>Achillea submillefolium</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	+	+
<i>Agrostis stolonifera</i>	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	1	+

Region	Right-bank Polesie																					Left-bank Polesie				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21					
<i>Sieglingia decumbens</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+					
<i>Succisa pratensis</i>	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
<i>Trifolium repens</i>	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Viola uliginosa</i>	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Cl. Vaccinio-Piceetea																										
<i>Arctostaphylos uva-ursi</i>	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.
<i>Chamaecytisus ruthenicus</i>	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.
<i>Dianthus pseudosquarrosus</i>	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Dicranum rugosum</i>	.	.	.	.	.	2	.	.	4	3	3	.	.	.	.	.	.	.	.	.	.
<i>Dryopteris carthusiana</i>	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Frangula alnus (b)</i>	4	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	+	.	.	.	.
<i>Luzula pilosa</i>	.	.	+	.	.	.	.	+	1	.	.	.	.	.	.	.	+	.	.	.	.
<i>Melampyrum pratense</i>	.	.	.	.	.	.	.	+	.	.	.	.	.	+	.	+	.	.	.	.	.
<i>Pinus sylvestris (b)</i>	.	.	.	.	.	5	3	1	1	5	5	4	5	1	.	.	4				
<i>Pinus sylvestris (c)</i>	.	.	.	.	.	.	+	.	.	.	1	5	+	.	.	.	+				
<i>Pleurozium shreberi</i>	2	.	.	.	.	.	.	4	4	5	2	5	4	4	.	.	.	.	.	.	.
<i>Polytrichum commune</i>	.	.	.	.	5	.	2	.	2	.	.	.	.	.	.	.	.	.	.	.	.
<i>Polytrichum gracile</i>	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Polytrichum juniperinum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	2
<i>Rhododendron luteum</i>	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
<i>Trientalis europaea</i>	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Vaccinium uliginosum</i>	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
<i>Vaccinium vitis-idaea</i>	+	.	.	.	.	.	.	+	+	+	2	1	2	.	.	+					
Cl. Scheuchzerio palustris-Caricetea fuscae																										
<i>Agrostis canina</i>	.	.	.	.	2	.	1	.	.	.	.	.	.	.	2	.	.	.	.	.	.

Region	Right-bank Polesie																					Left-bank Polesie				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21					
<i>Phalacrolooma annuum</i>	+				
<i>Populus tremula</i> (b)	1	.	.	.	.	.	.	.	.	2	2	.	.	.	.	+	.	.	.	.	.
<i>Populus tremula</i> (c)	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	+	.	.	.	.	.
<i>Pteridium aquilinum</i>	.	.	.	.	.	.	.	1	2	+	.	.	.	.	.	.	.	.	.	.	.
<i>Quercus robur</i> (b)	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.
<i>Sorbus aucuparia</i> (b)	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Veronica chamaedrys</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.

Notes. Dates, localities and authors of relevés:

- 1 – 11.08.1985, the floodplain of the Prypiat river, near the Nobel lake, the Zarichansk district, Rivne region; T. Andrienko.
- 2 – 11.08.1985, the floodplain of the Prypiat river, the Zarichansk district, Rivne region; T. Andrienko.
- 3 – 03.08.1980, the Polesie Nature Reserve, the floodplain of the Kamenka river, the *Kopyshtche* forestry, Zhytomyr region; T. Andrienko.
- 4 – 23.06.1981, the Polesie Nature Reserve, the Perha forestry, Zhytomyr region; T. Andrienko.
- 5 – 13.08.1980, the sands, the Berezne district, Rivne region; T. Andrienko
- 6 – 14.06.1982, the Polesie Nature Reserve, (sq. 50), the Zhytomyr region; T. Andrienko.
- 7 – 11.06.1982, the post-pyrogenic succession stage, the Polesie Nature Reserve, (sq.42), the Zhytomyr region; T. Andrienko.
- 8 – 03.08.1980, the Polesie Nature Reserve, the floodplain of the Kamenka river, the *Kopyshtche* forestry, Zhytomyr region; T. Andrienko.
- 9 – 12.08.1980, the wasteland, near the Verbivka village, Berezne district, Rivne region; T. Andrienko.
- 10 – 27.08.1972, the Kurchytsia forestry (sq. 57), Novohrad-Volynskyi district, Zhytomyr region; T. Andrienko.
- 11 – 25.08.1972, the forest area at the Malynsk village, Berezne district, Rivne region; T. Andrienko.
- 12 – 23.08.1972, the Samy forestry (sq. 147), Samy district, Rivne region; T. Andrienko.
- 13 – 23.08.1972, the Samy forestry (sq. 147), Samy district, Rivne region; T. Andrienko.
- 14 – 25.07.1981, the Polesie Nature Reserve, the Selezivka forestry (sq. 31), Ovruch district, Zhytomyr region; T. Andrienko.
- 15 – 23.07.1981, the Polesie Nature Reserve, the Selezivka forestry (sq. 19), Ovruch district, Zhytomyr region; T. Andrienko.
- 16 – 07.06.1978, the dunes, the Vysofsk forestry, 6 km from the Verbivka village, Dubrovysia district, Rivne region; T. Andrienko.
- 17 – 11.06.1982, the post-pyrogenic succession stage, the Polesie Nature Reserve (sq.41), Zhytomyr region; T. Andrienko.
- 18 – 15.07.2013, the heathland (2 ha), Mokrets tract near the Uhlova Rudnia village, Ripky district, Chernihiv region; O. Lukash, V. Popruha.
- 19 – 19.07.1995, the meadow between the Berestovets and Sidorivka villages, Borzna district, Chernihiv region; O. Lukash.
- 20 – 18.08.2006, between the peaty meadow and pine forest, to the east of the Buda Vorobyivska village, Novhorod-Siverskyi district, Chernihiv region, N 52°22'43,2"; E 032°31'51,0"; O. Lukash.
- 21 – 27.07.1996, the meadow between the swamp and the pine forest, outskirts of the Smolianka village, Kulykivka district, Chernihiv region; O. Lukash.

Relevé number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
<i>Sphagnum cuspidatum</i>	.	.	1	4	2	.	.	5	5	.	.	4	.	.	.	.	.
<i>Sphagnum fallax</i>	.	.	.	.	4	.	5	.	.	.	.	.	.	.	.	.	.
<i>Sphagnum fuscum</i>	.	3	.	.	.	.	.	.	.	.	.	.	+	.	1	.	.
<i>Sphagnum magellanicum</i>	+	+	+	.	3	.	.	3	2	.	+	.	.	+	.	4	+
<i>Sphagnum rubellum</i>	.	.	.	.	.	.	.	.	.	5	.	+	.	5	1	+	.
Ch. Cl. Oxycocco-Sphagnetea																	
<i>Aulacomnium palustre</i>	.	.	+	.	.	3	+	+	.	.	.	2	.	.	.	.	+
<i>Drosera rotundifolia</i>	+	+	+	+	+	.	.	+	+	+	+	.	+	+	+	+	.
<i>Salix aurita</i>	.	+	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.
Accompanying species																	
Cl. Alnetea glutinosae																	
<i>Alnus glutinosa</i> (b)	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Betula pubescens</i> (a)	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.
<i>Betula pubescens</i> (b)	.	.	4	5	.	2	.	.	.	2	1	2	.	.	.	3	4
<i>Betula pubescens</i> (c)	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
<i>Salix cinerea</i>	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Cl. Vaccinio-Piceetea																	
<i>Dicranum rugosum</i>	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.
<i>Melampyrum pratense</i>	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Polytrichum commune</i>	+	.	.	1	.	.	.	.	.	.	.	4	.	.	.	.	.
<i>Polytrichum gracile</i>	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Cl. Scheuchzerio palustris-Caricetea fuscae																	
<i>Carex lasiocarpa</i>	.	.	.	2	1	.	.	.	.	+	.	.	.	+	.	.	.
<i>Carex nigra</i>	+	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
<i>Rhynchospora alba</i>	.	+	.	1	.	.	.	.	.	.	.	.	.	.	.	.	+
Cl. Molinio-Arrhenatheretea																	
<i>Molinia caerulea</i>	2	2	.	.	.	.	+	.	.	+	2	4	3	.	.	.	.
<i>Juncus effusus</i>	1	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
Cl. Nardetea strictae																	
<i>Nardus stricta</i>	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Potentilla erecta</i>	.	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
Cl. Calluno-Ulicetea																	
<i>Arctostaphylos uva-ursi</i>	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
<i>Calluna vulgaris</i>	40	60	65	60	1	5	2	1	10	50	60	25	1	5	10	30	80

Relevé number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Cl. Koelerio-Coryneporetea canescentis																	
<i>Astragalus arenarius</i>	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
Other species																	
<i>Betula pendula</i> (a)	.	.	.	.	.	.	+	.	.	.	.	.	.	.	3	.	.
<i>Betula pendula</i> (b)	4	4	.	.	5	.	.	.	.	.	.	3	2	+	.	.	
<i>Betula pendula</i> (c)	.	2	.	.	.	.	.	.	.	.	.	2	+	+	.	.	
<i>Populus tremula</i> (b)	.	1	+	+	.	.	.	.	.	.	.	.	.	.	.	+	.
<i>Populus tremula</i> (c)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
<i>Pteridium aquilinum</i>	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Polytrichum alpestre</i>	.	.	3	.	.	4	+	1	2	.	.	.	.	.	.	.	.

Notes.

Dates and localities of relevés:

- 1 – 16.08.1980, the Sarny forestry (sq. 9), Sarny district, Rivne region.
- 2 – 13.08.1980, the post-pyrogenic succession stage, the Berezne district, Rivne region.
- 3 – 10.08.1980, the post-pyrogenic succession stage, the Pochaiv Reserve (sq. 76), Berezne district, Rivne region.
- 4 – 10.08.1980, the post-pyrogenic succession stage, the Pochaiv Reserve (sq. 76), Berezne district, Rivne region.
- 5 – 12.07.1982, the Plotnytsia tract, Chervona Volia forestry (sq. 7), Novohrad-Volynskiy district, Zhytomyr region.
- 6 – 10.07.1982, the Chervona Volia forestry (sq. 1), Novohrad-Volynskiy district, Zhytomyr region.
- 7 – 22.10.1974, the Perebrody forestry (sq. 81), Dubrovytsia district, Rivne region.
- 8 – 27.07.1976, the Rostan forestry (sq. 21), Shatsk district, Volyn region.
- 9 – 16.07.1973, the Babii Mokh swamp, Zolote forestry (sq. 39), Dubrovytsia district, Rivne region.
- 10 – 25.06.1981, the Polesie Nature Reserve, the Klitne tract, *Kopyshche* forestry (sq. 47), Zhytomyr region.
- 11 – 25.06.1981, the post-pyrogenic succession stage, the Polesie Nature Reserve, the Klitne tract, *Kopyshche* forestry (sq. 38), Zhytomyr region.
- 12 – 25.06.1981, the Polesie Nature Reserve, *Kopyshche* forestry (sq. 26), Zhytomyr region.
- 13 – 13.06.1982, the swamp forest, the Polesie Nature Reserve (sq. 51), Zhytomyr region.
- 14 – 12.06.1982, the oligotrophic swamp, the Polesie Nature Reserve (sq. 40), Zhytomyr region.
- 15 – 12.06.1982, the oligotrophic swamp, the Polesie Nature Reserve (sq. 41), Zhytomyr region.
- 16 – 11.06.1982, the post-pyrogenic succession stage, the Polesie Nature Reserve (sq. 41), Zhytomyr region.
- 17 – 07.06.1978, the Vysotsk forestry (sq. 75), near the Verbivka village, Dubrovytsia district, Rivne region.

Author of relevés: T. Andrienko.

The European temperate and subboreal pine forests on nutrient-poor acidic sandy soils (the *Vaccinio-Piceetea* class) are typical and most common habitats of *Calluna vulgaris* in Ukrainian Polesie. The species occurs in phytocenoses mainly individually. The maximum projective coverage of *Calluna vulgaris* was observed in pine, birch-pine and oak-pine forests of 30-40 years of age. Tables 4 and 5 provide information on structure and floristic composition of forest phytocenoses with *Calluna vulgaris*, which projective coverage is over 1%. As it can be seen, all these plant communities were well diagnosed by characteristic and differentiating species. The relationships between the values of tree layer and projective coverage of *Calluna vulgaris* were not found.

The maximum projective coverage of *Calluna vulgaris* in plant communities of the *Pinetalia sylvestris* order associations (the *Dicrano-Pinion sylvestris* alliance) in Right-bank Polesie respectively is: *Quercus-Piceetum* – 45%, *Cladonio-Pinetum* – 40%, *Molinio-Pinetum* – 35%, *Peucedano-Pinetum* – 30%, *Vaccinio uliginosi-Pinetum* – 10% (Table 4, relevés 1-26). *Calluna vulgaris* coverage of 40% was observed only in the phytocenoses of the *Cladonio-Pinetum* association (Table 5, relevés 1-5) in Left-bank Polesie. The projective coverage of *Calluna vulgaris* in other plant communities of pine and mixed forests of Left-bank Polesie does not exceed 5% (Table 5, relevés 6-23).

Table 4. Floristic structure of the forest plant communities of the Cladonio-Vaccinietaalia (relevés 1-26) and Vaccinio-Piceetalia (relevés 27-29) orders with *Calluna vulgaris* in Right-bank Polesie

Relevé number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29					
Tree layer (a) cover [%]	20	50	50	50	40	70	50	50	60	60	60	50	60	40	60	50	70	60	60	70	40	70	60	70	60	50	60	65	75					
Shrub layer (b) cover [%]	5	0	25	15	<1	25	5	<1	1	20	25	10	30	40	1	0	10	1	30	20	30	20	10	5	20	10	20	10	15					
Herb layer (c) cover [%]	40	20	15	40	10	45	40	75	40	25	60	50	50	95	55	50	50	65	70	65	70	50	80	40	25	60	50	40	50					
Mosses and lichens layer (d-e) cover [%]	0	85	70	70	80	55	65	0	0	75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Mosses layer (d) cover [%]	40	0	0	0	0	0	0	80	80	0	30	40	50	10	60	40	90	70	10	5	30	70	75	90	85	50	40	45	50					
Lichens layer (e) cover [%]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Syntaxon																																		
D. Ass. Cladonio-Pinetum																																		
<i>Carex ericetorum</i>	.	+	+	+	+	+	+			
<i>Cladonia mitis</i>	2	+	4	+	5	1	5			
<i>Koeleria glauca</i>	+	+	+	.	.	.	+			
D. Ass. Peucedano-Pinetum																																		
<i>Convallaria majalis</i>	+	1	.	+	.	+			
<i>Peucedanum oreoselinum</i>	+	+	+	.	+	+		
<i>Polygonatum odoratum</i>	+	+	+	+	+	
<i>Solidago virgaurea</i>	.	.	+	.	+	+	.	+	+	+	+	+	+	+	+	+	
D. Ass. Molinio-Pinetum																																		
<i>Molinia caerulea</i>	.	.	.	+	.	.	.	1	.	.	+	.	.	+	4	4	1	1	3	5	.	.	+	.	+	3	1	4		
<i>Polytrichum commune</i>	2	+	+	+	+	.	+	4	4	4	4		
<i>Frangula alnus</i>	+	.	+	2	+	+	+	+	3	3	4		
D. Ass. Quercio-Pinetum, species of mixed forests																																		
<i>Carpinus betulus</i> (b)	
<i>Carpinus betulus</i> (c)	
<i>Corylus avellana</i>
<i>Euonymus verrucosa</i>

Relevé number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	
<i>Chimaphila umbellata</i>	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.
<i>Monotropa hypopitys</i>	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ch. D. O. Cladonio-Vaccinietalia																														
<i>Arctostaphylos uva-ursi</i>	.	.	.	.	.	.	3	.	+	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
<i>Pinus sylvestris</i> (a)	3	.	4	1	4	5	4	4	4	5	4	4	5	3	5	1	5	4	.	1	+	5	5	5	5	4	3	1	1	
<i>Pinus sylvestris</i> (b)	1	.	3	2	.	.	1	+	3	3	.	1	3	.	+	.	.	.	1	.	.	1	.	1	3	+	.	.	.	
<i>Pinus sylvestris</i> (c)	.	.	.	.	.	.	.	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
<i>Cladina rangiferina</i>	.	3	.	1	.	+	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ch. D. Ass. Sphagno girsensohnii-Piceetum																														
<i>Betula pubescens</i>	5	+	1	+
<i>Betula pubescens</i> (b)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	.	.	.	.	.	.	1	1	1
<i>Betula pubescens</i> (c)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	+	+
<i>Sphagnum girsensohnii</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	1
Ch. All. Piceion abietis and O. Vaccinio-Piceetalia																														
<i>Athyrium filix-femina</i>	+	+	.
<i>Lycopodium annotinum</i>	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+
<i>Mnium affine</i>	+	.	.	.
<i>Mnium spinosum</i>	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+
<i>Orthilia secunda</i>	+	.	.	.
<i>Picea abies</i> (a)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4	5	5
<i>Picea abies</i> (b)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	2	3
Ch. Cl. Vaccinio-Piceetea																														
<i>Hylocomium splendens</i>	+	+	.	+
<i>Pleurozium shreberi</i>	1	4	1	3	.	4	1	.	5	4	+	3	4	.	4	4	5	4	2	1	.	4	5	5	4	4	1	2	+	
<i>Trientalis europaea</i>	+	+	+	+	+	+

Relevé number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
<i>Pteridium aquilinum</i>	+	+	3	.	3	.	.	1	.	.	.	.	.	.	1	.	3	.	.	.	.	.	+	.
<i>Pyrus communis</i> (b)	+
<i>Rubus caesius</i>	+	+

Notes.

Dates, localities and authors of relevés:

- 1 – 28.07.2015, the Rivne Nature Reserve, *Ozersk* forestry, (sq. 26), Rivne region; O. Rak
 - 2 – 22.05.1973, the Syra Pohonia reserve, Bilsk forestry, (sq. 14), Dubrovnytsia district, Rivne region; T. Andrienko.
 - 3 – 27.07.1981, the Polesie Nature Reserve, Selezivka forestry, (sq. 29), Ovruch district, Zhytomyr region; T. Andrienko.
 - 4 – 25.07.1981, the Polesie Nature Reserve, Selezivka forestry, (sq. 29), Ovruch district, Zhytomyr region; T. Andrienko.
 - 5 – 23.07.1981, the Polesie Nature Reserve, Selezivka forestry, (sq. 26), Ovruch district, Zhytomyr region; T. Andrienko.
 - 6 – 06.08.1980, the Polesie Nature Reserve, Kopyshche forestry, (sq. 6), Zhytomyr region; T. Andrienko.
 - 7 – 06.08.1980, the Polesie Nature Reserve, Kopyshche forestry, (sq. 8), Zhytomyr region; T. Andrienko.
 - 8 – 20.10.2012, the Horka tract, near the Svitiyaz village, Shatsk district, Volyn region; O. Lukash.
 - 9 – 10.07.1982, the Chervona Volia forestry, (sq. 5), Novohrad-Volynskiy district, Zhytomyr region; T. Andrienko.
 - 10 – 30.07.1980, the Polesie Nature Reserve, *Kopyshche* forestry, (sq. 35), Zhytomyr region; T. Andrienko.
 - 11 – 09.08.1972, the Ostroh forestry, Ostroh district, Rivne region; T. Andrienko.
 - 12 – 08.06.1981, the Ostrivskiy tract, between the Great and Middle lakes, near the Ostrivsk village, Zarichchia district, Rivne region; T. Andrienko.
 - 13 – 25.08.1972, the Sosnivka forestry, (sq. 27), Berezne district, Rivne region; T. Andrienko.
 - 14 – 26.08.1972, the Horodnytsk forestry, near the Veresovsk village, Zhytomyr region; T. Andrienko.
 - 15 – 24.06.1981, the Polesie Nature Reserve, Kopyshche forestry, (sq. 39), Zhytomyr region; T. Andrienko.
 - 16 – 19.06.1981, the Polesie Nature Reserve, Kopyshche forestry, (sq. 38), Zhytomyr region; T. Andrienko.
 - 17 – 27.08.1972, the Mala Tsvilia forestry, (sq. 91), Novohrad-Volynskiy district, Zhytomyr region; T. Andrienko.
 - 18 – 19.07.1982, the Lystvyn forestry, (sq. 27), Ovruch district, Zhytomyr region; T. Andrienko.
 - 19 – 23.07.1981, the Polesie Nature Reserve, Selezivske forestry, (sq. 27), Ovruch district, Zhytomyr region; T. Andrienko.
 - 20 – 27.07.1978, the floodplain of the Pripiat river near the Nobel lake, Zarichchia district, Rivne region; T. Andrienko.
 - 21 – 14.08.1980, the Samy forestry, (sq. 75), Samy district, Rivne region; T. Andrienko.
 - 22 – 27.08.1972, the Mala Tsvilia forestry, (sq. 91), Novohrad-Volynskiy district, Zhytomyr region; T. Andrienko.
 - 23 – 14.06.1978, the Horodnytsia forestry, Novovolynsk enterprise, (sq. 36), Ivanychi district, Volyn region; T. Andrienko.
 - 24 – 14.06.1982, the Polesie Nature Reserve, (sq. 50), Zhytomyr region; T. Andrienko.
 - 25 – 25.07.1981, the Polesie Nature Reserve, Selezivka forestry, (sq. 30), Ovruch district, Zhytomyr region; T. Andrienko.
 - 26 – 11.06.1982, the Polesie Nature Reserve, (sq. 41), Zhytomyr region; T. Andrienko.
 - 27 – 11.08.1991, the Manevychi forestry, (sq. 14), Manevychi district, Volyn region; V. Melnyk
 - 28 – 08.07.1990, the Holovno forestry, (sq. 43), Liuboml district, Volyn region; V. Melnyk
 - 29 – 17.07.1989, the Klirytisk forestry, (sq. 21), Kamin-Kashyrskiy district, Volyn region; V. Melnyk
- Plant communities: 1 – *Cladonio-Pinetum*, 2 – *Peucedano-Pinetum*, 3 – *Molinio-Pinetum*, 4 – *Quercro-Piceetum*, 5 – *Vaccinio uliginosi-Pinetum*, 6 – *Sphagno girgensohnii-Piceetum*.

Table 5. Floristic structure of the forest plant communities of the Cladonio-Vaccinietaalia order with *Calluna vulgaris* in Left-bank Polesie

Relevé number	23																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Tree layer (a) cover [%]	20	70	30	25	35	30	25	90	50	45	45	90	60	40	70	90	40	55	65	70	45	40	50
Shrub layer (b) cover [%]	5	1	<1	<1	<1	10	10	<1	15	5	5	1	40	20	15	<1	20	10	5	10	<1	15	40
Herb layer (c) cover [%]	50	25	10	35	80	70	60	15	20	5	35	15	30	15	70	15	45	35	25	25	60	40	60
Mosses and lichens layer (d-e) cover [%]	65	85	35	5	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mosses layer (d) cover [%]	50	0	10	1	1	50	40	95	65	90	30	95	65	50	80	85	90	60	65	20	15	0	0
Syntaxon	1					2					3					4					5		
D. Ass. Cladonio-Pinetum																							
<i>Carex ericetorum</i>	+	+	+	+	+																		
<i>Cladonia rangiferina</i>	1	2	4	1	3																		
<i>Cladonia uncialis</i>	1		+																				
<i>Cladonia gracilis</i>	2			+																			
<i>Helictorichon pubescens</i>											+						+						
<i>Jurinea cyanoides</i>		+																					
<i>Koeleria glauca</i>	1	+	+	+	+			+		+									+				
D. Ass. Peucedano-Pinetum																							
<i>Convallaria majalis</i>		+				+	+	1	+	1	1	+	3	1	+	+	1	2	1	+		2	4
<i>Peucedanum oreoselinum</i>						+	+	+	+	1	1	+	1									+	
<i>Polygonatum odoratum</i>						+	+	+	+	+	+	+							1				
<i>Pulsatilla patens</i>									+		+												
<i>Solidago virgaurea</i>		+			1	+	+	+	+	+	+	+	+				+	+					
D. Ass. Molinio-Pinetum																							
<i>Molinia caerulea</i>							+	1	+		1			1	1	2							1
<i>Polytrichum commune</i>						+				+				+	+	+							
<i>Frangula alnus</i>						2	2		+	1	1	+	4	2	2	+	3	1	1	1	1	+	+
D. Ass. Veronicae-Pinetum																							
<i>Genista tinctoria</i>											+						+	+	+				

Relevé number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
<i>Hieracium umbellatum</i>	1	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	+	1	.	.	.	.	+
<i>Geranium sanguineum</i>	.	+	+	.	.	.	+	
<i>Koeleria grandis</i>	+	+	
<i>Rubus saxatilis</i>	+	1	1	+	.	.	1	1
<i>Veronica incana</i>	+	1
D. Ass. Quercio-Pinetum, species of mixed forests																								
<i>Carex brizoides</i>
<i>Carex sylvatica</i>
<i>Carpinus betulus</i> (b)
<i>Corylus avellana</i>	4	.	.	2	+	.	.	.	.	.	.	.	1	3
<i>Euonymus verrucosa</i>	+	1
<i>Melica nutans</i>	+	+
<i>Mycelis muralis</i>	+	+
<i>Stellaria holostea</i>	+	+
<i>Quercus robur</i> (a)	.	+	3	.	.	+	1	.	2	.	.	.	.	1	1	3
<i>Quercus robur</i> (b)	.	1	.	.	.	.	+	.	+	+	.	.	.	+	1	.	+	+	+	+	+	+	+	+
<i>Quercus robur</i> (c)	+	+	.	+	+	.	.	+	+	+	+	+	+	+	+	+	+
Ch. All. Dicrano-Pinion																								
<i>Dicranum rugosum</i>	.	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Chimaphila umbellata</i>	.	+	+	.	+	.	.	.	+
<i>Dianthus pseudosquarrosus</i>	+	+
<i>Monotropa hipopitys</i>	+	+
<i>Polytrichum juniperinum</i>	.	1	1	.	.	.	+	.	.	+	1	.	.	+	.	.	+	.	.	.	.	.	.	.
D., Ch. O. Cladonio-Vaccinietaalia																								
<i>Arctostaphylos uva-ursi</i>	+
<i>Pinus sylvestris</i>	3	5	4	3	4	3	3	5	4	4	4	5	5	4	5	4	4	4	5	5	5	4	3	3

Relevé number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
<i>Pinus sylvestris</i> (b)	.	1	+	+	+	+	+	.	+	+	.	.	+	.	+	.	+	.	+	.	.	.	.
<i>Pinus sylvestris</i> (c)	.	.	+	+	+	+	+	+	+	.	.	+	+
<i>Dicranum polysetum</i>	.	.	1	+	+	.	+	+	+	+	.	.	.	.	.	.	1	+	+	+	+	+	.
<i>Orthilia secunda</i>	+	+	+	.	+	.	.	+	1	.	.	+	.	.
Ch. Cl. Vaccinio-Piceetea																							
<i>Dicranum scoparium</i>	+
<i>Diphasiastrum complanatum</i>	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Diphasiastrum</i> × <i>zeileri</i>	+
<i>Dryopteris carthusiana</i>	+	+	+	.	+	+	.	+	.	.	+	1	+	.	.	.	.
<i>Hylocomium splendens</i>	+
<i>Luzula pilosa</i>	.	+	1	.	+	+	+	+	.	.	+	+	.	+	+	1	+	+	+
<i>Lycopodium annotinum</i>	+	+
<i>Melampyrum pratense</i>	.	+	.	+	+	.	.	1	1	+	1	1	+	1	1	+	1	1	+	.	+	.	.
<i>Pleurozium shreberi</i>	.	4	1	+	+	4	4	5	5	4	4	.	5	4	.	.	5	5	5	+	3	+	.
<i>Ptilium crista-castrensis</i>	+
<i>Pyrola rotundifolia</i>	+	+
<i>Trientalis europaea</i>	.	.	+	+	+	+	+	+	+	+	.	.	+	.	+	1	+	.	.
<i>Vaccinium myrtillus</i>	.	2	.	.	.	4	+	+	.	4	3	1	+	4	1	4	3	2	3	.	1	.	.
<i>Vaccinium vitis-idaea</i>	.	1	.	.	+	.	+	.	.	+	2	+	+	+	3	1	+	.	1	1	.	.	+
Accompanying species																							
Cl. Molinio-Arrhenatheretea																							
<i>Achillea submillefolium</i>	.	+	+
<i>Agrostis gigantea</i>	+	.	.	.	+	1
<i>Agrostis stolonifera</i>	+	+	.
<i>Agrostis vinealis</i>	+	+	+	+	.	.	.	1	.
<i>Anthoxanthum odoratum</i>	+	+	.	.	+	.

Relevé number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
<i>Populus tremula</i> (b)	+	.	.	.	.	+	+	.	.	+	.	.	.	+	.	+	.	.	.	.	.	.	.
<i>Populus tremula</i> (c)	+	.	.	.	.	+	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.
<i>Pyrus communis</i> (a)	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+
<i>Pyrus communis</i> (b)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
<i>Rubus caesius</i>	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
<i>Salix rosmarinifolia</i>	1	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Sorbus aucuparia</i> (a)	.	.	.	.	.	+	+	.	.	+	.	.	.	+	1	+	.	.	.	.	.	.	.
<i>Sorbus aucuparia</i> (b)	.	+	.	.	.	+	+	.	.	.	2	.	.	.	1	.	2	3	2	1	.	.	.
<i>Veronica chamaedrys</i>	.	.	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	1

Notes.

Dates, localities and authors of relevés:

- 1 – 16.08.2019, Mizhrichynskiy Regional Landscape Park, the shooting range, Kozelets district, Chernihiv region; O. Lukash, H. Danko, O. Rak, P. Buzumko
 - 2 – 05.07.1980, the Chudivka forestry (sq. 30), Ripky district, Chernihiv region; T. Andrienko.
 - 3 – 14.08.1996, the Horbachi forestry (sq. 113), Kozelets district, Chernihiv region; O. Lukash
 - 4 – 19.07.2019, the pine-forest terrace of the Desna river, near the Krasne village, Chernihiv district, Chernihiv region; H. Danko
 - 5 – 11.08.2019, the pine-forest terrace of the Dnieper river, near the Lisove village, Ripky district, Chernihiv region; O. Lukash
 - 6 – 13.08.2009, the Orlykivka forestry (sq. 101), Semenivka district, Chernihiv region, O. Lukash
 - 7 – 25.08.2018, the Kupshi tract, between the Nevklia and Bezykiv villages, Horodnia district, Chernihiv region; O. Lukash
 - 8 – 31.07.2003, the Starohutskiy forest area (sq. 45, site 8), Seredyna Buda district, Sumy region, N 52,33425°; EO 33,7469; S. Panchenko, O. Chornous (Panchenko, 2013).
 - 9 – 25.04.2004, the Zhuklia forestry (sq. 35), Koriukivka district, Chernihiv region; O. Lukash.
 - 10 – 18.05.2005, the Nova Zymnysia tract, Ripky district, Chernihiv region; O. Lukash.
 - 11 – 02.05.2005, the Kolochivska Dacha tract, Koriukivka district, Chernihiv region; O. Lukash.
 - 12 – 12.07.2002, the Myklashvshchyna tract, Travneve village (Horodnia district, Chernihiv region), O. Lukash.
 - 13 – 15.06.1998, the forest near the Drobitsi village, Korop district, Chernihiv region; Yu. Karpenko
 - 14 – 01.08.2010, the Radomska Dacha tract, Radomka forestry (sq. 60), Semenivka district, Chernihiv region, O. Lukash.
 - 15 – 30.09.2003, the Nevklia forestry, between the Nevklia and Tupychiv villages, Horodnia district, Chernihiv region; O. Lukash.
 - 16 – 14.07.2002, the Starohutskiy forest area (sq. 65, site 7), Seredyna Buda district, Sumy region, N 52,3317°; EO 33,7622; S. Panchenko (Panchenko, 2013).
 - 17 – 16.08.1999, the Masheve forestry, Spaske tract, between the Masheve and Ivanivka villages, Semenivka district, Chernihiv region; O. Lukash.
 - 18 – 10.07.2016, the pine-forest terrace of the Desna river, near the Sokolivka village, Kozelets district, Chernihiv region; O. Lukash.
 - 19 – 01.07.2003, the Novi Borovychi forestry, between the Turia and Zahrebelna Sloboda villages, Snovsk district, Chernihiv region; O. Lukash.
 - 20 – 11.07.1997, the Starohutskiy forest area (sq. 97), Seredyna Buda district, Sumy region, N 52,3209°; EO 33,8121, S. Panchenko (Panchenko, 2013).
 - 21 – 15.07.2010, the Hnizdyshechanska Dacha tract, Horodnia district, Chernihiv region; O. Lukash.
 - 22 – 17.08.2013, the Yasenske tract, Liubech forestry, Ripky district, Chernihiv region; O. Lukash, V. Popruha, O. Rak.
 - 23 – 15.08.1996, the Horbachi forestry (sq. 19), near the Lykholitky village, Kozelets district, Chernihiv region; O. Lukash.
- Plant communities: 1 – *Cladonio-Pinetum*, 2 – *Peucedano-Pinetum*, 3 – *Molinio-Pinetum*, 4 – *Veronico incanae-Pinetum*, 5 – *Quercio-Piceetum*.

The ontogenetic structure of *Calluna vulgaris* in plant communities of pine forests of the *Cladonio-Pinetum* association was investigated. Two model cenopopulations of *Calluna vulgaris* (equal in area, ecological and phytocenotic conditions) were selected: in Right-bank Polesie – in the Rivne Nature Reserve (Table 4, relevé 1) and in Left-bank Polesie – in Mizhrichynskyi Regional Landscape Park (Table 5, relevé 1). The results of population studies are represented in Table 6 and Figure 2.

Table 6 shows that the density of the “right-bank” population is 118 individuals per m². It has incomplete age

spectrum (without seedlings and senile individuals) and is right-sided, with the peak on virginal and generative individuals (Fig. 2: I). The density of the “left-bank” population is 120 individuals per m². It is also incomplete (without seedlings, juvenile and senile individuals) and right-sided with the peak on old generative individuals (Fig. 2: II). The difference in indexes of the ontogenetic status assessment of two populations indicates the following: the growth conditions for *Calluna vulgaris* in the Rivne Nature Reserve are more optimal and are followed by more active growth of plants and settling on new territories.

Table 6. *Calluna vulgaris* (L.) Hill. populations in *Cladonio-Pinetum* Juraszek 1927 communities of Ukrainian Polesie

Population localization	Average number of individuals/m ²									Index of ontogenetic status assessment			
	p	j	im	v	g ₁	g ₂	g ₃	s	Σ	I _{inn}	I _{sen}	I _{gen}	I _{aet}
Rivne Nature Reserve (Right-bank Polesie)	0	3	5	30	27	28	25	0	118	32.20	21.19	67.80	0.65
Mizhrichynskyi Regional Landscape Park (Left-bank Polesie)	0	0	2	29	25	24	40	0	120	25.83	33.33	40.83	1.29

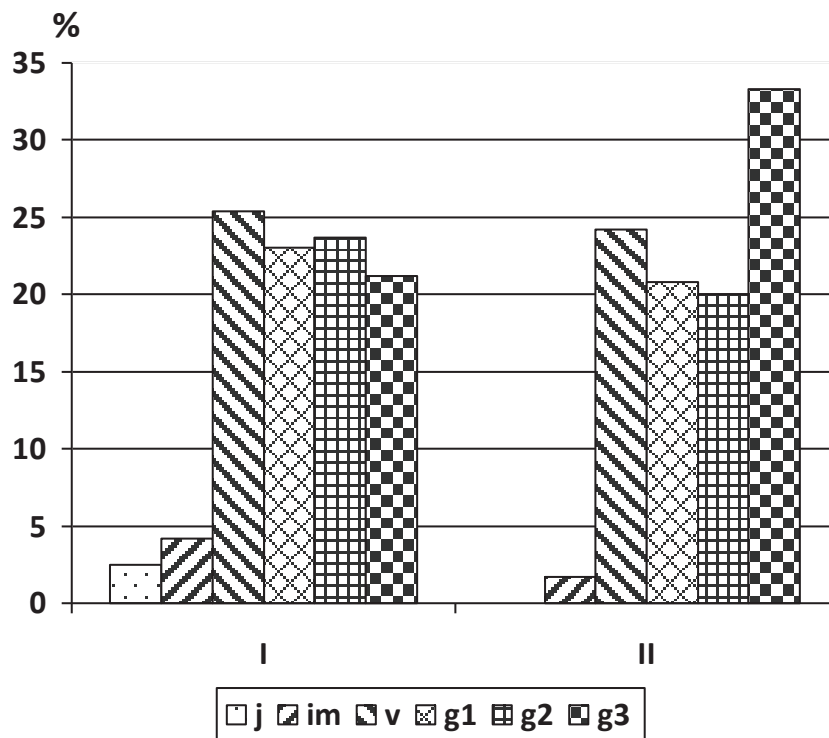


Figure 2. Age-related structure of the *Calluna vulgaris* populations in Rivne Nature Reserve (I) and Mizhrichynskyi Regional Landscape Park (II). Denotations: j – juvenile individuals, im – immature individuals, v – virginile individuals; g₁ – young generative individuals, g₂ – mature generative individuals, g₃ – old generative individuals

The “western” population is younger ($I_{\text{aet}} = 0.65$) than the “eastern” one, where the aging processes are prevailing ($I_{\text{aet}} = 1.29$). To compare with, the aging of the *Calluna vulgaris* populations in the forest phytocenoses in the east of Left-bank Polesie (National Nature Park “Desniansko-Starohutskyi”), is more intensive: *Index aetas* (I_{aet}) is 1.72 (Kovalenko, 2015).

It should be noted that the syntaxonomical affiliation of the *Calluna vulgaris* forest habitats in Right-bank and Left-bank Polesie is different. In particular, rare, as for Polesie, communities of the *Veronico incanae-Pinetum* association (Table 5, relevés 17-19) occur only in Left-bank Polesie. Pine forests of the *Vaccinio uliginosi-Pinetum* association with *Calluna vulgaris* (Table 4, relevés 23-26) were described only in Right-bank Polesie. The communities of the *Vaccinio uliginosi-Pinetum* association are known only in National Nature Park “Desniansko-Starogutskyi” in Left-bank Polesie (Panchenko, 2013). *Calluna vulgaris* as well as *Vaccinium uliginosum* L. (diagnostic species of the *Piceo-Vaccinienion uliginosi* suballiance) are absent in all 10 relevés of this association. The European boreo-montane spruce forests of the *Piceion excelsae* class (Table 4, relevés 27-29) occur only in Right-bank Polesie. The phytocenoses are represented by the *Sphagno girgensohnii-Piceetum* association. The projective coverage of *Calluna vulgaris* does not exceed 1%.

According to the results of the research, the map of the *Calluna vulgaris* distribution in Ukrainian Polesie biotopes was created (Fig. 3).

We compared the frequency of the *Calluna vulgaris* constancy in plant communities of Right-bank and Left-bank Polesie. The results of the comparison are shown in Table 7.

Undoubtedly, *Calluna vulgaris* has the maximum constancy frequency in the phytocenoses of the *Calluno-Ulicetea* and the *Nardetea strictae* classes, where it is a characteristic or differentiating (diagnostic) species. The *Calluna vulgaris* high constancy is observed in the plant communities of the *Ledo-Sphagnetum magellanici* association. The *Calluna vulgaris* occurrence in pine forests of Right-bank Polesie is slightly higher (than in Left-bank Polesie). The spruce forests of the *Sphagno girgensohnii-Piceetum* association are rare biotopes for *Calluna vulgaris*. It should be noted that *Calluna vulgaris* does not grow in other spruce forests, which have an “island” distribution in Polesie. Rather stable position and high constancy of *Calluna vulgaris* in different phytocenoses of Ukrainian Polesie is a consequence of high drought and frost resistance of this species in combination with plasticity of its morphological structure (Grubb, 1992).

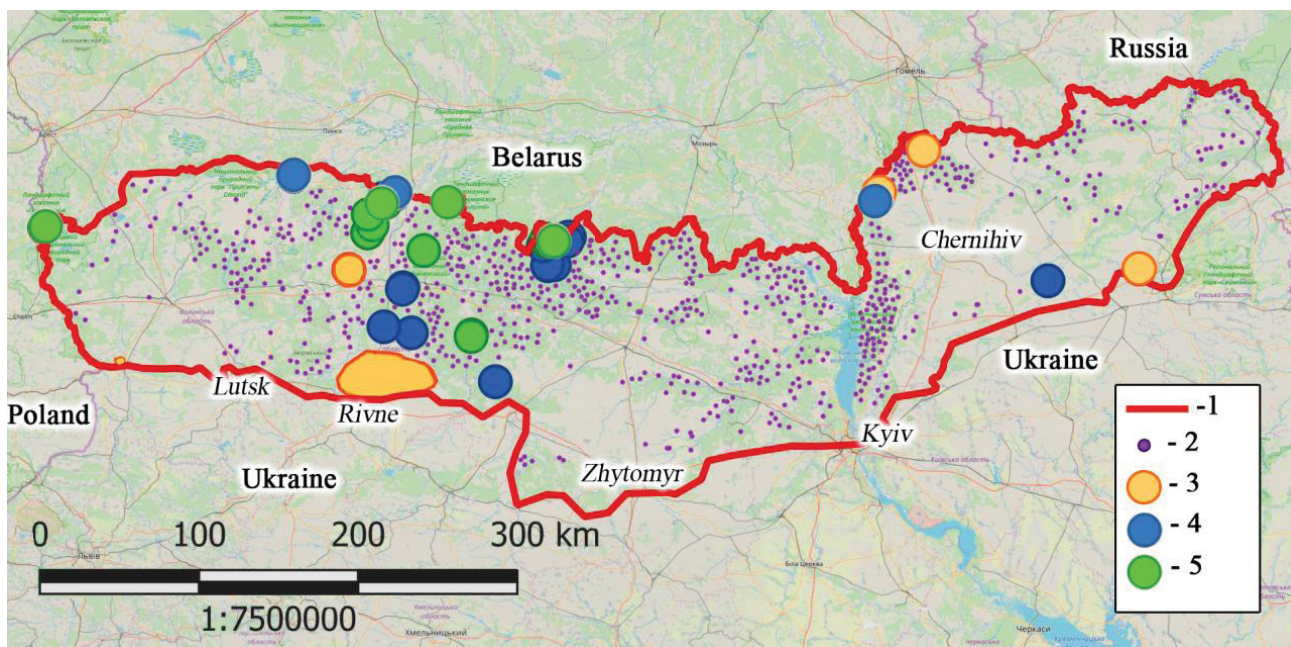


Figure 3. Distribution of *Calluna vulgaris* (L.) Hill. in the biotopes of Ukrainian Polesie. Map symbols: 1 – border of Ukrainian Polesie, 2 – temperate and subboreal pine forests on nutrient-poor acidic sandy soils (the *Vaccinio-Piceetea* class), 3 – boreo-temperate heathlands of the *Calluno-Ulicetea* class, 4 – boreo-temperate heathlands of the *Nardetea strictae* class, 5 – dwarf-shrub, sedge and peat-moss ombrotrophic raised bogs on extremely acidic soils (the *Oxycocco-Sphagnetea* class)

Table 7. Constancy of *Calluna vulgaris* (L.) Hill. in plant communities of Ukrainian Polesie

Association	Right-bank Polesie			Left-bank Polesie		
	Total number of relevés analyzed	Number of relevés with <i>Calluna vulgaris</i>	Constancy, %	Total number of relevés analyzed	Number of relevés with <i>Calluna vulgaris</i>	Constancy, %
<i>Calluno-Genistetum pilosae</i>	3	3	100	0	0	-
<i>Scabioso canescentis-Genistetum</i>	0	0	-	5	5	100
<i>Calluno-Nardetum strictae</i>	17	17	100	4	4	100
<i>Ledo-Sphagnetum magellanicum</i>	41	38	92.7	0	0	-
<i>Cladonio-Pinetum</i>	67	43	64.2	63	36	57.1
<i>Peucedano-Pinetum</i>	82	63	76.8	93	68	73.1
<i>Veronico incanae-Pinetum</i>	0	0	-	43	38	65.1
<i>Molinio-Pinetum</i>	57	41	71.9	36	25	69.4
<i>Quercus-Piceetum</i>	45	18	40.0	48	19	39.6
<i>Vaccinio uliginosi-Pinetum</i>	36	17	47.2	10	0	0
<i>Sphagno girgensohnii-Piceetum</i>	43	7	16.3	0	0	-

5. Conclusions

The heathlands are rare ecosystems in Ukrainian Polesie. Their vegetation is represented by the plant communities of the *Calluno-Ulicetea* and the *Nardetea strictae* classes. They are forming in greatly anthropogenically disturbed areas (e.g., areas after wildfires) or in the areas with intensive human activities (at shooting ranges first of all). The cenoses of the *Calluno-Genistetum pilosae* association, which are present only in Right-bank Polesie, have larger areas (up to 20 km²). Other heather communities are smaller in size; they usually occupy the area of several hectares (the *Calluno-Nardetum strictae* association) or are represented by small patches in landscape of pine forests (less frequently in mixed forests) on upland terraces of rivers (the *Scabioso canescentis-Genistetum* association).

A significant participation (with the projective cover of up to 80%) and high constancy (92.7%) in oligotrophic swamps the phytocenoses of the *Ledo-Sphagnetum magellanicum* association is a characteristic feature of the *Calluna vulgaris* distribution in Right-bank Polesie of Ukraine.

The middle-aged pine and birch-pine forests of the *Di-crano-Pinenion* suballiance are the most common habitats of *Calluna vulgaris* in Ukrainian Polesie (mostly, with its projective cover of less than 1%). The phytocenoses of the

Veronico incanae-Pinetum association is the habitat of *Calluna vulgaris* only in Left-bank Polesie. *Calluna vulgaris* has the lowest constancy (57.1%) in the *Cladonio-Pinetum* association of Left-bank Polesie and the highest constancy (76.8%) in the *Peucedano-Pinetum* association of Right-bank Polesie. *Calluna vulgaris* constancy does not exceed 40% in the oak-pine forests of the *Quercus-Piceetum* association. The syntaxonomic difference of the *Calluna vulgaris* forest habitats in Right-bank Polesie and Left-bank Polesie is primarily revealed at the *Piceo-Vaccinienion uliginosi* suballiance level and the *Piceetalia excelsae* order. The spruce forests of the *Sphagno girgensohnii-Piceetum* association are rare biotopes for *Calluna vulgaris*.

The *Calluna vulgaris* populations within the forest plant communities of the *Cladonio-Pinetum* association are characterized by a similar ontogenetic structure: they are incomplete. There are no sprouts, vegetative reproduction prevails, and age spectrum maximum falls on generative individuals. However, the *Calluna vulgaris* cenotic population in Right-bank Polesie of Ukraine is characterized by a greater activity of plants growth and spreading on new territories, while aging prevails in the “left bank” population.

In general, the environmental conditions of Right-bank Polesie of Ukraine are more favorable to *Calluna vulgaris*, than the conditions in Left-bank Polesie.

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