

CHARACTERISTICS OF PLANT COMMUNITIES OF THE WESTERN PART OF THE GARBATÓWKA BOG (ŁĘCZNA-WŁODAWA LAKELAND)

Danuta Urban*, Hanna Wójciak**

*Institute of Soil Sciences and Environmental Management, University of Life Sciences in Lublin
Leszczyńskiego str. 7, 20-069 Lublin, danuta.urban@up.lublin.pl

**Department of Botany and Mycology, Maria Curie-Skłodowska University
Akademicka str. 19, 20-033 Lublin, hanna.wojciak@poczta.umcs.lublin.pl

Summary. The study bog is situated near Garbatówka in the Łęczna-Włodawa Lakeland. It is part of the Jeziora Uściwierskie Natura 2000 area. The aim of the study was to record plant communities and rare and legally protected plant species found in the area. The study object was characterized by great diversity of plant communities. Twenty-five associations and three plant communities from the classes *Charetea*, *Potametea*, *Utricularietea intermedio-minoris*, *Phragmitetea*, *Scheuchzerio-Caricetea fuscae*, *Molinio-Arrhenatheretea* and *Alnetea glutinosae* have been found here. The most valuable phytocoenoses were submersed meadows of Charophytes from the class *Charetea*, and communities from the class *Scheuchzerio-Caricetea fuscae* (e.g. *Caricetum lasiocarpae* and *Caricetum davallianae*). Localities of the following legally protected plant species have been found: *Betula humilis*, *Carex davalliana*, *Dactylorhiza incarnata*, *Dactylorhiza maculata*, *Dactylorhiza majalis*, *Dianthus superbus*, *Epipactis palustris*, *Frangula alnus*, *Pedicularis sceprum-carolinum*, *Ostericum palustre*, *Pinguicula vulgaris* ssp. *bicolor*, *Utricularia intermedia*, *Utricularia vulgaris*, *Menyanthes trifoliata*, *Climacium dendroides*, *Caliergonella cuspidata*, *Aulacomium palustre* and *Nitella opaca*.

Key words: fen, plant communities, rare plant species, Garbatówka bog

INTRODUCTION

The Łęczna-Włodawa Lakeland is extremely rich in bogs. According to Borowiec [1990], there are about 800 differently sized peat bogs with predominance of fens, and a distinctly smaller number of transitional bogs and mires. Most of these objects offer great natural values; they are located in the Poleski and Sobiborski National Parks, the Poleski Landscape Park, the Łęczna-Włodawa Lakeland and the Poleski Protected Landscape Area. They are legally protected

as nature reserves and ecological grounds. The complex of bogs located near Garbatówka is of great natural value.

STUDY AREA, MATERIALS AND METHODS

In terms of administration, the object is located in the municipality of Cyków, the county of Łęczna, Lublin Province. According to the physical-geographical division developed by Kondracki [2002], it is situated on the Łęczyńsko-Włodawska Plain (Łęczyńsko-Włodawskie Lakeland), which is a mezoregion of Polesie. The bog is located near the village of Garbatówka and is included in the Jeziora Uściwierskie Natura 2000 area, and the Polesie Zachodnie Biosphere Reserve, as well as the Garbatówka nature reserve, which is being designed now.

The Garbatówka bog is classified as a fen [Borowiec 1990]. The study conducted by Gawlik and Urban [2003] indicated that the western part of the peatland is formed by poorly decomposed moss (*Bryalo-Parvocaricioni*) and sedge (*Magnocaricioni*) peats. They are deposited on a mineral, clay, and clayey-calcareous gyttja layer containing a 20 cm layer of sand; at the depth of 260–300 cm there is a layer of fibrous moss peat. Some fragments of this bog are characterized by high hydration. This is related to the type of layer peat formations (poorly decomposed moss peats with a fibrous and spongy-fibrous structure), characterized by absorption capacity and efficient capillary conductivity [Gawlik and Urban 2003]. The peatlands in the area had been exploited for heating purposes, the remnants of which are differently sized and shaped peat lakes.

In the years 2009–2011, studies were conducted on the plant communities found in the western part of the Garbatówka bog. The analyses were performed on an area of 16 ha. Ninety-one phytosociological relevés were made in the area with the method of Braun-Blanquet [1951]. The phytosociological classification and nomenclature of plant communities follows that developed by Matuszkiewicz [2005]; the nomenclature follows Mirek *et al.* [2002] for vascular plants and Ochyra *et al.* [2003] for bryophytes. Chara species were identified with the „Identification key for charophytes (*Charales*) of rivers and lakes” [Pełechaty and Pukacz 2008].

The primary aim of our study was to compile a record of plant communities and rare plant species occurring in the western part of the Garbatówka bog. The material collected will facilitate tracking further changes in the vegetation of the object.

RESULTS AND DISCUSSION

The phytosociological relevés made in 2010–2011 revealed 24 associations and 4 plant communities in the study bog (Tab. 1–3).

Table 1. Floristic composition of communities from the classes *Charetea* (Fukarek 1961 n.n.) Krausch 1964, *Potametea* R. Tx. et Prsg, *Utricularietea intermedio-minoris* Den Hartog et Segal 1964 em Pietsch 1965 and *Phragmitetea* R. Tx. et Prsg 1942 (*Phragmition* Koch 926 alliance): 1 – *Charetea fragilis* Krausch 1964, 2 – *Hydrocharitetum morsus-ranae* Langendonck 1935, 3 – *Sparganietum minimi* Schaaf 1925, 4 – *Typhetum angustifoliae* (Alorge 1922) Soó 1927, 5 – *Equisetum fluviatile* Steffen 1931, 6 – *Phragmitetum australis* (Gams 1927) Schmale 1939, 7 – *Typhetum latifoliae* Soó 1927, 8 – *Acoretum calami* Kobendza 1948; *association number, **frequency in phytosociological relevés, ***density range

Association number	1*	2	3	4	5	6	7	8
Cover of layer b in %	.	.	.	.	.	0-5	.	.
Cover of layer c in %	100	70-100	90-100	100	70	100	70-100	100
Cover of layer d in %	.	.	.	.	.	0-40	.	.
Number of phytosociological relevés	4	8	1	1	1	2	1	1
1* <i>Chara globularis</i>	4**/2-3***	5/+2	.	.	.	.	1/1	.
2. <i>Stratiotes adoides</i>	.	8/3-5	.	.	.	.	1/3-4	.
3. <i>Sparganium minimum</i>	.	.	2/4-5	.	.	.	.	.
3. <i>Typha angustifolia</i>	.	1/+	.	1/5	.	.	.	.
4. <i>Equisetum fluviatile</i>	2/+	.	1/+	1/+	1/4	.	.	.
5. <i>Phragmites australis</i>	.	1/3	1/2	1/3	1/4	2/5	1/5	.
6. <i>Typha latifolia</i>	.	2/+1	1/+	1/3	1/4	1/5	1/5	.
7. <i>Acorus calamus</i>	.	.	.	.	.	.	.	1/5
<i>Charetea, Charion fragilis</i>								
<i>Chara intermedia</i>	4/2-4	5/+2	.	.	.	.	1/2	.
<i>Nitellion fragilis</i> :								
<i>Nitella opaca</i>	2/1-2	.	.	.	.	.	.	.
<i>Nymphaeion</i> :								
<i>Potamogeton natans</i>	3/1-3	7/+4	.	.	.	.	3/+3	.
<i>Nymphaea alba</i>	.	.	.	.	.	.	1/1	.
<i>Potametea</i> :								
<i>Utricularia vulgaris</i>	.	4/2-5	.	.	.	1/+	2/1	.
<i>Myriophyllum verticillatum</i>	.	1/1	.	.	.	.	.	.
<i>Phragmition</i> :								
<i>Thelypteris palustris</i>	.	.	.	1/4	.	1/5	.	.
<i>Schoenoplectus lacustris</i>	.	.	.	.	.	.	1/1	.
<i>Oenanthe aquatica</i>	.	.	1/+	.	.	.	.	.
<i>Magnocaricion</i> :								
<i>Carex pseudocyperus</i>	.	3/+1	.	1/1	.	.	1/2	.
<i>Carex elata</i>	.	.	.	1/+	1/1	1/2	.	.
<i>Galium palustre</i>	.	.	.	.	1/+	1/+	.	.
<i>Carex disticha</i>	.	.	.	.	1/+	.	.	.
<i>Peucedanum palustre</i>	.	.	.	.	.	1/+	.	.
<i>Phragmitetea</i> :								
<i>Alisma plantago-aquatica</i>	.	.	1/+	.	.	.	.	.
<i>Scutellaria galericulata</i>	.	.	.	.	.	.	.	1/+
Accompanying:								
<i>Scheuchzerio-Caricetea nigrae</i> :								
<i>Comarum palustre</i>	.	.	1/1	2/+	1/2	1/+	.	.
<i>Molinio-Arrhenatheretea</i> :								
<i>Lythrum salicaria</i>	.	.	.	.	1/+	1/+	.	.
<i>Lysimachia vulgaris</i>	.	.	.	.	1/+	1/+	.	1/+
Bryophytes:								
<i>Caliergonella cuspidata</i>	.	.	.	.	.	1/3	.	.
<i>Plagomnium affine</i>	.	.	.	.	.	1/2	.	.

Accompanying species recorded once: 2* – *Lemnetea*: *Lemna trisulca* 1/+; 5 – *Molinio-Arrhenatheretea*: *Caltha palustris* 1/2, *Geum rivale* 1/+, *Alnetea glutinosae*: *Lycopus europaeus* 1/+, *Solanum dulcamara* 1/+; 6 – trees and shrubs: *Salix cinerea* b 1/+, *Salix rosmarinifolia* b 1/+, *Scheuchzerio-Caricetea nigrae*: *Carex diandra* 1/1, *Carex lasiocarpa* 1/3, *Carex panicea* 1/+, *Menyanthes trifoliata* 1/+.

The study results indicate that aquatic vegetation was represented by three associations from the classes *Charetea*, *Potametea*, and *Utricularietea intermedio-minoris* (Tab. 1). Phytocoenoses from the classes *Potametea* – *Hydrocharitetum morsus-ranae* and *Potametum natantis* were frequently reported. The *Sparganietum minimi* association from the class *Utricularietea intermedio-minoris* was found much less frequently in distinctly shallow ditches and peat lakes. The most valuable aquatic phytocoenoses in a few peat lakes included single- and double-layered underwater charophyte meadows overgrown by *Chara globularis*, *Chara intermedia* and *Nitella opaca*. Investigations of the distribution, associations, and ecology of charaophytes in the area of the Łęczyńsko-Włodawskie Lakeland were performed by Karczmarz and Malicki [1968, 1971]; however, they did not provide data from our study object. Studies conducted so far have indicated that the communities present in the peat lakes of the study bog exhibited different developmental stages. Like in other object of this type [Podbielkowski 1960, Ilnicki 1996, Mosek and Miazga 1999, Trąba *et al.* 2004, Sugier 2006, Urban 2007], communities from the class *Potametea* were predominant in the initial stage. Communities from the class *Phragmitetea* and, less frequently, *Scheuchzerio-Caricetea fuscae* occurred in the former peat excavation ponds in the subsequent stage of overgrowing (transitional stage).

In terms of physiognomy and species composition, rush communities from the class *Phragmitetea* did not differ from the communities occurring in other similar objects [Fijałkowski and Chojnacka-Fijałkowska 1990, Urban 1999a, b]. Fourteen rush associations from the class *Phragmitetea* from the alliances *Phragmition* and *Magnocaricion* were noted here (Tab. 1 and 2). These phytocoenoses were formed in wet fragments of the bog, at the edges of deeper peat excavation pits, and in distinctly shallow and silted peat lakes.

The study results demonstrate that, from the communities from the alliance *Phragmition* (Tab. 1), a large area was covered by the association *Phragmitetum Australis* occurring in some peat lakes and on waterlogged and currently unused meadows. Its species composition was diverse and changed depending on the habitat conditions. In peat excavation pits, there were patches dominated by *Phragmites Australis* with an admixture of rush plants from the class *Phragmitetea* and aquatic plants from the classes *Lemnetea* or *Potametea*. A high share of meadow species from the class *Molinio-Arrhenatheretea* was recorded on the heavily waterlogged meadows. Investigations conducted by many authors [Trąba *et al.* 2004, Grzywna and Urban 2008, Urban and Jendrzejewska 2009] indicate spread of *Phragmites australis* patches on the unused meadows.

Two associations, namely, *Equisetetum fluviatile* and *Typhetum latifoliae* occurred in the study object only infrequently. The *Acoretum calami* association was found in a slight depression of the terrain in the proximity of buildings north of the study object.

Table 2. Floristic composition of *Phragmitetea* R. Tx. et Prsg 1942 communities (*Magnocaricion* Koch 1926 alliance: 9 – *Thepalypteridi-Phragmitetum* Kuiper 1957, 10 – *Cicuto-Caricetum pseudocyperi* Boer et Siss. in Boer 1942, 11 – *Caricetum acutiformis* Saue 1937, 12 – *Caricetum rostratae* Rübel 1912, 13 – *Caricetum elatae* Koch 1926, 14 – *Caricetum appropinquatae* (Koch 1926) Soó 1938, 15 – *Caricetum distichae* (Nowiński 1928) Jonas 1933, 16 – *Caricetum gracilis* (Graebn. et Hueck 1931) R. Tx. 1937, 17 – *Caricetum vesicariae* Br-Bl. et Denis 1926

Association number	9	10	11	12	13	14	15	16	17
Cover of layer b in %	0-40	.	.	.	5-10	5-30	0-5	.	.
Cover of layer c in %	90-100	100	90-100	60-90	90-100	60-100	80-90	90-100	90-100
Cover of layer d in %	.	30	0-50	0-90	40	30-70	.	40-80	50
Number of phytosociological relevés	3	1	3	3	4	6	2	1	1
<i>Salix cinerea</i> b	3/2-3	.	.	.	1/+	3/+1	1/+	.	.
<i>Frangula alnus</i> b	3/+1	.	.	.	1/+	3/+1	.	.	.
<i>Betula pubescens</i> b	2/+	.	.	.	.	1/+	.	.	.
<i>Salix rosmarinifolia</i> b	.	.	.	.	2/+	3/+1	.	.	.
1. <i>Thelypteris palustris</i>	3/4-8	.	.	.	.	2/1-2	.	.	.
1. <i>Phragmites australis</i>	.	.	.	.	1/+	1/+2	.	.	1/1
2. <i>Carex pseudocyperus</i>	.	.	.	.	.	1/+	.	.	.
3. <i>Carex acutiformis</i>	.	.	3/4-5	.	½	.	.	.	.
4. <i>Carex rostrata</i>	.	.	1/+	3/3-5	.	1/1	.	1/1	.
5. <i>Carex elata</i>	1/+	.	.	.	4/3-5	.	1/1	.	.
6. <i>Carex appropinquata</i>	.	.	1/1	.	.	6/3-5	.	1/1	.
7. <i>Carex disticha</i>	.	.	.	.	.	.	2/4-5	.	.
8. <i>Carex gracilis</i>	.	.	.	.	.	.	.	1/3-5	.
9. <i>Carex vesicaria</i>	.	.	.	.	.	1/+	.	.	1/4
<i>Magnocaricion:</i>									
<i>Galium palustre</i>	1/+	.	2/+	.	4/+	6/+	1/+	2/+	2/+
<i>Lysimachia thyrsiflora</i>	.	.	1/+	.	1/+	.	.	.	.
<i>Iris pseudacorus</i>	.	.	1/+	.	.	.	1/+	.	.
<i>Ranunculus lingua</i>	.	.	1/+	.	.	.	1/+	1/+	.
<i>Peucedanum palustre</i>	.	.	1/+	.	1/+	2/+	.	.	.
<i>Scutellaria galericulata</i>	.	.	.	.	2/+	2/+	.	.	.
<i>Carex paniculata</i>	.	.	.	.	.	.	.	.	1/1
<i>Phragmition:</i>									
<i>Typha latifolia</i>	.	1/2	1/1	1/+	.	.	.	.	.

<i>Acorus calamus</i>	.	.	1/3	.	.	.	.	.	.
<i>Glyceria maxima</i>	.	.	1/1	.	.	.	.	.	.
<i>Thelypteris palustris</i>	.	.	.	.	1/3	.	.	.	.
Phragmitetea:									
<i>Equisetum fluviatile</i>	2/+	.	3/+1	.	3/+1	2/+1	2/+1	1/1	.
<i>Eleocharis palustris</i>	.	.	.	.	1/+	.	.	.	.
Accompanying:									
<i>Scheuchzerio-Caricetea nigrae:</i>									
<i>Comarum palustre</i>	.	.	2/+1	3/+2	3/+1	5/+	2/+	1/2	2/+
<i>Carex nigra</i>	.	.	1/+	.	.	4/+1	.	1/+	1/2
<i>Carex flava</i>	.	.	1/+	.	.	4/1	.	.	.
<i>Carex lasiocarpa</i>	.	.	2/+1	.	.	.	1/2	.	.
<i>Carex panicea</i>	.	.	2/+	.	.	2/+1	.	1/+	1/+
<i>Menyanthes trifolita</i>	.	.	.	1/+	.	1/+	1/+	1/+	.
<i>Carex davalla</i>	.	.	.	.	.	3/+3	.	1/+	.
<i>Eriophorum angustifolium</i>	.	.	.	.	.	.	1/+	.	2/+
<i>Molinio-Arrhenatheretea:</i>									
<i>Lysimachia vulgaris</i>	1/1	.	4/+1	1/+	3/+	6/+	1/+	1/+	.
<i>Cirsium palustre</i>	1/+	.	.	.	.	1/+	.	1/+	.
<i>Equisetum palustre</i>	.	.	3/+	.	.	1/+	1/+	2/+	1/+
<i>Lythrum salicaria</i>	.	.	1/+	1/+	1/+	1/+	2/+	1/+	.
<i>Geum rivale</i>	.	.	1/+	.	.	2/+1	.	1/1	.
<i>Festuca rubra</i>	.	.	1/+	.	.	1/2	.	1/1	.
<i>Valeriana officinalis</i>	.	.	1/+	.	.	1/+	.	.	.
<i>Cirsium palustre</i>	.	.	1/+	1/+	.	2/+	.	.	.
<i>Lytchrum salicaria</i>	.	.	3/+	.	.	3/+	.	.	.
<i>Myosotis palustris</i>	.	.	1/+	.	.	1/1	.	.	.
<i>Caltha palustris</i>	.	.	.	1/+	.	1/+	1/+	.	2/2
<i>Holcus lanatus</i>	.	.	.	.	.	1/1	.	1/2	.
<i>Cnidium dubium</i>	.	.	.	.	.	1/+	.	1/+	.
<i>Lemnetea:</i>									
<i>Utricularia vulgaris</i>	.	1/+	1/1	.	.	.	.	.	.

<i>Alnetea glutinosae</i> :									
<i>Lycopus europaeus</i>	.	.	.	1/+	.	1/+	.	.	.
Other:									
<i>Potentilla erecta</i>	2/+-1	.	.	.	1/+	3/+-1	.	1/+	.
<i>Mentha aquatica</i>	.	.	.	.	.	1/+	.	.	.
Bryophytes:									
<i>Carielgonella cuspidata</i>	.	3/1	.	2/3-5	3/2-3	4/+-1	.	.	1/4
<i>Plagiomnium affine</i>	.	.	.	2/3	2/1-2	2/2-3	.	1/4	.
<i>Climacium dendroides</i>	.	.	.	1/1	.	2/1	.	.	.
<i>Aulacomium palustre</i>	.	.	.	.	.	1/1	.	.	.
<i>Calliergon giganteum</i>	.	.	.	.	.	2/2	.	1/5	.
<i>Marchantia polymorpha</i>	.	.	.	.	.	1/+	.	.	.

Accompanying species recorded in the Table once: trees and shrubs: 1 – *Salix pentandra* b 1/1; 13 – *Alnus glutinosa* b 1/+; 14 – *Betula humilis* b 2/1; *Charetea*: 12 – *Chara intermedia* 1/1; *Potametea*: 10 – *Stratiotes aloides* 1/1; 10 – *Scheuchzerio-Caricetea nigrae*: 15 – *Calamagrostis neglecta* 1/+; *Molinio-Arrhenatheretea*: 9 – *Molinia caerulea* 2/+-1, *Stachys palustris* 1/+; *Lemnetea*: 10 – *Lemna trisulca* 1/1; 11 – *Filipendula ulmaria* 1/+, *Juncus effusus* 1/+; 14 – *Lychnis flos-cuculi* 1/+, *Poa pratensis* 1/+, *Ranunculus acris* 1/+, *Plantago lanceolata* 1/+, *Succisa pratensis* 1/+, *Viccia cracca* 1/+, *Poa trivialis* 1/+, *Sanguisorba officinalis* 1/+; 15 – *Prunella vulgaris* 1/+, *Briza media* 1/+, *Medicago lupulina* 1/+, *Ostericum palustre* 1/1; *Alnetea glutinosae*: *Solanum dulcamara* 1/+; Other: 14 – *Dactylorhiza incarnata* 1/+, *Mentha aquatica* 1/+; 17 – *Carex caespitosa* 1/3.

Table 3. Floristic composition of communities from the classes *Scheuchzerio-Caricetea nigrae* (Nordh. 1937) R.Tx. 1937, *Molinio-Arrhenatheretea* RTx. 1937, *Alnetea glutinosae* Br.-Bl. et R.Tx. 1943 18 – *Menyanthes trifoliata* community, 19 – *Comarum palustre* community, 20 – *Caricetum lasiocarpae* Koch 1926, 21 – *Caricetum diandrae* Jon. 1932 em. Oberd 1957, 22 – *Carex panicea* community, 23 – *Caricetum davallianae* Dutoid 1924 em. Görs 1963, 24 – *Molinietum caeruleae* W.Koch 1926, 25 – *Cirsietum rivularis* Nowiński 1927, 26 – *Caricetum caespitosae* (Steffen 1931) Klika et Šmarda 1940, 27 – *Holcus lanatus* community, 28 – *Betulo-Salicetum repentis* Oberd. 1964

Association number	18	19	20	21	22	23	24	25	26	27	28
Cover of layer b in %	.	.	5–20	.	40	0–10	5–40	.	.	.	80
Cover of layer c in %	100	100	60–100	100	70	80–100	80–100	100	80–100	100	20
Cover of layer d in %	20	.	10–70	40	40	50–90	20	20	80	40–80	30–80
Number of phytosociological relevés	1	1	11	2	1	17	8	1	2	2	2
<i>Salix cinerea</i> b	.	.	4/+1	1/+	1/+	5/+	2/+	.	.	.	2/1
<i>Frangula alnus</i> b	.	.	4/1	.	1/2	10/+	6/+1	.	.	.	2/3
<i>Betula pubescens</i> b	.	.	1/+	.	.	5/+	3/+2	.	.	.	2/1
<i>Salix pentandra</i> b	.	.	.	1/+	.	1/+	.	.	.	.	.
28. <i>Salix rosmarinifolia</i> b	.	.	6/+1	.	1/1	6/+	3/+2	.	.	.	2/+2
28. <i>Betula humilis</i> b	.	.	2/+2	.	1/+	7/+1	3/+1	.	.	.	2/3-4
18. <i>Menyanthes trifoliata</i>	1/5	.	4/+2	.	.	2/+1	1/+	.	.	.	.
19. <i>Comarum palustre</i>	1/+	1/4	9/+2	1/+	1/+	6/+	4/+	.	1/+	1/+	.
20. <i>Carex lasiocarpa</i>	.	.	11/3-5	1/4	.	16/1	1/2	.	.	.	.
21. <i>Carex diandra</i>	.	.	.	2/3-5	.	.	.	.	.	.	.
22. <i>Carex panicea</i>	.	.	8/+2	.	1/4	13/+3	3/+1	.	1/2	1/+	1/+
23. <i>Carex davalla</i>	.	.	5/+3	.	.	17/3-4	5/1-3	.	.	1/1	1/1
24. <i>Molinia caerulea</i>	.	.	4/+2	.	1/+	7/+3	8/4-5	.	.	.	2/+1
25. <i>Cirsium rivulare</i>	.	.	.	.	.	1/+	.	1/4	.	.	.
26. <i>Carex caespitosa</i>	.	.	1/2	.	.	.	.	.	2/4-5	.	.
27. <i>Holcus lanatus</i>	.	.	.	.	.	3/+	2/+	1/2	.	2/3	.
<i>Caricetalia nigrae</i>											
<i>Carex nigra</i>	1/+	.	.	.	.	9/+1	1/+	1/1	1/+	2/1-2	.
<i>Carex flava</i>	.	.	3/+2	.	.	13/+3	4/+1	1/+	2/+2	1/2	.
<i>Carex lepidocarpa</i>	.	.	2/+1	.	.	5/+	.	.	.	.	.
<i>Parnassia palustris</i>	.	.	.	.	.	3/+	.	.	.	.	.

<i>Pinguicula vulgaris</i>	.	.	.	.	.	1/+	.	.	.	.	.
<i>Epipactis palustris</i>	.	.	.	.	.	2/+	.	.	.	.	.
<i>Ranunculus flammula</i>	.	.	.	.	.	.	.	.	1/+	.	.
<i>Scheuchzerio-Caricetea nigrae:</i>											
<i>Eriophorum angustifolium</i>	.	.	3/+	.	.	13/+2	1/+	.	2/+1	.	.
<i>Agrostis canina</i>	.	.	2/+	.	.	.	.	.	.	.	.
<i>Triglochin palustre</i>	.	.	.	.	.	2/+	.	.	1/+	.	.
<i>Pedicularis sceptrum-carolinum</i>	.	.	.	.	.	1/+1	1/1	.	.	.	.
<i>Filipendulion:</i>											
<i>Lysimachia vulgaris</i>	1/+	.	11/+2	1/+	1/+	14/+1	7/+2	1/+	2/+	1/+	1/+
<i>Lythrum salicaria</i>	.	.	7/+1	.	.	11/+	4/+	.	1/+	.	.
<i>Valeriana officinalis</i>	.	.	.	.	.	6/+	1/+	.	.	.	.
<i>Filipendula ulmaria</i>	.	.	.	.	.	1/+	.	1/+	.	.	.
<i>Molinietalia:</i>											
<i>Cirsium palustre</i>	.	.	4/+	.	1/+	10/+	5/+1	.	.	2/+	1/+
<i>Equisetum palustre</i>	.	.	2/+	.	.	2/+	2/+	3/+	.	1/+	1/+
<i>Sanguisorba officinalis</i>	.	.	.	.	.	10/+1	3/+	2/+	.	.	.
<i>Deschampsia caespitosa</i>	.	.	.	.	.	.	1/1	1/1	.	.	.
<i>Lychnis flos-cuculi</i>	.	.	.	.	.	.	.	2/+	.	1/+	.
<i>Molinion:</i>											
<i>Succisa pratensis</i>	.	.	3/+	.	.	6/+	1/+	.	.	.	.
<i>Cnidion dubii:</i>											
<i>Cnidium dubium</i>	.	.	.	.	.	5/+	1/+	.	.	.	.
<i>Briza media</i>	.	.	.	.	.	10/+1	2/+	/+	.	1/+	.
<i>Calthion:</i>											
<i>Juncus effusus</i>	.	.	4/+	.	.	3/+	.	1/+	1/+	2/+	.
<i>Caltha palustris</i>	.	.	1/+	.	.	1/+	.	.	2/+1	2/+	.
<i>Geum rivale</i>	.	.	.	.	.	4/+	2/+1	2/+2	.	2/+	.
<i>Crepis paludosa</i>	.	.	.	.	.	3/+	1/+	1/2	.	.	.
<i>Epilobium palustre</i>	.	.	.	.	.	1/+	.	.	.	.	.
<i>Myosotis palustris</i>	.	.	.	.	.	.	.	1/+	.	2/+	.
<i>Polygonum bistorta</i>	.	.	.	.	.	.	.	1/2	.	.	.
<i>Arrhenatheretalia:</i>											

<i>Daucus carota</i>	.	.	.	.	.	.	.	1/+	.	.	.
<i>Lotus corniculatus</i>	.	.	.	.	.	.	.	1/+	.	.	.
Cynosurion:											
<i>Trifolium repens</i>	.	.	.	.	.	2/+	.	.	.	2/+	.
Trifolio fragiferae-Agrostietalia stoloniferae:											
<i>Agrostis stolonifera</i>	.	.	1/+	.	.	1/+	.	.	.	2/+	.
<i>Potentilla reptans</i>	.	.	.	.	.	.	.	1/+	1/1	.	.
<i>Carex hirta</i>	.	.	.	.	.	.	.	1/+	.	1/1	.
<i>Carex distans</i>	.	.	.	.	.	.	.	1/+	.	.	.
<i>Potentilla anserina</i>	.	.	.	.	.	.	.	1/+	.	.	.
<i>Ranunculus repens</i>	.	.	.	.	.	.	.	.	.	2/+	.
Molinio-Arrhenatheretea:											
<i>Prunella vulgaris</i>	.	.	1/+	.	.	5/+	1/+	.	.	.	.
<i>Festuca rubra</i>	.	.	.	.	.	1/1	.	2/1-2	.	2/2	.
<i>Trifolium pratense</i>	.	.	.	.	.	2/+	.	.	.	1/+	.
<i>Ranunculus acris</i>	.	.	.	.	.	1/+	.	2/+	2/+	2/+	.
<i>Lathyrus pratensis</i>	.	.	.	.	.	.	1/+	2/+	.	1/+	.
<i>Cerastium holsteoides</i>	.	.	.	.	.	.	.	2/+	.	1/+	.
<i>Poa trivialis</i>	.	.	.	.	.	.	.	1/1	.	.	.
<i>Plantago lanceolata</i>	.	.	.	.	.	.	.	2/+	.	1/+	.
Accompanying:											
Phragmieteae:											
<i>Carex rostrata</i>	1/+	.	.	1/+	.	1/+	.	.	.	.	.
<i>Equisetum fluviatile</i>	1/+	.	2/+	.	2/+	7/+-1	6/+-1	.	.	.	.
<i>Eleocharis palustris</i>	1/+	.	.	.	.	.	.	.	.	1/+	.
<i>Phragmites australis</i>	.	.	10/+-3	.	1/2	12/+-2	3/+-2	.	.	.	2/+
<i>Carex appropinquata</i>	.	.	1/+	.	1/1	3/+-2	.	.	.	.	.
<i>Carex gracilis</i>	.	.	3/+	.	.	.	1/+	2/+	2/+-1	.	.
<i>Galium palustre</i>	.	.	6/+	2/+	.	14/+	5/+	.	2/+	2/+	1/+
<i>Peucedanum palustre</i>	.	.	3/+	2/+	1/+	3/+	4/+	.	.	.	.
<i>Scutellaria galericulata</i>	.	.	1/+	1/+	.	4/+	3/+	1/+	.	.	.
<i>Thelypteris palustris</i>	.	.	1/2	.	.	1/+	1/2	.	.	.	.
<i>Lysimachia thyrsiflora</i>	.	.	.	1/+	.	1/+	.	.	1/+	.	.

<i>Alnetea glutinosae</i> :											
<i>Lycopus europaeus</i>	.	.	5/+	.	.	4/+	4/+	.	.	1/+	.
Other:											
<i>Galium verum</i>	.	.	1/+	.	.	.	1/+	1/+	.	.	.
<i>Dactylorhiza incarnata</i>	.	.	5/+	.	.	9/+-1	2/+	.	.	.	.
<i>Potentilla erecta</i>	.	.	5/+-1	.	.	16/+-3	5/+-2	.	.	.	.
<i>Mentha aquatica</i>	.	.	6/+	.	.	4/+	.	.	2/+	1/+	.
<i>Dactylorhiza maculata</i>	.	.	.	.	.	3/+	1/+	1/+	.	.	.
<i>Anthoxanthum odoratum</i>	.	.	.	.	.	3/+	1/+	1/+	.	.	.
Bryophytes:											
<i>Calliergonella cuspidata</i>	1/1	1/1	4/+-2	1/2	1/1	6/1-4	3/2-3	.	.	2/2-5	.
<i>Plagiommium affine</i>	.	1/1	.	1/2	.	6/+-2	.	1/+	.	.	.
<i>Aulacomum palustre</i>	.	1/+	.	.	.	1/1	1/1	.	.	.	.
<i>Leptodictyum riparium</i>	.	.	2/1	1/1	.	.	.	.	.	2/1-2	.
<i>Campylium stellatum</i>	.	.	4/+-2	.	1/2	3/2-3	.	.	.	.	.
<i>Calliergon giganteum</i>	.	.	3/1	.	.	.	.	.	.	.	.
<i>Drepanocladus aduncus</i>	.	.	2/1-2	.	.	.	.	.	.	.	.
<i>Climacium dendroides</i>	.	.	.	.	.	2/2	1/+	.	.	.	.
<i>Fissidens adianthoides</i>	.	.	.	.	.	3/1-3	.	.	.	.	.
<i>Bryum caespitosum</i>	.	.	.	.	.	4/+-2	.	.	.	.	.
<i>Marchantia polymorpha</i>	.	.	.	.	.	1/1	.	.	.	.	.

Accompanying species recorded in the Table once: trees and shrubs: 28 – *Betula pendula* b 1/1, 23 – *Quercus robur* 5/+, *Viburnum opulus* 1/+; *Phragmitetea*: 19 – *Typha latifolia* 1/1; 20 – *Carex acutiformis* 1/2, *Carex elata* 1/3, *Carex disticha* 1/2, *Ranunculus lingua* 2/+; 24 – *Scrophularia umbrosa* 1/+; 26 – *Iris pseudacorus* 1/+; *Alnetea glutinosae*: 20 – *Calamagrostis canescens* 1/+; Other: 18 – *Stratiotes aloides* 1/2, 19 – *Lemna trisulca* 1/2, *Utricularia vulgaris* 1/1, 23 – *Dactylorhiza majalis* 1/+, 24 – *Cirsium arvense* 1/+, *Galium aparine* 1/+, 25 – *Veronica chamaedrys* 1/+.

The alliance *Magnocaricion* was represented by 7 associations (Tab. 2). Local depressions of the terrain were the sites for the following associations: *Caricetum acutiformis*, *Caricetum gracilis*, *Caricetum elatae*, *Caricetum appropinquatae*, and less frequently – *Caricetum rostratae*, *Caricetum vesicariae* and *Caricetum distichae*. Small patches of *Thelypteridi-Phragmitetum* and *Cicuto-Caricetum pseudocyperi* phytocoenoses formed at the banks of the peat lakes. Among the phytocoenoses mentioned above, the presence of the *Caricetum distichae* association, rarely reported from Poland [Tomaszewski 1979, Matuszkiewicz 2005, Grzelak and Bocian 2011] and the region of Lubelszczyzna [Fijałkowski and Chojnacka-Fijałkowska 1990], is worth emphasising. The key component of this association and, at the same time, the dominant species is *Carex disticha* (70–90% cover). A relatively sparse admixture is constituted by species from the class *Phragmitetea* and *Molinio-Arrhenatheretea*.

The class *Scheuchzerio-Caricetea fuscae* was represented by 2 associations and 3 communities (Tab. 3). The area of some slight depressions and former peat excavation pits was covered by loose turf formed by *Comarum palustre* and *Menyanthes trifoliata* with an admixture of rush species from the class *Phragmitetea*. Patches of *Caricetum diandrae* formed a narrow belt on the banks of some peat lakes.

Patches of the *Caricetum lasiocarpae* and *Caricetum davallianae* associations were formed on the wet meadows (Tab. 3). *Carex lasiocarpa* dominated in the former association and the admixture included species from the classes *Scheuchzerio-Caricetea fuscae*, *Phragmitetea* and *Molinio-Arrhenatheretea*. The latter association was characterized by predominance of *Carex davalliana* (40 to 70% density). Among the accompanying species, those from the classes *Scheuchzerio-Caricetea nigrae*, *Phragmitetea* and *Molinio-Arrhenatheretea* had the greatest share. Patches dominated by *Carex panicea* were reported on some meadows.

Meadow phytocoenoses from the class *Molinio-Arrhenatheretea* were most frequently represented by the association *Molinietum caeruleae*, with predominance of the *Molinia caerulea* species, reaching density in the range of 60 to 100%. The admixture was usually composed of meadow species from the class *Molinio-Arrhenatheretea*. Other associations – *Cirsietum rivularis* and *Caricetum caespitosae*, and the community *Holcus lanatus* formed small patches.

Former peat excavation pits and the areas at the peat lake banks (heavily waterlogged sites) contained small patches of scrub communities from the class *Alnetea glutinosae* (*Betulo-Salicetum repentis* association). Narrow dykes between some peat lakes were overgrown by trees – *Alnus glutinosa*, *Betula pubescens* and *B. pendula*, and shrubs – *Frangula alnus*, *Salix cinerea* and *Betula humilis*.

Due to the ongoing secondary swamp-forming process on the study meadows, succession from class *Molinio-Arrhenatheretea* communities towards the communities from the class *Phragmitetea* was reported. Distribution and floristic diversity of the study phytocoenoses was related to not only the soil, water and topographic conditions, but also land management. Abandonment of mowing the excessively wet meadows resulted in spread of reed and sedge rushes.

Due to lack of maintenance, some drainage ditches were overgrown by vegetation from the classes *Phragmitetea* and *Alnetea glutinosae*. Similar relationships in other grassland objects were demonstrated in the work of Załuski and Kamińska [1999], Młynarczyk *et al.* [2001], Trąba [2001], and Grzelak *et al.* [2008].

Localities of 18 legally protected species were found in the study bog area (Tab. 4). Some of them are included in „The Polish Red Data Book of Plants” [Każmierczakowa and Zarzycki 2001], and „The Red List of Plants and Fungi in Poland” [Mirek *et al.* 2006].

Table. 4. List of legally protected species categories of threat: * CR – critically endangered, EN – endangered and vulnerable, **E – extinct, critically endangered, V – vulnerable, I – not evaluated

Species	Species protection ◊◊ – strict ◊ – partial	Annex II of the Habitats Directive Natura 2000	Polish Red Data Book of Plants	Red List of Plants and Fungi in Poland
<i>Aulacomium palustre</i> .	◊		-	
<i>Betula humilis</i>	◊◊	-	EN*	V**
<i>Carex davalliana</i>	◊◊	-	-	V
<i>Caliergonella cuspidata</i>	◊	-	-	-
<i>Climacium dendroides</i>	◊	-	-	-
<i>Dactylorhiza incarnata</i>	◊◊	-	-	-
<i>Dactylorhiza maculata</i>	◊◊	-	-	V
<i>Dactylorhiza majalis</i>	◊◊	-	-	-
<i>Dianthus superbus</i>	◊◊	-	-	V
<i>Epipactis palustris</i>	◊◊	-	-	V
<i>Frangula alnus</i>	◊	-	-	-
<i>Menyanthes trifoliata</i>	◊	-	-	-
<i>Nitella opaca</i>	◊◊	-	-	I
<i>Ostericum palustre</i>	◊◊	+	EN	V
<i>Pedicularis sceprium-carolinum</i>	◊◊	-	-	E
<i>Pinguicula vulgaris</i> ssp. <i>bicolor</i>	◊◊	-	CR	V
<i>Utricularia intermedia</i>	◊◊	-	-	V
<i>Utricularia vulgaris</i>	◊◊	-	-	-

Habitats from Annex I of the Habitats Directive Natura 2000 were reported from the study bog (3140 Hard oligo-mezotrophic waters with benthic vegetation of Chara formations, 6410 Molinia meadows on chalk and clay, 7230 Alkaline fens). Additionally, one species (*Ostericum palustre*) from Annex II of the Habitats Directive Natura 2000 was found.

CONCLUSIONS

1. The study objects are characterized by great diversity of plant communities, which, in terms of phytosociology, belong to the following classes: *Cha-*

reteae, *Potameteae*, *Phragmiteteae*, *Utricularietea intermedio-minoris*, *Scheuchzeria-Cariceteae fuscae*, *Molinio-Arrhenathereteae* and *Alnetea glutinosae*.

2. Plant communities at various developmental stages were found in the peat lakes, which is associated with their age, depth and size, and with the type of peat deposits. A process of regeneration of peat-bearing communities, initiated mainly by the rush communities from the class *Phragmiteteae*, was observed.

3. Abandonment of mowing of the excessively wet meadows and lack of maintenance of drainage ditches promotes the spread of reed and sedge rushes, and scrub communities.

4. Legally protected species occurred in the bog. The localities of *Ostericum palustre*, a species from Annex II of the Habitats Directive Natura 2000, deserve special attention.

REFERENCES

- Borowiec J., 1990. The peat-bogs on the Lublin region (in Polish). Wyd. LTN, pp. 348.
- Braun-Blanquet J., 1951. Pflanzensoziologie. Springer Verlag, Wien, pp. 631.
- Fijałkowski D., Chojnacka-Fijałkowska E., 1990. Zbiorowiska z klas *Phragmiteteae*, *Molinio-Arrhenathereteae* i *Scheuchzeria-Cariceteae fuscae* w makroregionie lubelskim, Wyd. PWN, Warszawa, pp. 414.
- Grzelak M., Bocian T., 2011. Zbiorowiska roślinne doliny Noteci Bystrej – stopień ich zagrożenia, syngeneza i rozpowszechnienie. Woda-Środowisko-Obszary Wiejskie, 11, 1(33), 87–96 (in Polish).
- Grzelak M., Janyszek M., Kaczmarek Z., Bocian T., 2008. Kształtowanie się różnorodności zbiorowisk szuwarowych z klasy *Phragmiteteae* pod wpływem warunków siedliskowych. Woda-Środowisko-Obszary Wiejskie, 8, 1(22), 99–108.
- Gawlik J., Urban D., 2003. Geneza torfowisk. Typologia torfowisk. Stratygrafia złóż z wyróżnieniem rodzajów torfów tworzących ich profile, w: Przyrodnicze podstawy ochrony i odnowy ekosystemów wodnotorfowiskowych w obszarze funkcjonalnym Poleskiego Parku Narodowego na tle antropogenicznych przekształceń środowiska przyrodniczego (red. Radwan S.). Rozprawy i Monografie. Acta Agrophysica, 91, 131–143.
- Grzywna A., Urban D., 2008. Zróżnicowanie florystyczne i fitosocjologiczne zbiorowisk szuwarowych dolin Ochozy i Bobrówki. Woda-Środowisko-Obszary Wiejskie, 8, 1, 109–116.
- Illicki P., 1996. Spontaneous renaturalisation of vegetation on cut-over raised bogs. Prz. Przyrod., 7, 3–4, 113–127.
- Karczmarz K., Malicki J., 1968. Rozmieszczenie mniej znanych ramienic na Lubelszczyźnie. Annales UMCS, sectio B, 20, 281–291.
- Karczmarz K., Malicki J., 1971. Zespoły i ekologia ramienic Pojezierza Łęczyńsko-Włodawskiego. Annales UMCS, sectio C, 20, 297–327.
- Kaźmierczakowa R., Zarzycki K. (red.), 2001. Polish red data book of plants. Pteridophytes and flowering plants (in Polish). W. Szafer Inst. of Botany, Polish Academy of Sciences, Kraków, pp. 664.
- Kondracki J., 2002. Geografia regionalna Polski. Wyd. Nauk. PWN, Warszawa.
- Matuszkiewicz W., 2005. A guide for marking Poland's plant communities (in Polish). Wyd. Naukowe PWN, pp. 536.
- Mirek Z., Piękoś-Mirkowa H., Zając A., Zając M., 2002. Flowering plants and pteridophytes of Poland a checklist (in Polish). W. Szafer Inst. of Botany, Polish Academy of Sciences, Kraków, pp. 442.

- Mirek Z., Zarzycki K., Wojewoda W., Szelaż Z., 2006. Red list of plants and fungi in Poland (in Polish). W. Szafer Inst. of Botany, Polish Academy of Sciences, Kraków, pp. 99.
- Młynarczyk K., Korona A., Marks E., 2001. Zmiany w fitocenozach łąkowych wywołane ograniczeniem lub zaniechaniem ich użytkowania. Zesz. Probl. Post. Nauk Roln. 478, 471–477.
- Mosek B., Miazga S., 1999. Flora of peat pits on Pojezierze Łęczyńsko-Włodawskie (in Polish). Fol. Univ. Stetin. 197 Agricultura (75), 233–238.
- Pełechaty M., Pukacz A., 2008. Klucz do oznaczania gatunków ramienic (*Charales*) w rzekach i jeziorach. Biblioteka Monitoringu Środowiska, Warszawa.
- Podbielkowski Z., 1960. The development of vegetation in peat pits (in Polish). Monogr. Bot. 10(1), pp. 144.
- Sugier P., 2006. Peat pits vegetation of peatlands in the Polesie National Park and its protected zone. Teka Kom. Ochr. Środ. Przyr. OL PAN, 3, 203–208.
- Tomaszewicz H., 1979. Poland's water and rush vegetation (in Polish). Wyd. UW, Warszawa, pp. 324.
- Trąba Cz., Wójcikiewicz M., Wolański P., 2004. Spontaneous renaturalisation of the „Broduszurki” peatland on Dynów Plateau (in Polish). Woda-Środowisko-Obszary Wiejskie, 4, 263–377.
- Urban D., 1999a. Floristic and phytosociological diversity of peatbogs in the river-basin of Piskornica in Małe Mazowsze Region (in Polish). Fol. Univ. Agric. Stetin. 197 Agricultura (75), 335–338.
- Urban D., 1999b. Vegetation of small peatbogs in the selected river valleys of Lublin Upland (in Polish). Fol. Univ. Agric. Stetin. 197 Agricultura (75), 339–344.
- Urban D., 2007. Floristic and phytosociological values of peat pits in the area of Komaszycy (The Chodel Basin). Teka Kom. Ochr. Środ. Przyr. OL PAN, 4, 278–284.

CHARAKTERYSTYKA ZBIOROWISK ROŚLINNYCH ZACHODNIEJ CZĘŚCI TORFOWISKA GARBATÓWKA (POJEZIERZE ŁĘCZYŃSKO-WŁODAWSKIE)

Streszczenie. Badany fragment torfowiska leży na Pojezierzu Łęczyńsko-Włodawskim w pobliżu miejscowości Garbatówka. Wchodzi w skład obszaru Natura 2000 Jeziora Uściwierskie. Celem badań było zarejestrowanie występujących tu zespołów roślinnych oraz rzadkich i objętych ochroną prawną gatunków roślin. Omawiany obiekt charakteryzował się dużym zróżnicowaniem zbiorowisk roślinnych. Stwierdzono tu występowanie 25 zespołów i 3 zbiorowisk roślinnych z klas *Charetea*, *Potametea*, *Utricularietea intermedio-minoris*, *Phragmitetea*, *Scheuchzerio-Caricetea fuscae*, *Molinio-Arrhenatheretea* i *Alnetea glutinosae*. Do najcenniejszych fitocenoz należały podwodne łąki ramienicowe z klasy *Charetea*, a także zbiorowiska z klasy *Scheuchzerio-Caricetea fuscae* (np. *Caricetum lasiocarpae* i *Caricetum davalliana*). Spośród gatunków roślin objętych ochroną prawną stwierdzono tu stanowiska: *Betula humilis*, *Carex davalliana*, *Dactylorhiza incarnata*, *Dactylorhiza maculata*, *Dactylorhiza majalis*, *Dianthus superbus*, *Epipactis palustris*, *Frangula alnus*, *Pedicularis sceptrum-carolinum*, *Ostericum palustre*, *Pinguicula vulgaris* ssp. *bicolor*, *Utricularia intermedia*, *Utricularia vulgaris*, *Menyanthes trifoliata*, *Climacium dendroides*, *Caliergonella cuspidata* i *Aulacomium palustre* oraz *Nitella opaca*.

Słowa kluczowe: torfowisko niskie, zbiorowiska roślinne, rzadkie gatunki roślin, torfowisko Garbatówka