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# Ephemeral wetland communities of *Isoëto-Nano-Juncetea* class – new data from south-eastern Poland

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**Abstract:** Vegetation data (70 relevés) of ephemeral wetlands collected in both permanent and temporal water basins were analyzed. Numerical classification of the data revealed two distinct subsets, the first comprised communities of *Eleocharition ovatae* Philippi 1968 alliance, the second combined communities dominated by *Alisma lanceolatum*, *Isolepis supina* or *Elatine alsinastrum* (*Alisma lanceolatum* group). Phytocoenoses of *Eleocharition ovatae* were widely distributed in the study area and developed, most frequently, on exposed bottoms of fishponds. This group could be divided into four types of communities. Patches representing *Alisma lanceolatum* group were found only in mid-field depressions periodically filled with water and concentrated in Volhynian Upland. In this group, two lower vegetation units were distinguished.

**Key words:** wetlands, ephemeral vegetation, numerical classification, SE Poland

## 1. Introduction

Vegetation of the *Isoëto-Nano-Juncetea* class represents pioneer amphibious plant communities, which develop on banks and exposed bottoms of lakes, ponds and rivers, as well as on temporally waterlogged terrain depressions and damp arable fields. This vegetation type occurs almost in the whole of Europe (Pietsch 1973; Taran 1995; Popiela 1997; Brullo & Minissale 1998; Deil 2005; Chytrý 2011; Šubmerová & Hrivnák 2013). In Poland, some plant associations of ephemeral wetlands and their characteristic species associated with the zone of Atlantic climate reach their eastern range limit (Popiela 2005). Because of their ecology, phytocoenoses of this type of vegetation are relatively poorly documented. Their ephemeral character, as well as frequently small patches which they form, make it virtually impossible to gather rich material from various localities and habitats within a short period of time.

Communities of *Isoëto-Nano-Juncetea* class from the territory of Poland were comprehensively analyzed by Popiela (1997) and the results were included in the national vegetation classification (Matuszkiewicz 2011). So far, the best documented vegetation type of *Isoëto-Nano-Juncetea* class from south-eastern Poland has been the *Radiolion linoidis* Pietsch 1973 alliance, which occurred on arable fields (Fijałkowski 1967, 1978; Trąba 1991). Regarding vegetation of *Eleocharition ovatae* alliance, associated mainly with fishponds, only scarce phytosociological documentation is available. These patches were recorded on sandy banks of the Bug river (Fijałkowski 1966), at fishponds in Janów Forests (Fijałkowski & Polski 1990; Fijałkowski *et al.* 1992, 1995) and along shores of a few lakes (Fijałkowski 1961; Fijałkowski & Kozak 1970). Besides the two already mentioned alliances, in the Lublin Region, Fijałkowski (1991) also distinguished the alliance of *Eu-Nanocyperion flavescentis*. Three alliances of the

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class contain nine associations: *Eleocharitetum ovatae*, *Cypero fusci-Limoselletum*, *Elatino alsinastri-Juncetum tenageiae*, *Ranunculo gracilis-Radioletum*, *Centuculo-Anthoceretum punctati*, *Hyperico-Spergularietum rubrae*, *Stellario-Isolepidetum*, *Cyperetum flavescentis*, *Pepli portulae-Agrostietum*.

Many of the typical ephemeral wetland communities have been regarded as severely threatened. At present, representatives of *Isoëto-Nano-Juncetea* class are protected under the Habitat Directive as a 3130 habitat type, and as habitat 3270, in case they are developed in river beds. It is not clear, how mid-field patches in periodically flooded depressions should be understood in terms of European regulations and their regional interpretations. Designing effective methods for protecting such ecosystems is also problematic.

The aim of this paper is to extend our knowledge regarding the distribution, diversity and ecology of *Isoëto-Nano-Juncetea* class communities occurring in south-eastern Poland.

## 2. Material and methods

The study was conducted in south-eastern Poland, including Sandomierz Basin, Lublin Upland, Roztocze and Wolyn Upland (Kondracki 2002). In order to locate patches of *Isoëto-Nano-Juncetea* vegetation, drained ponds, lake shores and mid-field depressions were visited. The field survey was carried out during summer and autumn months (June to November). The majority of relevés were made between 2011 and 2015, only a few of them were recorded in 2006. The data set containing 70 relevés was made using Braun-Blanquet method (1964). Additionally, the communities in the field considered as transitional between *Isoëto-Nano-Juncetea* and *Littorelletea* classes were sampled. Only terrestrial patches or patches developed in very shallow water (up to 5 cm) patches were documented.

A preliminary classification of relevés was made by means of numerical methods. Statistica 6.0 software was used for cluster analysis with Ward's method. For the

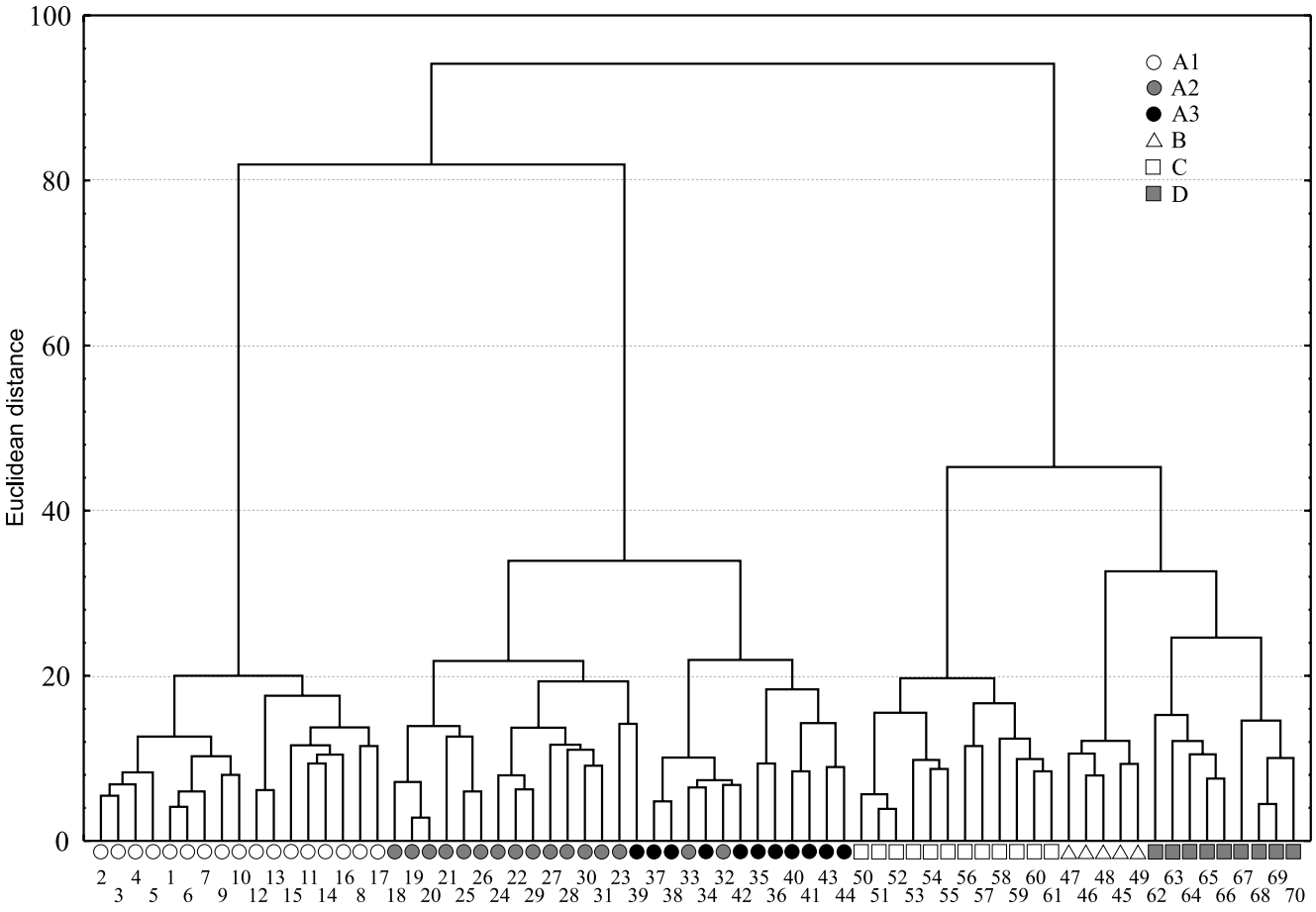


**Fig. 1.** Classification dendrogram of relevés (Ward's method)

Explanations: A1 – *Polygono-Eleocharitetum ovatae* variant with *Eleocharis acicularis*, A2 – *P-E. o.* typical variant, A3 – *P-E. o.* variant with *Juncus bulbosus*, B – *Cyperus fuscus-Limosella aquatica* community, C – *Alisma lanceolatum-Isolepis supina* community, D – community of *Elatine alsinastrum*

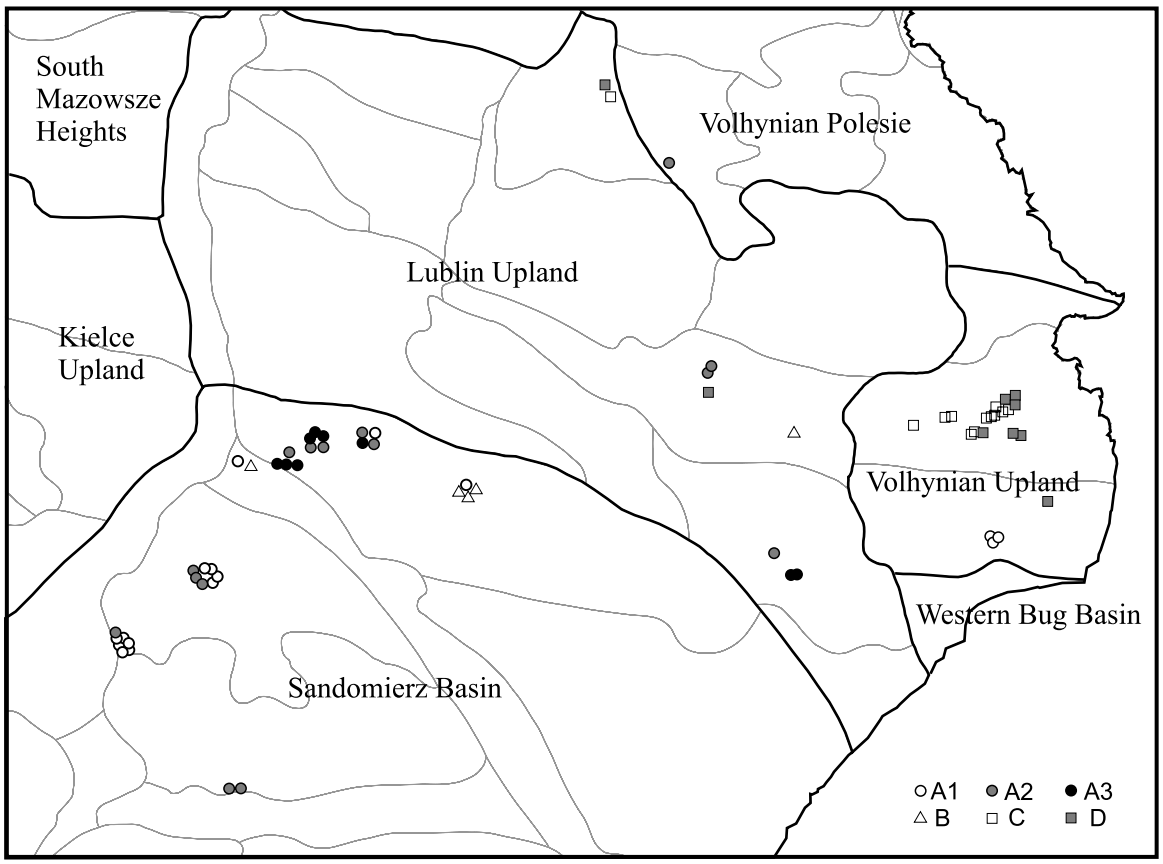


**Fig. 2.** Distribution of the studied communities against a background of physico-geographical regions (Kondracki 2002)
Explanation of abbreviations in Fig. 1

purpose of the analysis, the quantitative data of vascular plant species was transformed to the van der Maarel's ordinal scale. Then, on the basis of characteristic species for *Isoëto-Nano-Juncetea* class, the phytosociological tables were compiled.

The systematics of communities and species characteristic of syntaxa were taken from Matuszkiewicz (2011). The adopted syntaxa nomenclature follows Šubmerová and Hrivnák (2013). Species names are given according to Mirek *et al.* (2002).

## 3. Results

The results of numerical classification made it possible to distinguish two distinct groups of relevés. The first subset represented patches of the *Eleocharition ovatae* alliance, the other one could not be classified based on the adopted system – *Alisma lanceolatum* group (Tables 1-3, Fig. 1).

### 3.1. Communities of *Eleocharition ovatae* Philippi 1968

Four groups of relevés could be distinguished within the alliance: (1) with dominance of *Eleocharis ovata,* (2) with dominance of *Eleocharis acicularis*, (3) with dominance or co-dominance of *Juncus bulbosus* and (4) with presence of *Cyperus fuscus* and lack or negligible share of the species listed in groups 1-3 (Tables 1-2, Fig. 1). The first three groups were included in the *Polygono-Eleocharitetum ovatae* Eggler 1933 association. Thus, the vast majority of relevés represented the widely recognized central association of the alliance within which three variants were distinguished (Table 1). Phytocoenoses of the association formed distinct, often large, patches or small enclaves within marshes. The geographical range of the association covered the entire study area, but it was most common in the Sandomierz Basin (Fig. 2). The floristic core species of the phytocoenoses of this group were mostly *Eleocharis ovata, Eleocharis acicularis* and *Juncus bulbosus*. Among the species characteristic of the association and alliance with higher frequency and abundance were *Cyperus fuscus* and *Elatine triandra*. Other diagnostic species of the association and higher units were: *Elatine hydropiper, Peplis portula, Gnaphalium uliginosum* and *Limosella aquatica.* Sporadically, *Juncus bufonius, Lindernia procumbens, Elatine alsinastrum, Carex bohemica, Cyperus flavescens, Riccia cavernosa* and

*Plantago intermedia* were also observed. Species of the *Bidentetea* class demonstrated high constancy; this, particularly, referred to the knotweeds – *Polygonum* spp. and *Rorippa palustris*. Of the *Phragmitetea* class, the highest frequency was exhibited by *Alisma plantago-aquatica, Scirpus radicans, Typha angustifolia, Veronica anagallis-aquatica* and *Eleocharis palustris.* Species representing the remaining classes: *Juncus articulatus, Echinochloa crus-galli* and *Lythrum salicaria* should also be noted for their high constancy. The moss layer was usually scarce or it covered a small area of the relevés, up to 20%. Among the characteristic species, bryophytes were also recorded, namely: *Physcomitrium eurystomum, Riccia cavernosa, R. huebeneriana, R. glauca* and *R. sorocarpa.*

A typical variant of *Polygono-Eleocharitetum ovatae* (Table 1, A2) was most frequently characterized by absolute dominance of *Eleocharis ovata*. It usually occurred on fine-grained silt or clay substrate, at bottoms of drained fishponds and, sporadically, in mid-field, periodically flooded, depressions. In its optimum stage, they were short grasslands of high cover (80-100%) and a height of 10-30 cm. The relevés included from 4 to 30 species, with the average of 12.

The *Juncus bulbosus* variant of *Polygono-Eleocharitetum ovatae* association (Table 1, A3) was formed, primarily, on shores and bottoms of mid-forest fishponds in sandy areas of Sandomierz Basin, usually among pine forest communities (Fig. 2). One relevés came from a small lake in Roztocze, where exceptionally low water level was noted in 2013. Communities grew on sandy and muddy-sandy substrata and were distinguished by the share of acidophilous species. The variant was characterized, mainly, by high proportions of *Juncus bulbosus*, which co-dominated with *Eleocharis ovata*, besides the presence of *Juncus alpino-articulatus, Eleocharis mamillata, Lysimachia vulgaris, Agrostis canina* and relatively large share of *Scirpus radicans*. It is also worth noting that a very rare species – *Eleocharis carniolica* – was recorded in this community type. On highly neglected, unused fishponds the acidic *Polygono-Eleocharitetum ovatae* variant gave way to communities of *Rhynchosporion* alliance.

Phytocoenoses representing *Polygono-Eleocharitetum ovatae* association, variant of *Eleocharis acicularis* (Table 1, A1), were recorded on sandy and muddy banks and bottoms of fishponds and around banks of oxbow lakes. Small initial patches of this community occurring on shores or low elevations in the bottom of drained ponds were frequently found. Physiognomically, they were very low grasslands, vegetation cover was variable, but lower than in the typical variant. The variant was distinguished by a dominant share of *Eleocharis acicularis* f. *annua* and occurrence of terrestrial forms of *Elatine triandra* and *Elatine hydropiper*, also a more numerous representation of species of *Potametea* and *Charetea* classes. The lowest number of species (2) occurred at initial stage of development on bottoms of drained ponds and the highest number of species (30) was found on pond banks. One of the relevés, located on a sandy pond bank, included a rare species – *Lindernia procumbens.*

Relevés with the occurrence of *Cyperus fuscus* (Table 2, B) may be included into the *Cyperetum micheliani* Horvatić 1931. Four of the relevés were from silty and sandy-silty bottoms of drying fishponds. Together with *Cyperus fuscus*, an important role in the cover was played by *Riccia cavernosa*, especially in initial patches. Phytocoenoses were also built by *Eleocharis acicularis, Plantago intermedia, Gnaphalium uliginosum, Rorippa palustris, Polygonum persicaria, Veronica anagallis-aquatica, Agrostis stolonifera, Chenopodium rubrum, Rumex maritimus* and *Juncus articulatus.* The relevé 47 was a community with *Cyperus flavescens* presence; the assemblage was formed on a flat bank of an oxbow lake adjacent to a pasture.

### 3.2. Communities of the *Alisma lanceolatum* group

Communities of the *Alisma lanceolatum* group were associated with temporal ponds of mid-field depressions. They developed on damp, fine-grained substrate of arable fields. This type of vegetation occurred frequently on the uplands of Lublin region (Fig. 2).

The characteristic species for the group comprised: *Alisma lanceolatum*, *Isolepis supina* and *Elatine alsinastrum*, of which the highest constancy belonged to the first one. Of the *Isoëto-Nano-Juncetea* species class, the set included: *Limosella aquatica* (high constancy and cover) and *Plantago intermedia*. Two weed species occurred with a relatively high frequency – *Echinochloa crus-galli* and *Matricaria maritima* subsp. *inodora*. Within the described group, two communities could be distinguished, i.e. *Alisma lanceolatum-Isolepis supina* and the community of *Elatine alsinastrum* (Table 3, Fig. 1).

*Alisma lanceolatum-Isolepis supina* community (Table 2, C), in its optimal phase, was characterized by high cover (70-100%) and the height of its herbal layer of approximately 30-40 cm. Sites affected by a short-term flooding, e.g. low inclination slopes of vast mid-field depressions seemed to be optimal for their development. The dominant species were *Alisma lanceolatum* and *Isolepis supina* with variable quantitative ratios between these species. The typical taxa in this community were: *Lythrum hyssopifolia* and *Potentilla supina*. *Ranunculus sardous* also appeared in the assemblage. Generally, the community was characterized by a small share of *Phragmitetea* and *Bidentetea*

species classes, with more taxa observed moving from segetal communities. The moss layer was either poorly developed or missing. The following bryophyte species typical for ephemeral wetlands were sporadically recorded: *Physcomitrium pyriforme*, *Ph. sphaericum*, *Physcomitrella patens* and *Riccia cavernosa*. The data set comprised 12 relevés from 5 locations, with Sahryń as the place of the most abundant occurrence.

The community with *Elatine alsinastrum* (Table 3, D) was a distinctly pioneer vegetation type and was encountered in, both, the terrestrial and aquatic form. As far as species characteristic of *Isoëto-Nano-Juncetea* class was concerned, the community was also characterized by the presence of *Peplis portula, Gnaphalium uliginosum* and *Juncus bufonius*. Among the class of *Bidentetea*, the highest constancy was exhibited by *Rorippa palustris* and *Ranunculus sceleratus*. The moss layer was poorly developed or missing, with the occurrence of *Bryum argenteum* and, sporadically, *Riccia cavernosa* and *R. glauca*. Assemblages with *Peplis portula* or *Juncus bufonius* as well as the occasional *Myosurus minimus* should probably be treated as impoverished forms of the community.

## 4. Discussion

Although the *Polygono-Eleocharitetum ovatae* is a clearly distinguishable vegetation unit, the range of its variability is debatable. Similarly to the Popiela's approach (Popiela 1997; Popiela *et al*. 2010), we distinguished one broadly defined phytosociological association; however, numerical classification indicated that phytocoenoses with high abundance of *Eleocharis acicularis* may have represented a separate association (Fig. 1). Classification of such communities posed some difficulties and, sometimes, it was not possible if life forms of dominant species were not determined. Many associations with *Eleocharis acicularis* were described in Europe, they included into either *Isoëto-Nano-Juncetea* or *Littorelletea* classes, e.g. *Limosello aquaticae-Eleocharitetum acicularis* Wendelberger-Zelinka 1952 in Slovakia (Jarolímek *et al*. 2008) and the Czech Republic (Chytrý 2011). In our opinion, phytocoenoses built by annual forms of *Eleocharis acicularis*, and, in addition, with no other species characteristic for *Littorelletea*, should be classified as *Isoëto-Nano-Juncetea* class communities. Also according to Pietsch (1973), *Eleocharis acicularis* fo. *annua* is characteristic for the *Cyperetalia fusci* order.

Patches dominated by *Juncus bulbosus*, very common in the Sandomierz Basin, seemed rather problematic to classify. In the taxonomy of plant communities, they occupy an intermediate position between *Isoëto-Nano-Juncetea* and *Littorelletea* classes. In this study, we documented phytocoenoses with small terrestrial forms of *Juncus bulbosus*, which grew together with species diagnostic for the *Isoëto-Nano-Juncetea* class. In case of prolonged flooding (lack of terrestrial phase), the place of amphibious community is taken by an aggregation with the aquatic form of *Juncus bulbosus*, which are more closely related to *Littorelletea* class (not included in the studies).

Similar in character, both in terms of flora and habitat, was the community dominated by *Carex bohemica*, which was encountered on the shore of a small lake in Roztocze region. Bohemian sedge, which is a species typical for the association, occurs extremely rarely in this part of Poland. It can be assumed that the reported community was merely a facies with *Carex bohemica* within the discussed variant with *Juncus bulbosus*.

In several cases, at the same locality, both types of communities, i.e. with the dominance of *Eleocharis ovata* and the dominance of *Eleocharis acicularis* were found at the same time and on the same substrate. A probable factor differentiating the composition of species in such a case may have been a hydrological regime (the length of the terrestrial phase), as previously pointed out by authors working on ephemeral wetland communities (Zając & Zając 1988; Popiela 1997). Longer retention of water is conducive to species developing aquatic forms (*Eleocharis acicularis, Elatine* spp., *Juncus bulbosus*), whereas longer periods of terrestrial phase favour the creation of a typical variant with the domination of *Eleocharis ovata*. It can, therefore, be hypothesized that under favourable conditions (long period of drawdown), the centrally positioned variant with *Eleocharis ovata* predominance develops. If stagnant water persists for long time, *Eleocharis acicularis* and *Elatine* spp. dominate in eutrophic habitats, whereas on poorer and acidic soils – *Juncus bulbosus* prevails.

*Polygono-Eleocharitetum ovatae* is a community of wide ecological amplitude. In the study area, it was usually found at dried bottoms of fishponds, but it was also observed in other habitats, like banks of natural reservoirs (oxbow lakes, small lakes) or even mid-field depressions. The latter has never been reported from Europe.

Communities of *Cyperus fuscus* and *C. flavescens* were rarely reported from the Lublin province (Fijałkowski 1961, 1966; Fijałkowski & Kozak 1970). Relevés with the occurrence of *Cyperus fuscus* performed during the study were classified as *Cyperetum michelianii*. It belongs to the *Eleocharition ovatae* alliance, but in the classification dendrogram, it was combined together with *Alisma lanceolatum* group (Fig. 1). This can partly be explained by the Euclidean distance applied in the study, which is a measure of dissimilarity, and by a small number of relevés; however, it can also suggest an intermediate position of the community between two major subsets. The phytocoenoses

with *Cyperus flavescens* reported in the present study may also be representatives of *Cyperetum flavescentis* association, which is poorly recognized in Poland.

Undoubtedly, the most interesting in the study area were the communities with the participation of *Alisma lanceolatum*, *Isolepis supina* and *Elatine alsinastrum*. Communities of similar nature were previously reported from northern part of Poland. For the first time, they were described by Libbert (1932), and – towards the end of the 20th century – by Kępczyński and Rutkowski (1991, 1993) as well as Popiela and Fudali (1996). Moreover, the community with *Elatine alsinastrum* was included in the list of plant associations of the Lublin region (Fijałkowski 1991). In all cases, they occupied small, mid-field depressions.

During the phytosociological analysis, this type of vegetation turned out the most difficult to classify. Communities of this group do not fit into the accepted classification by Matuszkiewicz (2011). In some Central European countries, they were included in the *Eleocharition ovatae* alliance as *Polygono-Eleocharitetum ovatae* or *Elatino alsinastri-Juncetum tenageiae* Libb. 1932 (Kępczyński & Rutkowski 1993; Zlacká *et al.* 2006; Täuber *et al.* 2007). In the Czech Republic, very similar communities were grouped in *Verbenion supinae* Slavnić 1951 alliance (Šubmerová & Hrivnák 2013). Our results support the latter approach because the species composition (Fig. 1) as well as habitat and geographic distribution suggest that this group may constitute a separate syntaxonomical unit other than *Eleocharition ovatae*.

Communities with *Isolepis supina* or with *Elatine alsinastrum* are also described within other associations like *Eleocharito-Schoenoplectetum supini* Soo & Ubrizsy 1948 and *Elatinetum alsinastrum* Nagy J. *et al.* 2008 (Pietsch 1973; Brullo & Minissale 1998; Jarolímek *et al.* 2008; Borhidi *et al.* 2012).

Patches with high abundance of *Alisma lanceolatum* are related to *Eleocharito palustris-Alismatetum lanceolati*, which was described as a marsh community within *Phragmito-Magno-Caricetea* class (Hrivnák *et al.* 2015). However, *Alisma lanceolatum* has a wide ecological range and is of low indicative value, so distinguishing marsh association based on its dominance is questionable. According to Kępczyński's and Rutkowski's (1991) studies, *Alisma lanceolatum* occurred usually in marsh communities, but in ephemeral dwarf wetlands *Isoëto-Nano-Juncetea* reached the highest abundance (optimum). Moreover, in phytocoenoses documented in our studies, the share of other marsh species was very low. We also observed that the life cycle of *Alisma lanceolatum* was similar to annuals; they developed rather small terrestrial and short-living forms (the sites were regularly ploughed). The ultimate determination of its syntaxonomical position requires further analysis on larger sets of relevés as well as ecological field studies.

## References


Braun-Blanquet J. 1964. Pflanzensoziologie. Grundzüge der Vegetationskunde (3-rd edition). 865 pp. Springer Verlag, Vienna.

Borhidi A., Kevey B. & Lendvai G. 2012. Plant communities of Hungary. 544 pp. Akadémiai Kiadó, Budapest.

Brullo S. & Minissale P. 1998. Considerazioni syntassonomiche sulla classe *Isoeto-Nanojuncetea*. Itinera Geobotanica 11: 263-290.

Chytrý M. (ed.). 2011. Vegetace České republiky 3. Vodní a mokřadní vegetace. 827 pp. Academia, Praha.

Deil U. 2005. A review on habitats, plant traits and vegetation of ephemeral wetlands – a global perspective. Phytocoenologia 35: 533-705.

Fijałkowski D. 1961. Zbiorowiska roślinne jeziora Bartków w woj. lubelskim. Ann. Univ. M. Curie-Skłodowska, Sect. C, 16(4): 77-89.

Fijałkowski D. 1966. Zbiorowiska roślinne lewobrzeżnej doliny Bugu w granicach województwa lubelskiego. Ann. Univ. M. Curie-Skłodowska, Sect. C, 21: 247-312.

Fijałkowski D. 1967. Zbiorowiska roślin synantropijnych miasta Lublina. Ann. Univ. M. Curie-Skłodowska, Sect. C, 22(17): 195-233.

Fijałkowski D. 1978. Synantropy roślinne Lubelszczyzny. 260 pp. PWN, Warszawa-Łódź.

Fijałkowski D. 1991. Zespoły roślinne Lubelszczyzny. 303 pp. Wyd. UMCS, Lublin.

Fijałkowski D. & Kozak K. 1970. Roślinność rezerwatu „Torfowisko nad Jeziorem Czarnym Sosnowickim". Ann. Univ. M. Curie-Skłodowska, Sect. C, 25(20): 213-241.

Fijałkowski D., Bloch M., Flisińska Z., Nycz B., Polski A. & Wójciak H. 1992. Flora i zespoły projektowanego rezerwatu Bagno Rakowskie. Ann. Univ. M. Curie-Skłodowska, Sect. C, 47(14): 199-237.

Fijałkowski D., Matuszkiewicz A. & Polski A. 1995. Szata roślinna projektowanego rezerwatu Stawy Wilczowskie. Ann. Univ. M. Curie-Skłodowska, Sect. C, 50(4): 71-89.

Fijałkowski D. & Polski A. 1990. Stosunki geobotaniczne rezerwatu Lasy Janowskie. Ann. Univ. M. Curie-Skłodowska, Sect. C, 45 (16): 197-228.

Hrivnák R., Slezák M., Šubmerová K. & Hroudová Z. 2015. A new marsh plant community of *Eleocharito palustris-Alismatetum lanceolati* (*Eleocharito palustris-Sagittarion sagittifoliae* alliance) in Slovakia. Acta Soc. Bot. Pol. 84(3): 311-319.

Jarolímek I., Šibík J., Hegedüšová K. Janišová M., Kliment J., Kucera P., Májeková J., Michálková D., Sadlonová J., Šibíková J., Škodová I., Uhlírová J., Ujházy K., Ujházyová M., Valachovic M. & Zaliberová M. 2008. A list of vegetation units of Slovakia. In: I. Jarolímek & J. Šibík (eds.). Diagnostic, constant and dominant species of the higher vegetation units of Slovakia, pp. 295-329. Veda, Bratislava.

Kępczyński K. & Rutkowski L. 1991. Występowania *Alisma lanceolatum* With. w różnych zbiorowiskach roślinnych na terenie otaczającym dolną i środkową Wisłę. Acta Univ. Nicolai Copernici, Biologia 38: 93-103.

Kępczyński K. & Rutkowski L. 1993. Zbiorowiska namuliskowe brzegów śródpolnych oczek, stawów wiejskich i małych jezior w niektórych regionach środkowowschodniej części Pojezierzy Południowobałtyckich. Acta Univ. Nicolai Copernici, Biologia 42: 3-30.

Kondracki J. 2002. Geografia regionalna Polski. 441 pp. Wyd. Nauk. PWN, Warszawa.

Libbert W. 1932. Die Vegetationseiheiten der neumärkischen Staubeckenlandschaft unter besonderer Berücksichtigung der angrenzenden Landschaften. I. Verh. Bot. Ver. Prov. Brandenburg 74: 10-93.

Matuszkiewicz W. 2011. Przewodnik do oznaczania zbiorowisk roślinnych Polski. In: J. B. Faliński (ed.). Vademecum Geobotanicum, 3, 537 pp. Wyd. Nauk. PWN, Warszawa.

Mirek Z., Piękoś-Mirkowa H., Zając A. & Zając M. 2002. Flowering plants and pteridophytes of Poland. A checklist. In: Z. Mirek (ed.). Biodiversity of Poland, 1, 442 pp. W. Szafer Institute of Botany, Polish Academy of Sciences, Kraków.

Pietsch W. 1973. Beitrag zur Gliederung der europäischen Zwergbinsengesellschaften (*Isoëto-Nanojuncetea* Br.-Bl. et Tx. 1943). Vegetatio 28: 401-438.

Popiela A. 1997. Zbiorowiska namułkowe z klasy *Isoëto-Nanojuncetea* Br.-Bl. Et Tx.1943 w Polsce. Monogr. Bot. 80: 1-59.

Popiela A. 2005. *Isoëto-Nanojuncetea* species and plant communities occurring on their eastern distribution range (Poland). Phytocoenologia: 35(2-3): 283-303.

Popiela A. & Fudali E. 1996. The community with *Elatine alsinastrum* (the *Isoëto-Nanojuncetea*-class) in the town Chojna environs in the western Pomerania (NW Poland). Fragm. Flor. Geobot. 41(2): 771-774.

Popiela A., Prajs B. & Łysko A. 2010. New data on distribution of dwarf ephemeral wetland vascular plant species/communities in the western and north-western Poland. Biodiv. Res. Conserv. 14: 35-40.

Šubmerová K. & Hrivnák R. 2013. Formalised classification of the annual herb vegetation of wetlands (*Isoëto-Nano-Juncetea* class) in the Czech Republic and Slovakia (Central Europe). Phytocoenologia 43(1-2): 13-40.

Taran G. S. 1995. A little known vegetation class of the former USSR – flood-plain Ephemeretum (*Isoëto-Nanojuncetea* Br.-Bl. et Tx. 43). Siberian Journal of Ecology 2(4): 372-380.

Täuber T., Bruns E. & Steinhoff K.-J. 2007. Wiederfund des Elatino alsinastri-Juncetum tenageiae Libb. 1932 in Niedersachsen – Lebensbedingungen, Syndynamik und Schutzbemühungen. Hercynia N.F. 40: 269-278.

Trąba C. 1991. Zbiorowiska roślinne ściernisk w południowowschodniej Polsce. Cz. IV. Zbiorowiska ze związku *Nanocyperion flavescentis*. Acta Agrobot. 44(1-2): 171-193.

Zając M. & Zając A. 1988. Zbiorowiska z klasy *Isoëto-Nanojuncetea* na dnach wysychających stawów w południowej części Kotliny Oświęcimskiej. Zeszyty Naukowe UJ, Prace Botaniczne 17: 155-160.

Zlacká S., Sádovský M., Dítě D. & Eliáš P. 2006. Súčasné poznatky o výskyte a cenologických väzbách *Schoenoplectus supinus* (Cyperaceae) na Slovensku. Bull. Slov. Bot. Spolocn. 28: 149-158.

**Table 1**. *Polygono-Eleocharitetum ovatae* Eggler 1933 (A); A1 – variant with *Eleocharis acicularis*, A2 – typical variant, A3 – variant with *Juncus bulbosus*

| No. of relevé | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | 11-10-22 | 13-09-19 | 13-09-19 | 13-09-21 | 06-09-05 | 11-10-22 | 11-10-22 | 15-08-26 | 15-09-24 | 12-09-06 | 12-09-06 | 15-08-26 | 15-08-26 | 12-09-06 | 15-09-24 | 12-09-26 | 13-09-19 | 13-09-19 | 13-09-19 | 13-09-19 | 13-09-27 | 14-09-05 |
| Location | BS | Bb | BS | Ml | MP | BS | BS | Zm | Bb | Bb | Bb | Zm | Zm | Bb | Bb | MG | Bb | BS | BS | BS | Kr | PK |
| Area of releve [m²] | 4 | 1 | 1 | 1 | 1 | 4 | 4 | 2 | 4 | 2 | 4 | 4 | 3 | 2 | 4 | 2 | 1 | 1 | 1 | 1 | 3 | 4 |
| Cover of herb layer C [%] | 70 | 70 | 100 | 30 | 50 | 40 | 50 | 80 | 90 | 50 | 50 | 70 | 70 | 70 | 90 | 50 | 60 | 90 | 100 | 100 | 80 | 90 |
| Cover of moss layer D [%] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 10 | 0 | 0 | 0 | 0 | <5 | 0 | <5 | 10 | 0 | 0 | 0 | 0 | 0 |
| Habitat | f | f | f | f | l | f | f | f | f | f | f | f | f | f | f | f | f | f | f | f | d | f |
| Number of species | 3 | 8 | 5 | 7 | 9 | 2 | 7 | 19 | 14 | 13 | 20 | 20 | 16 | 22 | 16 | 20 | 20 | 6 | 5 | 4 | 12 | 7 |
| | | | | | | | | | A1 | | | | | | | | | | | | | |
| **I. Ch. *Polygono-Eleocharitetum ovatae*** | | | | | | | | | | | | | | | | | | | | | | |
| *Eleocharis ovata* | . | . | 1 | + | . | . | . | . | 1 | + | 1 | . | . | + | 2 | . | 1 | 5 | 5 | 5 | 4 | 4 |
| *Elatine triandra* | 1 | + | . | . | . | 3 | 3 | 2 | 2 | 2 | . | . | . | . | . | . | 2 | 2 | + | + | . | . |
| *Elatine hydropiper* | . | . | . | . | . | . | + | . | . | . | . | 1 | 2 | . | . | . | . | . | . | . | . | . |
| *Carex bohemica* | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| **II. D. variant with *Juncus bulbosus*** | | | | | | | | | | | | | | | | | | | | | | |
| *Juncus bulbosus* | . | . | . | + | . | . | . | . | . | . | . | . | . | . | . | . | + | . | . | . | . | . |
| **III. Ch. *Eleocharition ovatae*** | | | | | | | | | | | | | | | | | | | | | | |
| *Eleocharis acicularis* | 4 | 4 | 5 | 3 | 3 | 3 | 2 | 3 | 5 | 3 | 3 | 4 | 3 | 4 | 5 | 3 | 2 | . | 2 | 1 | 2 | . |
| *Cyperus fuscus* | . | . | . | . | + | . | . | . | . | . | + | . | . | . | . | 1 | . | . | . | . | . | 2 |
| *Limosella aquatica* | . | . | . | . | . | . | . | . | . | 1 | 1 | . | . | . | . | . | . | + | . | . | . | . |
| *Riccia cavernosa* | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | + | . | . | . | . | . | . |
| **IV. Ch. *Cyperetalia fusci*, *Isoëto-Nano-Juncetea*** | | | | | | | | | | | | | | | | | | | | | | |
| *Gnaphalium uliginosum* | . | . | . | . | . | . | . | . | . | . | + | . | . | + | + | + | . | . | . | . | . | . |
| *Peplis portula* | . | . | . | . | + | . | . | . | . | . | 1 | . | . | + | 1 | . | + | . | . | . | . | . |
| *Plantago intermedia* | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| *Juncus bufonius* | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| *Elatine alsinastrum* | . | . | . | . | . | . | 1 | . | . | . | . | . | . | . | . | . | . | . | . | . | 1 | . |
| **V. Ch. *Bidentetea tripartiti*** | | | | | | | | | | | | | | | | | | | | | | |
| *Polygonum persicaria* | . | . | . | . | . | . | . | + | . | . | . | . | . | . | . | + | . | . | . | . | . | . |
| *Polygonum minus* | . | . | . | . | . | . | . | + | + | . | . | . | . | + | + | . | . | . | . | . | 1 | . |
| *Polygonum hydropiper* | . | . | . | . | . | . | . | 1 | . | . | . | + | . | . | . | . | . | . | . | . | 1 | + |
| *Polygonum lapathifolium* | . | . | . | . | . | . | . | . | + | . | . | . | . | . | . | + | . | . | . | . | . | . |
| *Bidens frondosa* | . | . | . | + | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| *Bidens tripartitus* | . | . | . | . | . | . | . | . | . | . | + | . | . | . | . | . | . | . | . | . | . | . |
| *Rorippa palustris* | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | + | + | . | . | . | . | . |
| *Alopecurus aequalis* | . | . | . | . | . | . | . | + | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| *Ranunculus sceleratus* | . | . | . | . | + | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| *Bidens cernua* | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| **VI. Ch. *Phragmitetea*** | | | | | | | | | | | | | | | | | | | | | | |
| *Alisma plantago-aquatica* | . | + | + | . | . | . | . | 1 | + | + | + | 1 | 1 | . | + | . | + | . | . | . | 1 | . |
| *Scirpus radicans* | . | + | . | . | . | . | . | . | + | . | 1 | . | . | + | + | . | 2 | . | . | . | . | + |
| *Veronica anagallis-aquatica* | . | . | . | . | . | . | . | + | . | . | + | + | + | 1 | . | + | . | . | . | . | . | . |
| *Typha angustifolia* | . | . | . | . | . | . | + | 1 | . | . | . | 1 | 2 | 1 | . | . | + | 1 | + | + | . | . |
| *Eleocharis palustris* | . | . | . | . | . | . | . | 1 | . | . | . | + | + | . | . | 1 | + | . | . | . | . | . |
| *Phragmites australis* | . | . | . | . | . | . | . | + | + | 1 | . | + | . | . | . | . | . | + | . | . | . | . |
| *Oenanthe aquatica* | . | . | . | . | . | . | . | + | + | . | + | + | + | . | 1 | + | . | . | . | . | . | . |
| *Sagittaria sagittifolia* | . | + | . | . | . | . | . | . | . | + | + | 1 | . | . | + | . | + | + | + | . | . | . |
| *Glyceria fluitans* | . | . | . | . | . | . | . | + | . | . | . | . | . | + | . | . | . | . | . | . | . | . |
| *Rorippa amphibia* | . | + | . | . | . | . | . | + | . | . | . | . | . | + | 1 | . | . | . | . | . | . | . |
| *Schoenoplectus lacustris* | . | . | . | . | . | . | . | + | + | . | . | + | . | . | + | . | . | . | . | . | . | . |
| *Leersia oryzoides* | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | + |
| *Glyceria plicata* | . | . | . | . | 1 | . | . | . | . | 1 | . | . | . | . | . | . | . | . | . | . | . | . |
| *Sparganium emersum* | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | + | . | . | . | . | . | . |
| **VII. Accompanying species** | | | | | | | | | | | | | | | | | | | | | | |
| *Juncus articulatus* | . | . | . | + | . | . | . | 1 | + | + | + | + | + | + | . | + | + | . | . | . | + | . |
| *Echinochloa crus-galli* | . | . | . | . | . | . | . | . | + | . | + | . | . | . | . | + | + | . | . | . | . | . |
| *Lythrum salicaria* | . | . | . | + | . | . | . | . | . | . | . | . | . | . | + | . | + | . | . | . | . | + |
| *Agrostis stolonifera* | . | + | + | . | . | . | . | . | . | . | . | . | . | + | 2 | . | + | . | . | . | . | . |
| *Polygonum amphibium* | . | . | . | . | . | . | . | . | + | . | + | + | . | . | 1 | + | . | . | . | . | . | . |
| *Betula pendula* | . | . | . | . | . | . | . | . | . | . | . | . | . | + | . | + | . | . | . | . | . | . |

| 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12-07-31 | 14-09-05 | 13-09-27 | 14-09-21 | 12-09-06 | 12-09-05 | 12-09-05 | 12-09-07 | 14-09-05 | 12-09-05 | 12-09-05 | 12-09-05 | 12-09-05 | 12-09-05 | 15-09-24 | 15-09-24 | 12-07-31 | 12-09-07 | 12-09-07 | 12-09-05 | 13-09-20 | 12-07-31 | | | | |
| Rz | PK | Kr | Ol | Bb | Gl | Gl | Lp | PK | Os | Ml | Gl | Gl | Gl | Dr | Dr | Kn | Lp | Lp | Os | Lp | Kn | Constancy | | | |
| 3 | 4 | 4 | 1 | 4 | 4 | 4 | 4 | 2 | 4 | 4 | 6 | 6 | 6 | 6 | 2 | 6 | 6 | 4 | 4 | 1 | 6 | | | | |
| 50 | 100 | 100 | 90 | 60 | 50 | 90 | 90 | 30 | 80 | 70 | 100 | 90 | 50 | 40 | 30 | 100 | 40 | 50 | 80 | 100 | 100 | | | | |
| 0 | 10 | 0 | 0 | <5 | 0 | 0 | <5 | 10 | 0 | 0 | 0 | 20 | 50 | 5 | 0 | 10 | 0 | 0 | 0 | 0 | 0 | | | | |
| l | f | d | d | f | f | f | f | f | f | f | f | f | f | f | f | l | f | f | f | f | l | | | | |
| 26 | 15 | 9 | 6 | 21 | 19 | 12 | 18 | 15 | 7 | 7 | 12 | 30 | 28 | 13 | 8 | 24 | 21 | 23 | 7 | 10 | 12 | | | | |
| | | A2 | | | | | | | | | | | | | | A3 | | | | | | A1 | A2 | A3 | A |
| 2 | 5 | 5 | 5 | 3 | 3 | 5 | 4 | 2 | 4 | 4 | 4 | 3 | 2 | 2 | 2 | + | + | 1 | 2 | + | . | III | V | V | IV |
| . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | III | I | . | II |
| . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | I | . | . | I |
| 2 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 5 | . | . | . | . | 1 | . | I | I | I |
| . | . | . | . | . | . | 1 | 1 | 1 | 1 | 2 | 3 | 2 | 3 | 2 | 2 | + | 2 | 3 | 4 | 5 | 5 | I | II | V | III |
| . | . | . | . | . | . | . | . | . | . | . | . | . | . | 1 | + | . | . | . | . | . | . | V | I | I | III |
| 2 | 2 | . | . | 1 | + | 1 | . | . | . | . | . | + | + | . | . | . | . | + | . | . | . | I | II | II | II |
| + | . | . | . | 1 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | I | I | . | I |
| . | . | . | . | . | . | . | 1 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | I | I | . | I |
| + | . | . | . | 1 | . | . | . | . | . | . | . | + | . | . | . | . | . | . | . | . | . | II | I | I | I |
| . | . | 2 | 2 | 2 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | II | I | . | I |
| + | . | . | . | . | . | . | . | . | . | . | . | . | + | . | . | . | . | . | . | . | . | . | I | I | I |
| 1 | . | . | . | . | + | . | . | . | . | 1 | . | . | . | . | . | . | . | . | . | . | . | . | I | . | I |
| . | . | + | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | I | I | . | I |
| . | + | . | . | + | . | . | 1 | + | . | . | . | + | + | . | . | + | + | + | . | . | . | I | II | III | II |
| . | . | + | . | . | . | . | . | . | + | . | + | + | . | . | . | + | . | . | . | . | . | II | I | II | II |
| + | + | + | . | . | . | + | . | . | . | . | . | + | + | . | . | . | . | . | . | . | . | I | II | I | II |
| . | + | . | . | + | . | . | + | + | . | . | . | + | + | . | . | . | . | + | . | . | . | I | II | II | I |
| . | . | . | . | . | . | . | . | 1 | . | . | . | 1 | + | . | . | + | + | + | . | 1 | . | I | I | III | I |
| + | . | . | . | + | . | + | + | . | . | . | . | . | . | . | . | + | . | + | . | . | + | I | II | II | I |
| + | + | . | . | + | . | . | 1 | . | . | . | . | 1 | . | . | . | . | . | . | . | . | . | I | II | I | I |
| . | 1 | . | . | . | . | . | . | . | . | . | + | + | + | . | . | . | . | . | . | . | . | I | I | II | I |
| . | . | . | . | . | . | . | + | . | . | . | . | . | . | . | . | . | . | + | . | . | . | I | I | I | I |
| + | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | I | . | I |
| + | . | . | + | + | + | 1 | 1 | 1 | + | + | + | 1 | + | 2 | 1 | . | + | 1 | + | + | . | III | IV | V | IV |
| . | . | . | . | 1 | 1 | + | 2 | 1 | . | . | . | + | + | . | . | 1 | 2 | 2 | . | 1 | . | II | II | III | III |
| . | . | . | . | 1 | . | + | 1 | . | . | + | . | . | . | . | . | . | 1 | 1 | . | . | . | II | II | III | II |
| . | . | . | . | . | + | + | + | + | . | . | . | . | . | . | . | . | . | . | + | . | . | II | III | I | II |
| 1 | . | . | + | . | . | . | . | . | + | . | . | . | . | 1 | + | . | + | + | + | . | . | II | I | III | II |
| + | . | . | . | . | + | . | . | + | . | + | . | . | . | 1 | + | . | + | + | . | . | . | II | II | II | II |
| . | . | . | . | 1 | . | . | 1 | . | . | . | . | . | . | + | . | . | . | + | . | + | . | III | I | II | II |
| . | . | . | . | . | . | . | . | . | . | . | . | . | . | + | + | . | . | . | . | . | . | II | I | I | II |
| . | . | . | . | . | . | . | . | . | . | . | + | 1 | + | . | + | + | . | . | . | . | . | I | . | III | I |
| . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | II | . | . | I |
| . | . | . | . | . | + | . | . | . | . | . | . | . | . | . | . | + | . | . | . | . | . | II | I | I | I |
| . | + | . | . | . | + | + | . | . | . | . | . | + | . | . | . | . | . | . | . | . | . | . | II | . | I |
| . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 1 | . | I | . | I | I |
| + | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 1 | . | . | . | . | + | I | I | I | I |
| + | . | . | . | + | + | . | . | 1 | . | 1 | + | . | . | . | . | + | 1 | . | . | + | . | III | II | II | III |
| + | + | + | . | + | + | + | + | + | . | . | . | + | . | . | . | . | . | + | . | . | . | II | III | I | II |
| . | . | . | . | . | + | + | . | + | . | . | + | + | . | . | . | + | . | + | . | + | . | I | II | III | II |
| . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | II | . | . | I |
| . | . | + | . | + | . | . | . | . | + | . | . | . | . | . | . | 1 | . | . | . | . | + | II | I | I | II |
| . | . | . | . | . | . | . | . | . | . | . | . | 2 | 2 | . | . | . | . | . | . | . | . | I | . | I | I |

| No. of relevé | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | 11-10-22 | 13-09-19 | 13-09-19 | 13-09-21 | 06-09-05 | 11-10-22 | 11-10-22 | 15-08-26 | 15-09-24 | 12-09-06 | 12-09-06 | 15-08-26 | 15-08-26 | 12-09-06 | 15-09-24 | 12-09-26 | 13-09-19 | 13-09-19 | 13-09-19 | 13-09-19 | 13-09-27 | 14-09-05 |
| Location | BS | Bb | BS | Ml | MP | BS | BS | Zm | Bb | Bb | Bb | Zm | Zm | Bb | Bb | MG | Bb | BS | BS | BS | Kr | PK |
| Area of releve [m²] | 4 | 1 | 1 | 1 | 1 | 4 | 4 | 2 | 4 | 2 | 4 | 4 | 3 | 2 | 4 | 2 | 1 | 1 | 1 | 1 | 3 | 4 |
| Cover of herb layer C [%] | 70 | 70 | 100 | 30 | 50 | 40 | 50 | 80 | 90 | 50 | 50 | 70 | 70 | 70 | 90 | 50 | 60 | 90 | 100 | 100 | 80 | 90 |
| Cover of moss layer D [%] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 10 | 0 | 0 | 0 | 0 | <5 | 0 | <5 | 10 | 0 | 0 | 0 | 0 | 0 |
| Habitat | f | f | f | f | l | f | f | f | f | f | f | f | f | f | f | f | f | f | f | f | d | f |
| Number of species | 3 | 8 | 5 | 7 | 9 | 2 | 7 | 19 | 14 | 13 | 20 | 20 | 16 | 22 | 16 | 20 | 20 | 6 | 5 | 4 | 12 | 7 |
| | | | | | | | | | A1 | | | | | | | | | | | | | |
| *Batrachium circinatum* | . | . | . | . | . | . | . | . | . | + | + | + | + | . | . | + | . | . | . | . | . | . |
| *Callitriche verna* | . | . | . | . | . | . | . | + | . | . | + | . | . | 1 | . | . | 2 | . | . | . | . | . |
| *Conyza canadensis* | . | . | . | . | . | . | . | . | . | . | . | . | . | . | + | + | . | . | . | . | . | . |
| *Solidago gigantea* | . | . | . | . | . | . | . | . | . | . | . | . | . | + | . | . | . | . | . | . | . | . |
| *Lycopus europaeus* | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | + | . |
| *Lysimachia vulgaris* | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| *Rumex maritimus* | . | . | . | . | . | . | . | . | . | . | + | . | . | . | . | . | . | . | . | . | . | . |
| *Eleocharis mamillata* | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| *Juncus alpino-articulatus* | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| *Salix cinerea* | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| *Riccia huebeneriana* | . | . | . | . | . | . | . | . | 2 | . | . | . | . | . | . | . | 1 | . | . | . | . | . |
| *Myriophyllum spicatum* | . | . | . | . | . | . | . | + | . | . | . | 1 | 1 | . | . | . | . | . | . | . | . | . |
| Poaceae sp. | . | . | . | . | . | . | . | . | . | + | + | . | . | + | . | . | . | . | . | . | . | . |
| Bryophyta sp. indeterminate | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | + | . | . | . | . | . | . |

Explanations: Bb – Babule, BS – Buda Stalowska, Dr – Durdy, Gl – Gielnia, Kn – Kunki, Kr – Krzak, Lp – Lipa, MG – Momoty Górne, Ml – Maliniec, MP – Motycze Poduchowne, Ol – Oleśniki, Os – Osówek, PK – Poręby Kupieńskie, Rz – Róża, Zm – Zimno, f – fishpond, l – lake, natural pond, d – mid-field depression

| 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12-07-31 | 14-09-05 | 13-09-27 | 14-09-21 | 12-09-06 | 12-09-05 | 12-09-05 | 12-09-07 | 14-09-05 | 12-09-05 | 12-09-05 | 12-09-05 | 12-09-05 | 12-09-05 | 15-09-24 | 15-09-24 | 12-07-31 | 12-09-07 | 12-09-07 | 12-09-05 | 13-09-20 | 12-07-31 | | | | |
| Rz | PK | Kr | Ol | Bb | Gl | Gl | Lp | PK | Os | Ml | Gl | Gl | Gl | Dr | Dr | Kn | Lp | Lp | Os | Lp | Kn | Constancy | | | |
| 3 | 4 | 4 | 1 | 4 | 4 | 4 | 4 | 2 | 4 | 4 | 6 | 6 | 6 | 6 | 2 | 6 | 6 | 4 | 4 | 1 | 6 | | | | |
| 50 | 100 | 100 | 90 | 60 | 50 | 90 | 90 | 30 | 80 | 70 | 100 | 90 | 50 | 40 | 30 | 100 | 40 | 50 | 80 | 100 | 100 | | | | |
| 0 | 10 | 0 | 0 | <5 | 0 | 0 | <5 | 10 | 0 | 0 | 0 | 20 | 50 | 5 | 0 | 10 | 0 | 0 | 0 | 0 | 0 | | | | |
| l | f | d | d | f | f | f | f | f | f | f | f | f | f | f | f | l | f | f | f | f | l | | | | |
| 26 | 15 | 9 | 6 | 21 | 19 | 12 | 18 | 15 | 7 | 7 | 12 | 30 | 28 | 13 | 8 | 24 | 21 | 23 | 7 | 10 | 12 | | | | |
| | | A2 | | | | | | | | | | | | | | A3 | | | | | | A1 | A2 | A3 | A |
| . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | II | . | . | I |
| . | . | . | . | 1 | + | . | . | . | . | . | + | . | + | . | . | . | . | . | . | . | . | II | I | I | I |
| + | . | . | . | . | . | . | . | + | . | . | . | . | + | + | . | . | . | . | . | . | . | I | I | I | I |
| . | . | . | . | . | . | . | . | . | . | . | . | + | 1 | . | . | . | + | + | . | . | . | I | . | II | I |
| . | . | . | . | . | . | . | . | . | . | . | . | 1 | + | . | . | + | + | . | . | . | . | . | I | II | I |
| . | . | . | . | . | . | . | . | . | . | . | . | + | . | . | . | + | + | + | . | + | . | . | . | III | I |
| . | . | . | . | + | . | . | + | . | . | . | . | . | . | . | . | . | . | . | . | . | . | I | I | . | I |
| . | . | . | . | . | 1 | . | . | . | . | . | . | + | . | . | . | + | . | . | . | . | + | . | I | II | I |
| . | . | . | . | . | 1 | . | . | . | . | . | . | . | 1 | . | . | . | 3 | 1 | . | . | . | . | I | II | I |
| + | . | . | . | . | . | . | . | . | . | . | . | + | 1 | . | . | . | + | . | . | . | . | . | I | II | I |
| . | . | . | . | . | . | . | . | . | . | . | . | 2 | 1 | . | . | . | . | . | . | . | . | I | . | I | I |
| . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | I | . | . | I |
| + | . | . | . | + | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | I | I | . | I |
| . | + | . | . | . | . | . | + | 1 | . | . | + | 1 | . | . | . | . | . | . | . | . | . | I | I | I | I |

**Sporadic: IV** *Cyperus flavescens* 23(1), *Lindernia procumbens* 14(+); **VI.** *Equisetum fluviatile*13(+), *Glyceria maxima* 5(+), 12(+), 37(+), *Sparganium erectum* 15(+), 16(+), 26(2), *Typha latifolia* 21(2), 25(+), 46(+), *Veronica beccabunga* 41(+); **VII.** *Agrostis canina* 36(+), 39(+), 44(+), *Alnus glutinosa* 35(+), 36(+), *Batrachium aquatile* 17(+), *Bryum caespiticium* 36(3), *Carex hirta* 23(+), *Carex* sp. 10(+), 44(+), *Chara* sp. 13(+), *Cirsium arvense* 17(+), *Cirsium* sp. 14(+), 16(+), 30(+), 45(+), *Dicranella heteromalla* 36(1), *Dicranella varia* 14(+), *Eleocharis carniolica* 37(1), *Epilobium palustre* 39(+), *E. adnatum* 23(+), *Erechtites hieracifolia* 35(+), 36(+), *Hippuris vulgaris* 12(+), *Juncus effusus* 24(1), 35(+), 39(+), *Mentha arvensis* 21(+), 40(+), 41(+), *Myosotis caespitosa* 36(+), *Nitella mucronata* 1(1), 7(+), *Nymphaea alba* 12(+), 13(+), 42(+), *Lemna minor* 5(+), 21(1), *Physcomitrella patens* 37(1), *Physcomitrium eurystomum* 24(1), *Pinus sylvestris* 28(+), 40(+), *Pohlia bulbifera* 24(1), *Polygonum aviculare* 2(+), *Populus alba* 40(+), *P. tremula* 40(+), *Potamogeton gramineus* 37(+), *P. lucens* 13(+), *P. natans* 3(+), 10(+), 45(+), *P. pusillus* 12(1), 13(1), *Potentilla norvegica* 39(+), *Ranunculus flammula* 32(+), 42(+), *Riccia fluitans* 24(+), *R. glauca* 14(+), 27(+), *R. sorocarpa* 34(1), *Salix aurita* 28(+), 39(+), *S. fragilis* 23(+), *S. triandra* 28(1), 35(+), *Salix* sp. 28(+), 40(+), 41(+), *Salvinia natans* 5(+), 11(+), *Solanum dulcamara* 4(+), *Sphagnum denticulatum* 39(1), 44(2), *Sph. fallax* 44(+), *Spirodela polyrrhiza* 12(+), 13(+), 21(+), *Stachys palustris* 25(+), *Tanacetum vulgare* 14(+), *Tussilago farfara* 40(+), *Utricularia vulgaris* 7(+), *Veronica scutellata* 23(+), 36(+), *Warnstorfia fluitans* 8(2), 39(1), 44(+)

**Table 3.** Communities of the *Alisma lanceolatum* group: C – *Alisma lanceolatum-Isolepis supina* community, D – community of *Elatine alsinastrum*

| No. of relevé | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | 13-07-12 | 13-07-12 | 13-07-12 | 13-10-08 | 13-08-30 | 13-08-30 | 14-09-28 | 11-11-06 | 13-10-08 | 11-11-06 | 11-11-06 | 11-11-06 | 11-06-16 | 11-06-16 | 11-06-16 | 11-06-16 | 11-11-06 | 14-09-28 |
| Location | Sh | Sh | Sh | Sh | Hn | Kl | Zl | Sh | Hn | Sh | Tr | Tr | Sh | Sh | Sh | Sh | Sh | Ld |
| Area of relevé [m²] | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 2 | 2 | 2 | 2 | 2 | 3 |
| Cover of herb layer C [%] | 80 | 100 | 90 | 80 | 80 | 90 | 30 | 60 | 60 | 30 | 40 | 30 | 80 | 90 | 90 | 50 | 50 | 30 |
| Cover of moss layer D [%] | 0 | 0 | 0 | 0 | 0 | 0 | <5 | <5 | 0 | <5 | 5 | 10 | 10 | 0 | <5 | 0 | 0 | 5 |
| Habitat | d | d | d | d | d | d | d | d | d | d | d | d | d | d | d | d | d | d |
| Number of species | 6 | 4 | 3 | 9 | 14 | 19 | 25 | 20 | 9 | 12 | 9 | 10 | 17 | 11 | 15 | 9 | 10 | 26 |
| | C | | | | | | | | | | | | D | | | | | |
| *Alisma lanceolatum* | 2 | 3 | 4 | 3 | 4 | 3 | 2 | 1 | . | + | 2 | 1 | . | 1 | + | 2 | + | 1 |
| *Isolepis supina* | 5 | 4 | 3 | 3 | 2 | 3 | . | 1 | 2 | 1 | 2 | 2 | . | + | . | + | . | . |
| *Elatine alsinastrum* | . | . | . | . | . | . | . | . | . | . | . | . | . | + | . | 1 | + | 2 |
| **I. Ch. *Eleocharition ovatae*** | | | | | | | | | | | | | | | | | | |
| *Limosella aquatica* | + | + | 2 | 1 | 2 | 2 | 2 | 1 | . | 2 | + | . | 2 | . | 2 | 2 | 2 | . |
| *Peplis portula* | . | . | . | . | . | . | + | . | . | . | . | . | 2 | + | 4 | + | 3 | 2 |
| **II. Ch. *Radiolion linoidis*** | | | | | | | | | | | | | | | | | | |
| *Myosurus minimus* | . | . | . | . | . | . | . | . | . | . | . | . | 3 | . | 1 | . | . | . |
| *Ranunculus sardous* | . | . | . | . | . | + | . | + | . | . | . | + | . | . | . | . | . | . |
| **III. Ch. *Cyperetalia fusci, Isoëto-Nano-Juncetea*** | | | | | | | | | | | | | | | | | | |
| *Plantago intermedia* | . | . | . | 2 | 2 | 1 | 1 | 2 | 3 | 1 | . | . | 2 | . | 1 | . | . | + |
| *Potentilla supina* | . | . | . | 1 | . | 2 | 2 | 3 | . | + | . | . | . | . | . | . | . | + |
| *Lythrum hyssopifolia* | . | . | . | . | 2 | 2 | . | + | . | . | 2 | + | . | . | . | . | . | . |
| *Gnaphalium uliginosum* | . | . | . | . | . | . | + | . | . | . | . | . | 1 | + | + | + | 2 | + |
| *Juncus bufonius* | . | . | . | . | . | . | 1 | 1 | . | . | . | . | + | 5 | + | 1 | 1 | . |
| **IV. Ch. *Bidentetea tripartiti*** | | | | | | | | | | | | | | | | | | |
| *Rorippa palustris* | . | . | . | . | . | . | 1 | . | . | . | . | . | 2 | + | 1 | + | 1 | 1 |
| *Ranunculus sceleratus* | . | . | . | . | . | . | + | . | . | . | . | . | + | + | . | . | . | + |
| *Polygonum persicaria* | . | . | . | . | . | . | + | . | . | . | . | . | 2 | . | + | . | . | + |
| *Alopecurus aequalis* | . | + | . | . | . | . | + | . | 1 | 1 | . | . | . | . | . | . | . | . |
| *Polygonum lapathifolium* | . | . | . | . | + | + | . | . | . | . | . | . | . | . | . | . | . | . |
| *Bidens tripartitus* | . | . | . | . | + | . | . | . | . | . | . | . | + | . | + | . | . | . |
| *Polygonum hydropiper* | . | . | . | . | . | . | . | . | . | . | . | . | 1 | . | . | . | . | . |
| **V. Ch. *Phragmitetea*** | | | | | | | | | | | | | | | | | | |
| *Veronica anagallis-aquatica* | . | . | . | . | . | . | + | 2 | . | . | . | + | + | . | . | . | . | + |
| *Alisma plantago-aquatica* | . | . | . | . | . | . | + | . | . | . | . | . | . | 1 | 2 | . | . | + |
| *Eleocharis palustris* | . | . | . | . | . | . | + | . | . | . | . | . | . | . | . | . | . | 2 |
| *Oenanthe aquatica* | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 1 |
| *Typha latifolia* | + | . | . | 1 | . | . | . | . | + | . | . | . | . | . | . | . | . | . |
| *Phalaris arundinacea* | . | . | . | . | . | . | . | . | . | 2 | . | 2 | . | . | . | . | . | . |
| *Sparganium erectum* | . | . | . | . | . | . | 2 | . | . | . | . | + | . | . | . | . | . | . |
| **VI. Accompanying species** | | | | | | | | | | | | | | | | | | |
| *Echinochloa crus-galli* | + | . | . | 1 | + | 1 | + | . | 1 | . | . | . | 1 | 1 | 2 | 1 | 1 | + |
| *Matricaria maritima* ssp. *inodora* | . | . | . | . | + | . | + | + | + | . | . | . | + | . | + | . | + | + |
| *Polygonum aviculare* | + | . | . | 2 | + | + | . | . | . | . | . | . | 1 | + | . | . | . | . |
| *Polygonum amphibium* | . | . | . | . | + | + | + | . | . | . | . | . | . | . | . | . | . | 1 |
| *Rorippa sylvestris* | . | . | . | . | + | . | . | + | 1 | + | 1 | . | . | . | . | . | . | . |
| *Agrostis stolonifera* | . | . | . | . | . | . | + | . | . | . | . | . | 1 | . | . | . | . | 2 |
| *Chenopodium polyspermum* | . | . | . | . | + | + | . | + | . | . | . | . | . | . | . | . | . | + |
| *Cirsium arvense* | . | . | . | . | . | + | + | . | . | . | . | . | . | . | . | . | . | + |
| *Bryum argenteum* | . | . | . | . | . | . | + | . | . | . | . | . | 2 | . | + | . | . | . |
| *Callitriche verna* | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | + | 1 |
| *Conyza canadensis* | . | . | . | . | . | . | + | . | . | . | . | . | . | . | . | . | . | + |
| *Rumex acetosa* | . | . | . | . | . | . | . | . | 1 | . | . | + | . | . | . | . | . | . |
| *Dicranella varia* | . | . | . | . | . | . | . | + | . | + | . | . | . | . | . | . | . | . |
| *Physcomitrium pyriforme* | . | . | . | . | . | . | . | + | . | + | . | . | . | . | . | . | . | . |
| *Ricciocarpus natans* | . | . | . | . | . | . | . | . | . | . | 1 | 2 | . | . | . | . | . | . |
| Poaceae sp. | . | . | . | . | . | . | . | . | . | + | + | + | . | . | . | . | . | . |

Explanations: Ad – Adelina, Hn – Honiatyczki, Kl – Kotlice, Ld – Leopoldów, Nl – Nielisz, Pt – Poturzyn, Sh – Sahryń, Tr – Turkowice, Zl – Zalesie, d – mid-field depression

| 68 | 69 | 70 | | | |
|---|---|---|---|---|---|
| 13-09-07 | 13-09-27 | 11-11-06 | | | |
| Pt | Nl | Ad | Constancy | | |
| 2 | 4 | 4 | | | |
| 40 | 70 | 70 | | | |
| 0 | 0 | 0 | | | |
| d | d | d | | | |
| 6 | 4 | 10 | | | |
| | | | C | D | C-D |
| 1 | 2 | 2 | V | V | V |
| . | . | . | V | I | III |
| 4 | 4 | 3 | . | IV | II |
| | | | | | |
| . | . | 1 | IV | III | IV |
| . | . | 2 | I | IV | II |
| | | | | | |
| . | . | . | . | I | I |
| . | . | . | II | . | I |
| | | | | | |
| . | . | . | III | II | III |
| . | . | . | II | I | II |
| . | . | . | II | . | II |
| . | . | . | I | IV | II |
| . | . | . | I | III | II |
| | | | | | |
| . | . | + | I | IV | II |
| . | + | + | I | III | II |
| . | . | . | I | II | I |
| . | . | . | II | . | I |
| + | . | + | I | I | I |
| . | . | . | I | I | I |
| . | . | . | . | I | I |
| | | | | | |
| . | . | . | II | I | II |
| . | . | . | I | II | I |
| + | . | . | I | I | I |
| + | + | . | . | II | I |
| . | . | . | II | . | I |
| . | . | . | I | . | I |
| . | . | . | I | . | I |
| | | | | | |
| . | . | + | III | IV | III |
| . | . | . | II | III | II |
| . | . | . | II | I | II |
| . | . | 1 | II | I | II |
| . | . | . | II | . | II |
| . | . | 1 | I | II | I |
| . | . | . | II | I | I |
| . | . | . | I | I | I |
| . | . | . | I | I | I |
| . | . | . | . | I | I |
| . | . | . | I | I | I |
| . | . | . | I | . | I |
| . | . | . | . | . | I |
| . | . | . | I | . | I |
| . | . | . | I | . | I |
| . | . | . | II | . | I |

**Table 2.** *Cyperetum michelianii* Horvatić 1931 (B)

| No. of relevé | 45 | 46 | 47 | 48 | 49 |
|---|---|---|---|---|---|
| Date | 12-09-26 | 15-10-11 | 06-09-05 | 12-09-26 | 12-09-26 |
| Location | MG | Łb | Zb | MG | MG |
| Area of relevé [m²] | 4 | 4 | 2 | 2 | 4 |
| Cover of herb layer C [%] | 70 | 30 | 30 | <5 | 60 |
| Cover of moss layer D [%] | <5 | <5 | 10 | 30 | 40 |
| Habitat | f | f | l | f | f |
| Number of species | 24 | 12 | 10 | 15 | 21 |
| | | | B | | |
| **Ch. *Eleocharition ovatae*** | | | | | |
| *Cyperus fuscus* | 4 | 2 | 2 | + | 2 |
| *Riccia cavernosa* | + | + | . | 3 | 2 |
| *Eleocharis acicularis* | + | . | . | . | 1 |
| *Eleocharis ovata* | + | . | . | . | . |
| **Ch. *Cyperetalia fusci, Isoëto-Nano-Juncetea*** | | | | | |
| *Gnaphalium uliginosum* | 1 | . | . | . | 1 |
| *Plantago intermedia* | + | . | + | . | + |
| *Juncus bufonius* | . | + | . | + | . |
| *Cyperus flavescens* | . | . | 2 | . | . |
| **Ch. *Bidentetea tripartiti*** | | | | | |
| *Rorippa palustris* | + | + | . | 1 | 1 |
| *Polygonum persicaria* | + | + | + | . | + |
| *Chenopodium rubrum* | . | + | . | . | + |
| *Polygonum lapathifolium* | . | + | . | + | . |
| *Ranunculus sceleratus* | . | . | + | . | . |
| **Ch. *Phragmitetea*** | | | | | |
| *Veronica anagallis-aquatica* | + | 2 | . | + | + |
| *Oenanthe aquatica* | + | + | . | . | . |
| *Glyceria plicata* | . | . | 1 | . | . |
| *Eleocharis palustris* | + | . | . | . | . |
| *Phragmites australis* | + | . | . | . | . |
| *Scirpus radicans* | . | . | . | . | + |
| *Typha latifolia* | | + | | | |
| **Accompanying species** | | | | | |
| *Agrostis stolonifera* | + | + | 1 | + | 2 |
| *Juncus articulatus* | + | . | + | + | 2 |
| *Echinochloa crus-galli* | + | + | . | . | . |
| *Betula pendula* | 2 | . | . | + | + |
| *Batrachium circinatum* | + | . | . | + | + |
| *Conyza canadensis* | + | . | . | + | + |
| *Rumex maritimus* | . | . | . | + | + |
| *Myriophyllum spicatum* | . | . | . | + | . |
| *Potamogeton natans* | + | . | . | . | . |
| *Solidago gigantea* | + | . | . | . | . |
| *Cirsium* sp. | + | . | . | . | . |
| Bryophyta sp. indeterminate | + | . | 1 | + | 3 |

Explanations: Łb – Łabunie, MG – Momoty Górne, Zb – Zbydniów, f – fishpond, l – lake, natural pond

**Sporadic: I.** *Cyperus fuscus* 54(+), *Riccia cavernosa* 56(+); **V.** *Butomus umbellatus* 67(+), *Leersia oryzoides* 59(+), *Phragmites australis* 55(1), *Rorippa amphibia* 68(+), *Typha angustifolia* 55(+); **VI.** *Batrachium trichophyllum* 64(+), *Bryophyta* sp. 67(+), *Capsella bursa-pastoris* 57(+), *Carex hirta* 67(+), *Chenopodium album* 56(+), *Convolvulus arvensis* 55(+), *Equisetum arvense* 58(+), *Juncus compressus* 53(+), *Lathyrus tuberosus* 55(+), *Lemna minor* 67(+), *Lythrum salicaria* 60(+), *Marchantia polymorpha* ssp. *ruderalis* 57(+), *Mentha arvensis* 55(+), *Physcomitrium sphaericum* 57(+), *Riccia glauca* 67(+), *Setaria glauca* 55(+), *S. viridis* 60(+), *Sonchus oleraceus* 57(+), *Vicia* sp. 56(+)

## **Appendix 1.** Coordinates of relevés

**1** – N 50°29’43.62”, E 21°47’32.88”; **2** – N 50°22’55.17”, E 21°34’15.73”; **3** – N 50°29’42.84”, E 21°47’25.97”; **4** – N 50°42’51.12”, E 22°12’44.26”; **5** – N 50°40’10.3”, E 21°51’41.8”; **6** – N 50°29’43.09”, E 21°47’33.3”; **7** – N 50°29’43.93”, E 21°47’32.03”; **8** – N 50°31’10.94”, E 23°44’05.68”; **9** – N 50°22’55.15”, E 21°34’07.86”; **10** – N 50°22’56.71”, E 21°34’14.18”; **11** – N 50°23’15.96”, E 21°33’48.34”; **12** – N 50°31’14.12”, E 23°44’05.54”; **13** – N 50°31’13.51”, E 23°44’05.74”; **14** – N 50°22’58.89”, E 21°34’12.52”; **15** – N 50°23’19.23”, E 21°33’47.56”; **16** – N 50°36’55.39”, E 22°27’18.53”; **17** – N 50°22’55.52”, E 21°34’6.84”; **18** – N 50°29’40.18”, E 21°47’20.24”; **19** – N 50°29’43.12”, E 21°47’17.38”; **20** – N 50°29’43.62”, E 21°47’25.28”; **21** – N 50°47’40.36”, E 23°5’28.38”; **22** – N 50°9’10.46”, E 21°51’32.75”; **23** – N 50°29’24.33”, E 23°13’18.57”; **24** – N 50°9’9.98”, E 21°51’31.58”; **25** – N 50°47’16.23”, E 23°5’9.46”; **26** – N 51°7’4.6”, E 23°0’6”; **27** – N 50°23’18.6”, E 21°33’47.89”; **28** – N 50°42’25.66”, E 22°5’11.52”; **29** – N 50°42’28.93”, E 22°5’9.28”; **30** – N 50°40’25.93”, E 22°0’59.56”; **31** – N 50°9’14.34”, E 21°49’43.34”; **32** – N 50°42’14.77”, E 22°12’59.94”; **33** – N 50°42’36.94”, E 22°12’24.83”; **34** – N 50°42’29.68”, E 22°5’16.43”; **35** – N 50°42’24.79”, E 22°5’8.99”; **36** – N 50°42’29.82”, E 22°5’7.99”; **37** – N 50°23’14.96”, E 21°36’02.93”; **38** – N 50°23’17.7”, E 21°35’50.0”; **39** – N 50°27’12.59”, E 23°16’26.43”; **40** – N 50°40’24.2”, E 22°0’59.14”; **41** – N 50°40’18.14”, E 22°1’11.01”; **42** – N 50°42’17.78”, E 22°12’56.75”; **43** – N 50°40’20.21”, E 22°1’2.82”; **44** – N 50°27’13.82”, E 23°16’26.99”; **45** – N 50°36’52.88”, E 22°27’21.56”; **46** – N 50°39’40.5”, E 23°20’27.9”; **47** – N 50°40’13.6”, E 21°54’50.4”; **48** – N 50°37’4.34”, E 22°27’16.5”; **49** – N 50°37’8.02”, E 22°27’21.77”; **50** – N 50°41’30.1”, E 23°48’39.9”; **51** – N 50°41’19.8”, E 23°48’27.6”; **52** – N 50°41’19.2”, E 23°48’27”; **53** – N 50°41’32.3”, E 23°48’48.3”; **54** – N 50°41’28.43”, E 23°40’20.53”; **55** – N 50°40’53.92”, E 23°35’30.18”; **56** – N 51°14’29.46”, E 22°53’0.69”; **57** – N 50°41’21.1”, E 23°48’33.6”; **58** – N 50°41’37.4”, E 23°41’23.1”; **59** – N 50°41’30.2”, E 23°48’41.3”; **60** – N 50°39’46.3”, E 23°45’25.7”; **61** – N 50°39’46.4”, E 23°45’24.9”; **62** – N 50°39’34.17”, E 23°51’4.5”; **63** – N 50°41’34.98”, E 23°48’50.37”; **64** – N 50°39’33.81”, E 23°51’3.32”; **65** – N 50°41’32.65”, E 23°48’49.1”; **66** – N 50°41’34”, E 23°48’43.1”; **67** – N 51°15’15.28”, E 22°51’52.09”; **68** – N 50°32’53.87”, E 23°55’28.65”; **69** – N 50°45’18.29”, E 23°4’57.27”; **70** – N 50°39’49.61”, E 23°46’18.07”