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NOMENCLATURE NOTES ON VEGETATION OF THE *SALICETEA PURPUREAE* MOOR 1958 CLASS IN UKRAINE

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A brief history of the syntaxonomic studies of floodplain vegetation of the *Salicetea purpureae* class in Ukraine is presented and the tasks of further research are established. Our study has shown that the vegetation of the class includes more than 30 associations, which belong to 6 alliances and 2 orders. According to the ecological peculiarities, they are divided into willow shrubs on the gravel banks of streams in the montane and subalpine belts of the temperate and boreal zones of Europe and the Caucasus (*Salicion eleagno-daphnoidis*), willow and poplar forests of lowland and foothill rivers formed on alluvium in the nemoral zone of Europe and at high altitudes in the Mediterranean region (*Salicion albae*), willow shrubs on the sandy-loamy soils of the river banks of lowlands and foothills of the nemoral zone of Europe (*Salicion triandrae*), willow shrubs on riverine dunes in central Ukraine (*Artemisio dniproicae-Salicion acutifoliae*), shrubs on temporarily flooded clay soils in central Ukraine (*Rubo caesi-Amorphion fruticosae*).

The problems of using the phytosociological nomenclature during the analysis of the *Salicetea purpureae* vegetation on the territory of Ukraine are highlighted. It was found that half of the syntaxa listed in Ukrainian geobotanical literature are synonyms, published invalidly, or need typification. Every syntaxon is accompanied by explanations of its non-validity with citations of the relevant articles published in the 4th edition of the International Code of Phytosociological Nomenclature. In addition to the incorrectly cited associations, two of the six alliances (*Artemisio dniproicae-Salicion acutifoliae, Rubo caesii-Amorphion fruticosae*) also require correction because their description was based on the invalid nomenclatural types formed by the selection of species which are invalid according to The Euro+Med PlantBase.

In this paper, we aimed to analyze the studies on the vegetation of the *Salicetea purpureae* class on the territory of Ukraine using the Braun–Blanquet approach, determine the issues that require more detailed research in the future, and make some notes on nomenclature discordances. Such review makes it possible to determine all mismatches in phytosociological nomenclature.

Keywords: willow forests, vegetation classification, syntaxonomy, phytosociological nomenclature, Ukraine

INTRODUCTION

One of the biggest problems of humanity is the preservation of biological diversity, in particular, its structural component – vegetation. Solving this problem is impossible without its comprehensive study. However, the amount of information has grown rapidly over the years, and scientists sometimes must spend a lot of effort and time to establish the already-known results. Therefore, all scientific research should be based on the discovery and further structuring of the results obtained by predecessors, which allows setting a range of unsolved issues and opens opportunities for new research and critical re-evaluation of the obtained data.

The literature dedicated to the floodplain forest vegetation in Ukraine contains a considerable amount of materials on its phytocoenotic characteristics. However, there is a clear difference in the amount of data obtained in different geographical regions and different syntaxons.

Since the 1920s, the vegetation of Ukraine, including floodplain vegetation of *Salicetea purpureae* class, has been studied based on dominant classification. As a result of these studies, the “Prodrome of Vegetation of Ukraine” was published in 1991 (Shelyag-Sosonko *et al*., 1991). The list of syntaxa listed in the Prodrome was the first attempt to systematize all classification units in such a large region in the history of Ukrainian phytocoenology. In the Prodrome were listed 18 white willow and 15 ash willow associations. Such a large number of associations made it difficult to understand the extent and real representation of this type of vegetation in Ukraine.

In the 1990s, the study of vegetation using Braun–Blanquet approach was initiated in Ukraine. At that time, the main aim was the systematization and compilation of phytosociological data, creating the regional classification schemes and the classification scheme of vegetation of Ukraine, in particular. Such studies produced a large number of narrow associations of regional importance, which did not correspond to the requirements of the International Code of Phytosociological Nomenclature (Kuzemko, 2011). Among them are more than 30 associations belonging to the *Salicetea purpureae* class. Also, 8 different citations of the alliance *Salicion albae* by different authors have been noted. This situation indicates the problem that Ukrainian phytosociologists faced – limited access to the protologues, where syntaxa were described for the first time.

Harmonization of the regional classification schemes is possible based on a broad-scale comparison of vegetation of certain classes in the European context. This objective today is the main task of the European phytosociological community and has the first positive results (Douda *et al*., 2016; Marcenò *et al*., 2018; Landucci *et al*., 2020; Kalníková *et al*., 2021). Thus J. Douda and co-authors (2016) developed an overwiev of the floodplain forests dominated by *Alnus* species (*Alnus glutinosa, A. incana*). Unfortunately, such a survey has not yet been conducted for the *Salicetea purpureae* class, either at

the European or at the Ukrainian level. Therefore, at this stage of research, a database of the *Salicetea purpureae* vegetation, based on relevés collected in all regions of Ukraine, was created. This database includes 580 releves. In the future, we plan to make a comprehensive syntaxonomical overwiev of the *Salicetea purpureae* class for Ukraine. In the process of the literature data analysis, some nomenclature discordances were discovered as a result of incorrect use of the rules of the International Code of Phytosociological Nomenclature (Theurillat *et al*., 2021).

In this paper, we aimed to analyze the study of the vegetation of the *Salicetea purpureae* class on the territory of Ukraine using the Braun–Blanquet approach, to determine issues that require more detailed research in the future and to make some comments on nomenclature discordances. Such review makes it possible to highlight critical positions of the classification scheme of this type of vegetation in Ukraine, as well as to determine all mismatches in phytosociological nomenclature. All names of higher syntax are given according to the EuroVegChecklist (Mucina *et al*., 2016).

The class *Salicetea purpureae* is represented by floodplain willow and poplar forests, as well as shrub communities that grow on moist silty, sod, sandy, and gravelly alluvial soils (Mandžukovski *et al*., 2021). Vegetation of the class is spread over the entire territory of Europe – from the Azores to the north of Finland. It usually stretches in strips on the sides of river beds. The vegetation of this class develops under the influence of a complex of environmental factors, the main ones being the soil (composition of alluvial deposits), flooding regime, moisture, soil aeration, and biological features of the plants. Poplar forests are widespread on the drier sandy or sandy loamy soils of the floodplain, while willow floodplain forests develop in low-lying areas with muddy soil (Mandžukovski *et al*., 2021).

The first work that provides data about the class *Salicetea purpureae* according to the Braun–Blanquet approach in Ukraine was published in 1996 based on research in the territory of the Kaniv Nature Reserve (Shevchyk & Solomakha, 1996). V. Shevchyk with co-authors made a significant contribution to the study of the *Salicetea purpureae* class in Ukraine. They described 2 alliances and 5 associations of willow forests that were new to the science (Shevchyk *et al*., 1996; Senchylo *et al*., 1999).

In the 1990s and at the beginning of the 21st century, the studies of willow forests and shrubs were very active. They were quite well studied within the territory around the Dnipro River and its tributaries (Kuzemko & Chorna, 2002; Gomlya, 2005; Chinkina, 2006). For many years, similar studies have also been conducted on the Danube River banks. A comprehensive study of the syntaxa of the class in the Danube Biosphere Reserve was presented by D. Dubyna and co-authors (Dubyna *et al*., 2002, 2003). These data were summarized in the monograph “Classification and prodrome of vegetation of reservoirs, floodlands and arenas of the Northern Black Sea Region” (Dubyna *et al*., 2004).

Over the past 20 years, a series of monographic works performed on protected territories of Ukraine have been published. They highlighted the general features and peculiarities of this type of vegetation in different natural reserves and national nature parks (Tkachyk, 1999; Stetsiuk, 2004; Galchenko, 2006; Soroka, 2008; Derzhypilsky *et al*., 2011, Panchenko, 2013). Some information about the floodplain forests of the Carpathian region was presented by A. Malynovsky (2002), L. Felbaba-Klushyna (2010), Yu. R. Shelyag-Sosonko and co-authors (2010), O. T. Kuzyarin (2011), P. M. Ustymenko and co-authors (2015).

In 1996, V. Solomakha published the first syntaxonomical overwiev of the vegetation in Ukraine according to the Braun–Blanquet approach. In his monograph, he included 3 alliances and 6 associations to the *Salicetea purpureae* class (Solomakha, 1996). All syntaxa, except the *Salicion albae* alliance, were described for the first time in 1996 on the territory of the Kaniv Nature Reserve and were first reported in this publication. This can be explained by the fact that most of the studies of this class at that time were conducted on the Dnipro River banks with an intermittent flooding regime and a more continental climate, which is not characteristic of other European countries.

In 2008, the next survey of the vegetation of Ukraine was published (Solomakha, 2008). The number of alliances in this study did not change, but the number of associations increased to 12. Among them, the authors included in the list associations *Salicetum albae, Salicetum triandro-viminalis*, typical for this region, as well as the newly described order *Asparago tenuifolii-Quercetalia robori* O. Umanets et I. Solomakha 1999, which comprised coenoses of the broad-leaved forests on the Lower Dnipro arenas. As a result, the list of syntaxa of the class in these two publications was quite incomplete and differed significantly from the classification schemes described on the territory of the neighboring countries (Matuszkiewicz, 2012; Chytry *et al.*, 2013; Valachovič *et al.,* 2022).

In 2019, the “Prodrome of the Vegetation of Ukraine” was published (Dubyna *et al*., 2019). In this study, information about floodplain forests was more systematized. The authors provided information about 2 orders, 6 alliances and 16 associations, which better reflects the diversity of the *Salicetea purpurea* vegetation on the territory of Ukraine. However, the information about some associations and even alliances, such as *Salicion eleagno-daphnoidis*, was still missing. This situation indicates that future syntaxonomic revision of the *Salicetea purpureae* class is inevitable.

In Ukraine, the *Salicetea purpureae* class is represented by two orders: *Salicetalia purpureae*, which is typical for entire Europe, and *Tamaricetalia ramosissimae*, which comprises coenoses, distributed mainly in the southern regions of Europe and the Mediterranean region.

The order *Salicetalia purpureae* is divided into 5 alliances, which are separated according to their ecological requirements. Thus, willow and poplar forests formed on the alluvium of lowland and foothill rivers in the nemoral zone and at high altitudes of the Mediterranean (*Salicion albae*); willow shrubs – on the loamy-sandy sedimentary river banks in the lowland and submontane belt of the nemoral zone of Europe (*Salicion triandrae*); willow shrubs – on the gravel banks of streams in the montane and subalpine belt of temperate and boreal zone of Europe and the Caucasus (*Salicion eleagno-daphnoidis*); willow shrubs – on the riverine dunes of Central Ukraine (*Artemisio dniproicae-Salicion acutifoliae*); riparian shrubs – on temporarily flooded clay soils of central Ukraine (*Rubo caesi-Amorphion fruticosae*). The order *Tamaricetalia ramosissimae* contains only one alliance of tamarisk riparian shrubs on course-gravel soils on the banks of lowland rivers in the Sarmatian region of southern Ukraine and russia (*Artemisio scopariae-Tamaricion ramosissimae*) (Mucina *et al*., 2016).

A brief analysis and description of these syntaxa at the association level with some nomenclature notes on the territory of Ukraine is shown below.

Order *Salicetalia purpureae* Moor 1958

Alliance *Salicion albae* Soó 1951

This is the central alliance of the order with a wide geographical range. Willow-poplar forests are common in the temperate and hemiboreal zone of Europe, from

the Balkan Peninsula in the south to Scandinavia in the north. In the east, they reach western Siberia.

The association *Salicetum albae*, which is the nomenclatural type of the *Salicion albae*, was first described in the Vosges in northeastern France (Issler, 1926). This association, along with the alliance *Salicion albae*, described on the territory of Hungary (Soó, 1951), was originally assigned to the order *Populetalia* of the class *Querceto-Fagetea*. It was believed that this vegetation was related to the alliance of the *Alnion incanae* and is a preliminary stage of their formation. Only in 1958, M. Moore noted that it is not correct to assign willow forests and shrubs to the *Querceto-Fagetea* or *Alnetea glutinosae* class, as some authors did (Moore, 1958). Considering the low species richness, pioneer character and floristic difference, the author assigned this vegetation to the separate class *Salicetea purpureae,* the order *Salicetalia purpureae*.

The *Salicion albae* includes the highest number of associations described in different regions of Europe. About 13 associations are listed on the territory of Ukraine. Six associations are listed in the "Prodrome of the vegetation of Ukraine", 4 of them are valid:

Salicetum albae Issler 1926 (accepted name);

Poo nemoralis-Salicetum albae Shevchyk et Solomakha 1996 (accepted name);

Myosotido palustris-Salicetum albae Shevchyk et Solomakha 1996 (Needs correction according to Art. 44);

Populetum nigro-albae Slavnić 1952 (accepted name);

Salici-Populetum (Tx. 1931) Meijer-Drees 1936 (syntax. syn. *Salicetum albae*);

Salici acutifoliae-Amorphetum fruticosae Senchylo et al. 1999 (Art. 3b)

Other associations are listed in the Ukrainian geobotanical literature. Many of them are not valid. Their existence and distribution on the territory of Ukraine need some further research.

Syntaxons mentioned in the Ukrainian geobotanical literature:

Aristolochio clematitis-Populetum nigrae Goncharenko et Yatsenko 2020 (accepted name);

Populetum marylandicae Mititelu 1970 (ass. cult.) (syn. *Populetum x canadensis* I. Lupu 1979) (syntax. syn. *Populetum nigro-albae*);

Salicetum albae Klika 1955 (Art. 31);

Salicetum albo-fragilis R.Tx. 1955 (syntax. syn. *Salicetum albae*);

Salicetum albo-fragilis R. Tx. ex Moor 1958 p. p. (syntax. syn. *Salicetum albae*);

Salicetum albo-fragilis (Issler 1926) R.Tx. 1955 (syntax. syn. *Salicetum albae*);

Salicetum triandro-viminalis Lohmeyer 1952 (syntax. syn. *Salicetum triandrae; Salicion triandrae* alliance);

Fraxino-Populetum Jurko 1958 (syntax. syn. *Fraxino pannonicae-Ulmetum glabrae* Aszód 1935 corr. Soó 1963; *Fraxino-Quercion roboris* alliance).

***Salicion triandrae* T. Müller et Görs 1958**

This vegetation type is widespread in the temperate and hemiboreal part of Europe, from the Balkan Peninsula in the south to Scandinavia in the north. In the east, they reach russia, but occur there more rarely due to the intermittent floodplain regime of the rivers and the influence of continentality.

Although communities of the alliance spread all over Europe, they are not diverse. Only a few associations are mentioned in European geobotanical sources. Most of them are synonyms of the first validly published association *Salicetum triandrae*, described in the lowlands of northeastern France (Malcuit, 1929). According to the traditions of the

time to attribute willow communities to the alliance of alder forests, the author assigned this association to the *Alnion glutinosae* alliance. But, as with the *Salicion albae* alliance, it was obvious that this descision also was debatable. As a result, a new alliance *Salicion triandrae* was described on the territory of Germany in 1958. The authors noted that communities with the dominance of *Salix triandra* cannot belong to the *Alnetea glutinosae* or *Querco-Fagetea* class, and proposed to distinguish a separate order of *Salicetalia purpureae*, which would include 2 alliances – *Salicion albae*, described in 1951 and the newly described alliance *Salicion triandrae* (Müller & Görs, 1958).

In the "Prodrome of the vegetation of Ukraine" only one association is listed under the name *Salicetum triandrae* Noirfalise in Lebrun, Noirfalise et Sougnez 1955, which is a late homonym of *Salicetum triandrae* Malcuit 1929.

Syntaxons mentioned in the Ukrainian geobotanical literature:

Salicetum triandrae Malcuit 1929 (accepted name);

Salicetum triandrae Noirfalise in Lebrun, Noirfalise et Sougnez 1955 (Art. 31);

Salicetum triandro-viminalis R. Tx. et Lohmayer 1950 (syntax. syn. *Salicetum triandrae*).

***Salicion eleagno-daphnoidis* (Moor 1958) Grass 1993**

The alliance was first time described by Aichinger in 1933 as *Salicion incanae*. It was a part of the order *Myricarietalia* Aichinger 1933 of the class *Thlaspietea rotundifolii*, which presents the pioneer vegetation of the montane and subalpine river banks and moraines. In 1958, M. Moor described the new alliance *Salicion eleagni* (Moor, 1958; Mandžukovski *et al.*, 2021) and proposed to replace the name *Myricarietalia* with the name *Epilobietalia fleischeri*, because *Myricaria germanica* is more likely an element of willow scrub than of herbaceous communities of gravel bars. For the same reason, it was necessary to replace the name of the alliance *Salicion incanae*, which was usually used to denote the alliance *Salicion eleagni*, represented by willow shrubs of gravel banks. It was proposed to rename this alliance as *Epilobion fleischeri*. Therefore it is proposed to consider the name of the alliance *Salicion incanae* Aichinger 1933 as a nomen ambiguum.

In 1993 V. Grass discovered that the alliance *Salicion eleagni* is the later homonym of *Salicion incanae* alliance (Art. 31) and for this reason should be rejected (Grass, 1993). The new name *Salicion eleagno-daphnoidis* (Moor 1958) Grass 1993 nom. nov. was described by him according to this study.

There is no information about the presence of this alliance on the territory of Ukraine in the "Prodrome of the Vegetation of Ukraine", although it is mentioned in several publications (Chorney *et al*., 2005; Stoyko *et al*., 2008; Derzhypilsky *et al.*, 2011; Kalnikova *et al*., 2021).

Syntaxons mentioned in the Ukrainian phytosociological literature:

Salicion eleagno-daphnoidis (Moor 1958) Grass 1993 (accepted name);

Salicion eleagni Moor 1958 (Art. 31, 39, later homonym of *Salicion incanae*; *Salix eleagnos* Scop. = Salix incana Schrank);

Salicion eleagni (Aichinger 1933) Moor 1958 (Art. 31);

Agrostio-Salicetum purpureae Jurko 1964 (Art. 29c);

Salici-Myricarietum Moor 1958 (accepted name).

Some authors mistakenly included in this alliance communities dominated by *Hippophae rhamnoides* and *Elaeagnus angustifolia*, common in the southern regions of Ukraine on coastal dunes (Dubyna *et al*., 2002, 2004). According to our data

(Borsukevych *et al.,* 2023), the above-mentioned communities should be included into the alliance *Artemisio scopariae-Tamaricion ramosissimae* Simon et Dihoru 1963 of the order *Tamaricetalia ramosissimae* Borza et Boscaiu ex Doltu et al. 1980 (Simon & Dihoru 1963).

Indeed, according to some sources, the *Salicion eleagno-daphnoidis* alliance consists of some shrub communities dominated by *Hippophae rhamnoides,* which are included in the *Salici eleagni-Hippophaëtum rhamnoidis* association. However, they are common in Alps, Pyrenees, and the Caucasus. They are very rare in the Romanian Carpathians and in Slovenia, Croatia, and Hungary (Mucina *et al.,* 2016). They do not occur on the territory of Ukraine.

***Rubo caesii-Amorphion fruticosae* Shevchyk et V. Solomakha in Shevchyk et al. 1996**

The alliance unites riparian shrubs on temporarily flooded clay soils of central Ukraine. They are formed on sod and clay soils covered with water during the spring or summer flooding. Although *Amorpha fruticosa* is actively spreading in different regions of Ukraine, it is most common in the Dnipro basin. The alliance was first described in 1996 from the territory of the Kaniv Nature Reserve (Shevchyk *et al*., 1996). The association *Euphorbio virgultosae-Amorphetum fruticosae* was chosen as the nomenclatural type of this alliance. Along with this association, two other associations (*Strophiostomo sparsiflorae-Amorphetum* and *Aristolochio-Salicetum albae*) were described in this publication (Shevchyk & Solomakha, 1996). According to Euro+Med Base, *Euphorbia virgultosa* Klokov is a synonym of *Euphorbia esula* subsp. *tommasiniana* (Bertol.) Kuzmanov. According to the rules of International Code of Phytosociological Nomenclature (Theurillat *et al*., 2021), the name of this syntaxon should undergo the procedure of mutation using the accepted name.

In the “Prodrome of the Vegetation of Ukraine” only one association *Aristolochio-Salicetum albae* is listed. However, this association should be considered as part of the *Salicion albae* alliance.

Syntaxons mentioned in the Ukrainian phytosociological literature:

Euphorbio virgultosae-Amorphetum fruticosae Shevchyk et V. Solomakha 1996 (Needs correction according to Art. 44);

Strophiostomo sparsiflorae-Amorphetum Shevchyk et V. Solomakha 1996 (Needs correction according to Art. 44).

Aristolochio-Salicetum albae Shevchyk et V. Solomakha 1996 (accepted name; *Salicion albae*).

***Artemisio dniproicae-Salicion acutifoliae* Shevchyk et V. Solomakha in Shevchyk et al. 1996**

This alliance represents willow shrubs on riverine sandy dunes of central Ukraine. It is pioneer vegetation presented by shrubby communities with low coverage of the shrub layer. They are formed on slightly enriched organic sandy soils of the highest sections in the floodplain profile. The alliance was described in 1996 from the territory of the Kaniv Nature Reserve and included one association *Artemisio dniproicae-Salicetum acutifoliae*, which is the nomenclatural type of the alliance (Shevchyk & Solomakha, 1996).

Initially, this alliance was mistakenly assigned to the *Festucetea vaginatae* class, which includes psammophyte grasslands. Later, the authors noted that although the species composition of this alliance includes a significant number of species, characteristics of *Festucetea vaginatae* class, the coenotic features, pioneer character and the

dominance of *Salix acutifolia* indicate that this alliance belongs to the class *Salicetea purpureae*. In 1999, O. Senchylo and co-authors also identified the *Salici acutifoliae-Amorphetum fruticosae* association on the territory of the Kaniv reserve, but it was suggested by the authors as a provisional name, therefore it is not validly published (Senchylo *et al*., 1999). *Artemisia dniproica* Klokov is a synonym of *Artemisia campestris* L. (Euro+Med, 2015). According to the International Code of Phytosociological Nomenclature the name of both syntaxa (association and alliance) should be corrected by using the accepted species name (Theurillat *et al*., 2021).

Some authors reported the *Agrostio vinealis–Salicion acutifoliae* Bulokhov 2005 alliance on the territory of Ukraine (Panchenko, 2013). Its nomenclature type is *Agrostio vinealis-Salicetum acutifoliae* Bulokhov 2005 association, described from the territory of Bryansk region. However, this alliance was considered a heterotypic synonym of *Artemisio dniproicae-Salicion acutifoliae* (Mucina *et al*., 2016).

In the “Prodrome of the Vegetation of Ukraine”, only one association *Artemisio dniproicae-Salicetum acutifoliae* is listed.

Syntaxons mentioned in Ukrainian geobotanical literature:

Artemisio dniproicae-Salicetum acutifoliae Shevchyk et V. Solomakha 1996 (Needs correction according to Art. 44);

Salici acutifoliae-Amorphetum fruticosae (nom. prov., Art. 3b).

Agrostio vinealis-Salicetum acutifoliae Bulokhov 2005 (syntax. syn. *Artemisio dniproicae-Salicetum acutifoliae*)

Order *Tamaricetalia ramosissimae* Borza et Boscaiu ex Doltu et al. 1980

Alliance *Artemisio scopariae-Tamaricion ramosissimae* Simon et Dihoru 1963

The order *Tamaricetalia ramosissimae* includes only one alliance *Artemisio scopariae-Tamaricion ramosissimae,* which is represented by tamarisk riparian shrubs on coarse-gravel soils of lowland river banks of the eastern regions of the Balkan Peninsula and the Sarmatian region of Southern Ukraine and russia. Communities of this order are not widespread in the territory of Ukraine. They occur only in the southern part of Ukraine within the steppe zone, mostly on the coastal dunes and in the delta regions of large rivers. There are some notes about their occurrence in the Danube Biosphere Reserve (Dubyna *et al*., 2002, 2004), the estuary of the Dnipro River (Chinkina, 2006).

Previously, some researchers considered tamarisk communities as part of the *Nerio-Tamaricetea* class. This class was described from Spain in 1958 and previously included all *Tamarix*-dominated vegetation distributed in the Mediterranean and the Irano-Turanian region. However, further studies showed that the intracontinental communities of the Irano-Turanian floristic region with the participation of *Tamarix ramosissima* are floristically different from the Mediterranean ones (Mucina *et al.* 2016). Based on these data, the *Tamaricetea arceuthoidis* class was described in 2015. The oleander-tamarisk shrub communities of the Mediterranean region remained in the *Nerio-Tamaricetea* class (Mucina *et al.* 2016).

Phytocoenotic analysis showed, that the shrub coenoses with a diagnostic block, including *Tamarix ramosissima, Hippophaë rhamnoides,* and *Elaeagnus angustifolia* from the territory of Ukraine are floristically, ecologically, and physiognomically different from Mediterranean communities of the *Nerio-Tamaricetea* class (Borsukevych *et al.*, 2023). They have the closest relation to communities of *Artemisio scopariae-Tamaricion ramosissimae* alliance which was described by Romanian phytocenologists (Simon and Dihoru, 1963).

We included relevés from the territory of Romania made by Simon and Dihoru (1963) and presenting the association *Calamagrostio-Tamaricetum ramosissimae*, a nomenclature type of *Artemisio scopariae-Tamaricion ramosissimae* alliance, in our analysis of communities dominated by *Elaeagnus angustifolia* on the territory of Ukraine. The results showed a close relation between relevés collected from the territory of Ukraine with Romanian ones (Borsukevych *et al*., 2021). As a result of our studies, four associations new to the territory of Ukraine were described:

Balloto nigrae-Elaeagnetum angustifoliae Borsukevych in Borsukevych, Iemelianova, Kolomiychuk 2023;

Lactuco tataricae-Elaeagnetum angustifoliae Sokolova, Ermolaeva, Kolomiychuk 2021;

Leymo sabulosi-Elaeagnetum angustifoliae Borsukevych, Iemelianova, Kolomiychuk 2023;

Plantago arenariae-Elaeagnetum angustifoliae I. Solomakha, Vorobyov, Moysiyenko ex Borsukevych, Iemelianova, Kolomiychuk 2023.

After describing the new order *Tamaricetalia ramosissimae* it was established that communities of *Artemisio scopariae-Tamaricion ramosissimae* alliance more likely belong to the *Salicetea purpureae* class. Floristically, the number of halophyte and psammophyte species in this group is higher, but they, like the rest of the syntaxa of the class, depend on the groundwater level and, sometimes, the flooding regime.

Despite a small number of relevés of this alliance collected on the territory of Ukraine, 6 associations are listed in the “Prodrome of the vegetation of Ukraine”, 2 of which are valid.

Syntaxa mentioned in the Ukrainian geobotanical literature:

Calamagrostio-Tamaricetum ramosissimae Simon et Dihoru 1963 (accepted name);

Calamagrostio epigei-Hippophaëtum rhamnoidis Popescu, Sanda et Nedelcu 1986 (accepted name);

Leymo sabulosi-Hippophaëtum rhamnoidis Dubyna et Dziuba ass. nova prov (Art. 3b)

Carici ligericae-Hippophaëtum rhamnoidis Dubyna et Dziuba ass. nova prov (Art. 3b)

Tamaricetum ramosissimae Grosheim 1948 (syn. Calamagrostio-Tamaricetum ramosissimae Simon et Dihoru 1963)

Elaeagnetum angustifoliae Chinkina 2002 nom. inval. (Art. 3o, 5).

In 2023 we did not consider numerous syntaxa described by I. Solomakha with co-authors (Solomakha *et al*., 2015) as they were suggested by the authors as a provisional names, therefore they are not validly published.

***Galio veri-Aristolochion clematidis* Shevchyk et Solomakha in Shevchyk et al. 1996**

In the prodrome of the vegetation of Ukraine, the alliance *Galio veri-Aristolochion clematidis* with the association *Galio veri-Aristolochietum clematidis* for the class *Salicetea purpureae* were listed. These syntaxa were described by V. Shevchyk and co-authors from the territory of the Kaniv Nature Reserve (Shevchyk & Solomaha, 1996). Among the diagnostic species of the alliance and association, such species as *Populus nigra* and *Salix acutifolia* were noted, and it was indicated that they are the semi-sylvan communities of river floodplains, which are formed under a strongly changing regime of moisture. The names of these syntaxa must be considered illegitimate (Art. 29b), since

no name-forming taxon belongs to the highest of the dominant layers defining the vertical structure of the vegetation. In the EuroVegChecklist this alliance was transferred to the *Molinio-Arrhenatheretea* class and placed among the synonyms of the alliance *Agrostion vinealis* (Mucina *et al*., 2016).

As a result of our studies, we prepared a list of syntaxa from the territory of Ukraine, published according to the International Code of Phytosociological Nomenclature.

***Salicetea purpureae* Moor 1958**
***Salicetalia purpureae* Moor 1958**
***Salicion albae* Soó 1951**
Aristolochio clematitis-Populetum nigrae Goncharenko et Yatsenko 2020
Aristolochio-Salicetum albae Shevchyk et V. Solomakha 1996
Salicetum albae Issler 1926
Poo nemoralis-Salicetum albae Shevchyk et Solomakha 1996
Populetum nigro-albae Slavnić 1952
***Salicion traindrae* T. Müller et Görs 1958**
Salicetum triandrae Malcuit 1929
***Salicion eleagno-daphnoidis* (Moor 1958) Grass 1993**
Salici-Myricarietum Moor 1958

***Rubo caesii-Amorphion fruticosae* Shevchyk et V. Solomakha in Shevchyk et al. 1996**
***Tamaricetalia ramosissimae* Borza et Boscaiu ex Doltu et al. 1980**
***Artemisio scopariae-Tamaricion ramosissimae* Simon et Dihoru 1963**
Calamagrostio-Tamaricetum ramosissimae Simon et Dihoru 1963
Calamagrostio epigei-Hippophaëtum rhamnoidis Popescu, Sanda et Nedelcu 1986
Lactuco tataricae-Elaeagnetum angustifoliae Sokolova, Ermolaeva, Kolomiychuk 2021
Balloto nigrae-Elaeagnetum angustifoliae Borsukevych in Borsukevych, Iemelianova, Kolomiychuk 2023
Leymo sabulosi-Elaeagnetum angustifoliae Borsukevych, Iemelianova, Kolomiychuk 2023
Plantago arenariae-Elaeagnetum angustifoliae I. Solomakha, Vorobyov, Moysiyenko ex Borsukevych, Iemelianova, Kolomiychuk 2023

CONCLUSIONS

At the current level of study, the vegetation of the *Salicetea purpureae* class in Ukraine is studied quite well. According to the “Prodrome of the Vegetation of Ukraine”, it includes coenoses of 2 orders, 6 alliances and 16 associations. However, only half of them are published validly. The rest of the associations are synonyms, published invalidly, or require typification. Therefore, a detailed revision of the nomenclature of previously described vegetation units of this class following the rules of the International Code of Phytosociological Nomenclature is particularly relevant.

The nomenclature revision confirmed the necessity to use protologues when describing new syntaxa in order not to create numerous syntaxonomical synonyms. Many syntaxa, described by Ukrainian scientists, need validation since the active use of floristic classification in Ukraine during the 1990s led to the appearance of many

invalidly described syntaxa and later homonyms. The reason for this could be the difficulties of obtaining the old publishing protologues of foreign origin.

The new unresolved issue is the classification of communities formed by alien species. Classification of communities with *Amorpha fruticosa* and *Elaeagnus angustifolia* is performed. Now these shrub communities are distributed in many regions of Ukraine, in different habitat types. Other naturalized alien species, such as *Fraxinus pennsylvanica*, are actively spreading on new territories, in particular, floodplains. There are no reports of coenoses of this species in Ukraine, but the new association *Salici albae-Fraxienetum pennsylvanicae* V. B. Golub et E. G. Kuzmina in V. B. Golub 2001 was described from the nearby territory of the Lower Volga.

Further research aims to perform the new syntaxonomical revision, assess the different levels of diversity of plant communities, and indicate the ecological factors affecting the floodplain forests. It is important to create a database of the vegetation, to which all available relevés from various sources should be added. This step should be followed by processing of the entire dataset based on a large-scale comparison of vegetation of the *Salicetea purpureae* class in the European context.

COMPLIANCE WITH ETHICAL STANDARDS

Conflict of Interest: the author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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НОМЕНКЛАТУРНІ ПРИМІТКИ РОСЛИННОСТІ КЛАСУ *SALICETEA PURPUREAE* MOOR 1958 В УКРАЇНІ

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Метою нашої роботи було проаналізувати праці, які містять інформацію про рослинність класу *Salicetea purpureae* на території України за підходом Брауна–Бланке, визначити питання, які потребують більш детального дослідження у майбутньому, та зробити деякі примітки щодо номенклатурних розбіжностей.

Викладено коротку історію синтаксономічних досліджень заплавної рослинності класу *Salicetea purpureae* в Україні, розглянуто актуальні завдання подальших досліджень. Згідно з проведеним нами аналізом, виявлено, що на території України рослинність класу охоплює ценози понад 30 асоціацій, які належать до

6 союзів і 2 порядків. Вони поділяються на вербові чагарники на гравійних берегах потоків у передгірному та субальпійському поясах помірної і бореальної зони Європи та Кавказу (*Salicion eleagno-daphnoidis*), вербові й тополеві ліси низинних і передгірних річок, що формуються на алювії у неморальній зоні Європи та на великих висотах Середземномор'я (*Salicion albae*), вербові чагарники на суглинисто-піщаних берегах низинних і передгірних річок неморальної зони Європи (*Salicion triandrae*), вербові чагарники на прирічкових піскових дюнах Центральної України (*Artemisio dniproicae-Salicion acutifoliae*), прибережні чагарники на тимчасово затоплених глейових ґрунтах Центральної України (*Rubo caesi-Amorphion fruticosae*).

Висвітлено проблеми застосування фітосоціологічної номенклатури під час аналізу рослинності цього класу на території України. Внаслідок проведеної роботи виявлено, що половина наведених в українських геоботанічних джерелах синтаксонів є синонімами, вони опубліковані невалідно та потребують типіфікації. Приклади супроводжуються поясненнями причин невалідності, доказами коректності іншого авторства, посиланнями на відповідні статті 4-го видання Міжнародного кодексу фітосоціологічної номенклатури. Виявлено, що крім невірно наведених асоціацій, корекції також потребують 2 із 6 союзів (*Artemisio dniproicae-Salicion acutifoliae, Rubo caesi-Amorphion fruticosae*), де як номенклатурний тип обрано асоціації з видами, невалідними згідно з базою The Euro+Med PlantBase.

Ключові слова: вербові ліси, класифікація рослинності, синтаксономія, фітосоціологічна номенклатура, Україна

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