

AQUATIC AND MARSH VEGETATION (*POTAMETEA* AND *PHRAGMITO-MAGNOCARICETEA*) IN VICINITY OF THE HLOHOVEC TOWN

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Súhrn: Vodná a močiarna vegetácia (*Potametea* a *Phragmito-Magnocaricetea*) v blízkom okolí Hlohovca. Na jednotlivých lokalitách bolo nájdených 7 spoločenstiev tried *Potametea* a *Phragmito-Magnocaricetea*: *Nymphaetum albo-luteae*, *Phragmitetum vulgaris*, *Typhetum angustifoliae*, *T. latifoliae*, *Sparganietum erecti*, *Caricetum gracilis* a porasty s *Phalaroides arundinacea*. Porasty s *Phragmites australis* sa uplatňujú aj na antropogénnych stanovištiach, v depresiách poľnohospodárskych polí.

Key words: Slovakia, plant communities

Introduction

Feráková et al. (1966) published a proposal for conservation of the botanically important locality Sedliská. This locality has been declared as Protected Finding Site in 1974. Feráková (1967) studied the flora of environs of Hlohovec Town. Vavro (1979) performed research of flora of floodplain forests by highway. The work of Vavro (1986) presented rare and endangered species of the floodplain forests.

Recently research focus to area situated in and out of floodplain of the Váh River (Malovcová-Staníková 2003, 2004; Malovcová 2005, 2006).

The goal of the work is to present new knowledge about spreading of the communities of the *Potametea* and *Phragmito-Magnocaricetea* in vicinity of the Hlohovec town.

Communities form physiognomically homogeneous stands. They are species poor communities. Their appearance is formed by dominant species.

Studied area

Hlohovec Town is situated on south border of Považský Inovec Mountains, on left shore of the Váh River (48° 26' N 35° 29' E, at the elevation of 156 m). It is surrounded by two geographical units Považský Inovec Mountains and Podunajská nížina Lowland. The phytocoenological research was carried in Nitrianska pahorkatina and Trnavská pahorkatina Heights. The mean temperature of the coldest month (January) is 1,5 °C, the mean temperature of the warmest month (July) is 20,0 °C, and the mean yearly temperature is 9,4 °C. The yearly average precipitation attains 585 mm (Feráková et al. 1968). Phytogeographically this area is characterized by the Praecarpathian flora and the Eupannonian xerothermic flora (Futák 1966, 1984).

Material and methods

In the years 2003, 2004 and 2005 the phytocoenological relevés were made. The methods of Zurich-Montpellier School (Braun-Blanquet 1964) were used during the field research of plant communities and the data processing. The seven-degree Braun-Blanquet's scale was used to estimate the abundance and dominance of the plant species.

The data were put into the database of phytocoenological relevés in the program TURBOVEG (Hennekens 1996a). The phytocoenological table was edited in the program MEGATAB (Hennekens 1996b).

The names of the plants are in accordance with the Checklist of non-vascular and vascular plants of Slovakia (Marhold, Hindák 1998). The names of the plant communities from the classes *Potametea* and *Phragmito-Magnocaricetea* are presented according to Ořáhelová (1995) and Ořáhelová et al. (2001). The categories of threat and rareness for the vascular plants are stated by the review of Feráková et al. (2001).

Results and discussion

Syntaxonomical survey of plant communities

Class: *Potametea* R. Tx. et Preising 1942

Order: *Potametalia* Koch 1926

Alliance: *Nymphaeion albae* Oberd. 1957

1. as.: *Nymphaetum albo-luteae* Nowiński 1928

Class : *Phragmito-Magnocaricetea* Klika in Klika et Novák 1941

Order: *Phragmitetalia* Koch 1926

Alliance: *Phragmition communis* Koch 1926

2. as.: *Phragmitetum vulgare* von Soó 1927

3. as.: *Typhetum angustifoliae* Pignatti 1953

4. as.: *Typhetum latifoliae* Lang 1973

5. as.: *Sparganietum erecti* Roll 1938

Alliance: *Magnocaricion elatae* Koch 1926

Suballiance: *Caricion gracilis* (Neuhäusl 1959) Oberd. et al. 1967

6. as.: *Caricetum gracilis* Almquist 1929

7. stands with *Phalaroides arundinacea*

1. *Nymphaetum albo-luteae*

Stands of community occur in stagnant and slow-flowing waters of river oxbows of the studied area. Their water regime is relatively dynamic. Stands with dominant species *Nuphar lutea* tolerate fluctuation of water level well.

The community borders on discontinuity stands of class *Lemnetea* de Bolós et Masclans 1955 and in the direction of drier environment (landwards) on associations of the class *Phragmito-Magnocaricetea*.

The recorded vulnerable species are *Myriophyllum verticillatum* (VU) and *Nuphar lutea* (VU). This association is a rare community in the studied area.

The floristic composition of the community is documented by the following relevé:

Relevé No. 1: Hlohovec – Šulekovo, 1 km behind the village, floodplain of the Váh River, the river oxbow; the sampled area of 25 m²; the cover of E_c 90%; July 24, 2004: *Nuphar lutea* 5, *Myriophyllum verticillatum* 3.

2. *Phragmitetum vulgaris*

Stands of the community occur in a littoral zone of open water areas and in ceased (silted) river oxbows. This community has wide ecological amplitude, its water regime is dynamic. The stands are flooded mainly during spring. The vegetation tolerates both autumn and winter drainages. The *Phragmitetum vulgaris* represent often the first silting stadium of the standing waters, it participates in terrestrialisation process.

The community borders on associations of the alliance *Phragmition communis* and in the direction of water environment (waterwards) on associations of class *Potametea*. It is built on dominancy of the species *Phragmites australis* and on the diagnostic species of the class *Phragmito-Magnocaricetea* (Tab. 1). The average cover of the stands is 99%. The average number of species in the relevé is 7.

There is a small occurrence of vulnerable species: *Butomus umbellatus* (VU). The stands of community belong to the most abundant communities in the studied area, because there are adapted to secondary habitats – depressions in fields. The relevés were made in the river oxbows only.

From the territory of Nitrianska pahorkatina Heights, *Phragmitetum vulgaris* was described (Ripka 1999).

Relevé number	1 2 3 4 5 6 7 8	S
Relevé area (m ²)	2 2 2 2 2 2 2 2	
	5 5 5 5 5 5 5 5	
<i>Phragmito-Magnocaricetea, Phragmitetalia</i>		
<i>Lythrum salicaria</i>	1 + + +	III
<i>Alisma plantago-aquatica</i>	1 + .	II
<i>Butomus umbellatus</i>	3 1	II
<i>Lycopus europaeus</i> + + .	II
<i>Mentha aquatica</i> + . +	II
<i>Stachys palustris</i>	. + +	II
<i>Epilobium palustre</i> r .	I
<i>Lysimachia vulgaris</i>	3	I
<i>Phalaroides arundinacea</i>	1	I
<i>Phellandrium aquaticum</i>	+	I
<i>Scutellaria galericulata</i>	1	I
<i>Typha angustifolia</i> + . .	I
<i>Phragmition communis, Phragmitetum vulgaris</i>		
<i>Phragmites australis</i>	5 5 5 5 5 5 5 5	V
The constant taxa		
<i>Calystegia sepium</i>	2 3 2 3 2 3 . .	IV
Other taxa		
<i>Galium aparine</i>	. 1 + . 1 . . .	II
<i>Rubus caesius</i>	1 . 1 . + . . .	II

Tab. 1 *Phragmitetum vulgaris* in the vicinity of Hlohovec Town

Appendix 1:

Tab. 1. Species found only in one relevé:

Agrostis stolonifera - 1 (7); *Aster species* - + (7); *Bidens frondosa* - + (7); *Calamagrostis epigejos* - + (1); *Cirsium arvense* - + (7); *Coryza canadensis* - + (7); *Humulus lupulus* - + (3); *Juncus articulatus* - + (7); *Plantago uliginosa* - 2 (7); *Poa trivialis* - + (1); *Rumex crispus* - + (1); *Sonchus oleraceus* - r (7); *Symphytum officinale* - 1 (1); *Tanacetum vulgare* - r (7); *Thalictrum aquilegifolium* - 1 (1); *Urtica dioica* - + (5).

Localities of the relevés and other information about the phytocoenological relevés:
(relevé number, village/town, locality, cover herb layer, date)

1. Hlohovec, northwest of the town, Koží vrch Top, floodplain of the Váh River, the ceased river oxbow, treated for drainaging; E₁ 100 %; July 22, 2005
2. Hlohovec, northwest of the town, Koží vrch Top, floodplain of the Váh River, the ceased river oxbow, treated for drainaging; E₁ 100 %; July 22, 2005
3. Hlohovec, northwest of the town, Koží vrch Top, floodplain of the Váh River, the ceased river oxbow, treated for drainaging; E₁ 100 %; July 22, 2005
4. Hlohovec, northwest of the town, Koží vrch Top, floodplain of the Váh River, the ceased river oxbow, treated for drainaging; E₁ 100 %; July 22, 2005
5. Hlohovec, northwest of the town, Koží vrch Top, floodplain of the Váh River, the ceased river oxbow, treated for drainaging; E₁ 100 %; July 22, 2005
6. Hlohovec – Šulekovo, near the village, floodplain of the Váh River, the river oxbow; E₁ 100 %; July 24, 2004
7. Hlohovec, southwest of the town, floodplain of the Váh River, the river oxbow; E₁ 95 %; June 29, 2003
8. Hlohovec – Šulekovo, near the village, floodplain of the Váh River, the river oxbow; E₁ 100 %; July 24, 2004

3. *Typhetum angustifoliae*

Stands of the community occur in the littoral zone of open water areas of the studied area. Their water regime is fluctuating during the vegetation period. They tolerate fall in water well, shortly under surface of soil too. The community is hemerophile. It participates in terrestrialisation process.

The community borders on associations of the alliance *Phragmition communis* and of the classes *Potametea* and *Lemnetea*. It is built on dominancy of the species *Typha angustifolia* and on the diagnostic species of the class *Phragmito-Magnocaricetea* (Tab. 2). The average cover of the stands is 98 %. The average number of species in the relevé is 4.

Endangered species *Bolboschoenus maritimus* s.s. (EN) was detected in vegetation cover. This association is a vulnerable community in natural biotops of the studied area.

The community was studied at the territory of Nitrianska pahorkatina Heights by Ripka (1999).

Relevé number	1 2 3 4 5	S
Relevé area (m ²)	2 2 2 2 2	
	0 5 5 5 5	
<i>Phragmito-Magnocaricetea, Phragmitetalia</i>		
<i>Alisma plantago-aquatica</i>	1 + 1 . .	III
<i>Lythrum salicaria</i>	. . + 1 .	II
<i>Mentha aquatica</i>	. + + . .	II
<i>Eleocharis palustris</i>	+	I
<i>Lycopus europaeus</i>	. . + . .	I
<i>Bolboschoenus maritimus</i>	r	I
<i>Phragmition communis, Typhetum angustifoliae</i>		
<i>Typha angustifolia</i>	5 5 5 5 5	V
<i>Phragmites australis</i> +	I
<i>Typha latifolia</i> +	I
Other taxa		
<i>Agrostis stolonifera</i> +	I

Tab. 2. *Typhetum angustifoliae* in the vicinity of Hlohovec Town

Appendix 2:

Localities of the relevés and other information about the phytocoenological relevés:
(relevé number, village/town, locality, cover herb layer, date)

1. Hlohovec, southwest of the town, floodplain of the Váh River, the river oxbow; E₁ 90%; June 29, 2003
2. Hlohovec – Šulekovo, near the village, floodplain of the Váh River, the river oxbow; E₁ 100%; July 24, 2004
3. Hlohovec – Šulekovo, near the village, floodplain of the Váh River, the river oxbow; E₁ 100%; July 24, 2004
4. Hlohovec – Šulekovo, near the village, floodplain of the Váh River, the river oxbow; E₁ 100%; July 24, 2004
5. Hlohovec, southwest of the town, floodplain of the Váh River, the river oxbow; E₁ 100%; July 20, 2003

4. *Typhetum latifoliae*

The community is very similar to the association *Typhetum angustifoliae* by its structure and phenology. It forms monocoenoses in hydrophase, too.

Stands of the community occur in the littoral zone of the open water areas of the studied area. Their water regime is fluctuating during the vegetation period. If terrestrial phase is longer, the community is damaged. The community is hemerophile. It participates in terrestrialisation process.

The community borders on associations of the alliance *Phragmition communis* and of the class *Potametea*. It is created by dominancy of the species *Typha latifolia* and by the diagnostic species of the class *Phragmito-Magnocaricetea*.

Recorded vulnerable and endangered species are *Berula erecta* (VU), *Bolboschoenus maritimus* s.s. (EN), *Butomus umbellatus* (VU), *Nuphar lutea* (VU), *Sagittaria sagittifolia*

(LR:nt) and *Teucrium scordium* (VU). This association is the vulnerable community in the natural biotops of the studied area.

Typhetum latifoliae was described at Nitrianska pahorkatina Heights (Ripka 1999).

The floristic composition of the community is documented by the following relevés:

Relevé No. 1: Hlohovec, southwest of the town, floodplain of the Váh River, the river oxbow; the sampled area of 20 m²; the cover of E_c 90%; June 29, 2003: *Typha latifolia* 4, *Alisma plantago-aquatica* 2, *Nuphar lutea* 2, *Eleocharis palustris* 1, *Typha angustifolia* 1, *Agrostis stolonifera* +, *Butomus umbellatus* +, *Juncus articulatus* +.

Relevé No. 2: Hlohovec, southwest of the town, floodplain of the Váh River, the river oxbow; the sampled area of 25 m²; the cover of E_c 95%; July 20, 2003: *Typha latifolia* 5, *T. angustifolia* 2, *Agrostis stolonifera* +, *Alisma plantago-aquatica* +, *Bolboschoenus maritimus* +, *Lythrum salicaria* +.

Relevé No. 3: Hlohovec – Šulekovo, 1 km behind the village, floodplain of the Váh River, the river oxbow; the sampled area of 25 m²; the cover of E_c 100%; July 24, 2004: *Typha latifolia* 5, *Agrostis stolonifera* 2, *Nuphar lutea* 2, *Phellandrium aquaticum* 2, *Alisma plantago-aquatica* 1, *Lythrum salicaria* 1, *Sparganium emersum* 1, *Berula erecta* +, *Mentha aquatica* +, *Rumex hydrolapathum* +, *Sagittaria sagittifolia* +, *Teucrium scordium* +, *Veronica anagallis-aquatica* +.

5. *Sparganietum erecti*

Stands of community occur in the littoral zone of the open water areas of the studied area. Their water regime is dynamic. They tolerate fall in water, however, ones are resistant to drainage of the soil dimly. They quickly respond to changes of ecological conditions. It manifests itself in occupying of a new space or subsidencing. Phytocoenoses considerably contribute to silting water sites.

The community borders on associations of the alliance *Phragmition communis* and of the class *Potametea*. It is created by dominancy of the species *Sparganium erectum* and by the diagnostic species of the class *Phragmito-Magnocaricetea*.

Recorded vulnerable and endangered species are *Berula erecta* (VU), *Sagittaria sagittifolia* (LR:nt) and *Teucrium scordium* (VU). This association is the vulnerable community in the natural biotops of the studied area, because it forms small patches and strips, often as pioneer community.

Ripka (1999) studied this community at Nitrianska pahorkatina Heights.

The floristic composition of the community is documented by the following relevé:

Relevé No. 1: Hlohovec – Šulekovo, 1 km behind the village, floodplain of the Váh River, the river oxbow; the sampled area of 20 m²; the cover of E_c 100%; July 24, 2004: *Sparganium erectum* 5, *Lemna minor* 2, *Phellandrium aquaticum* 1, *Alisma plantago-aquatica* +, *Berula erecta* +, *Mentha aquatica* +, *Rumex hydrolapathum* +, *Sagittaria sagittifolia* +, *Teucrium scordium* +.

6. *Caricetum gracilis*

Stands of the community occur in the ceased (silted) river oxbows of the studied area. Their water regime is dynamic, floods are low and short-term. Groundwater decreases

under soil surface in the summer. On the contrary long-lasting and high floods create fall in vitality of *Carex acuta*.

The community borders on associations of the alliance *Phragmition communis*. It is created by dominance of the species *Carex acuta* and by the diagnostic species of the class *Phragmito-Magnocaricetea*.

The rare and endangered species was not detected in vegetation cover. This association is the rare community in the studied area.

The floristic composition of the community is documented by the following relevé:

Relevé No. 1: Hlohovec, northwest of the town, Koží vrch Top, floodplain of the Váh River, the ceased river oxbow, treated for draining; the sampled area of 20 m²; the cover of E_c 95%; July 22, 2005: *Carex acuta* 5, *Galium palustre* 3, *Lysimachia vulgaris* 3, *Alisma plantago-aquatica* 2, *Calamagrostis epigejos* 2, *Eleocharis palustris* 2, *Phellandrium aquaticum* 2, *Alopecurus aequalis* 1, *Elytrigia repens* 1, *Lythrum salicaria* 1, *Rubus caesius* 1, *Thalictrum aquilegifolium* +.

7. Stands with *Phalaroides arundinacea*

Community occurs in the river oxbows of the studied area. Its water regime is typical by water level fluctuation. Floods are short. The community tolerates fall in water deep under surface of the soil. It appears on the outer side close to reed community hydroseries. It primarily inhabits silting shore zones of marshes and river oxbows and it secondarily inhabits flooded depressions.

The community borders on associations of the alliance *Phragmition communis*. It is created by dominance of the species *Phalaroides arundinacea* and by the diagnostic species of the class *Phragmito-Magnocaricetea*.

The vulnerable species *Butomus umbellatus* (VU) was presented in vegetation cover. Stands with *Phalaroides arundinacea* are a frequently occurring community in the studied area.

From the territory of Nitrianska pahorkatina Heights, *Phalaridetum arundinaceae* Libbert 1931 was described (Ripka ined.).

This community is characterised by the following relevés which are documentary only:

Relevé No. 1: Hlohovec, floodplain of the Váh River, the river oxbow; the sampled area of 25 m²; the cover of E_c 95%; June 29, 2003: *Phalaroides arundinacea* 5, *Calystegia sepium* 3, *Lythrum salicaria* 1, *Urtica dioica* 1, *Butomus umbellatus* +, *Humulus lupulus* +, *Rumex crispus* +, *Symphytum officinale* +.

Relevé No. 2: Hlohovec, floodplain of the Váh River, the river oxbow; the sampled area of 25 m²; the cover of E_c 100%; July 20, 2003: *Phalaroides arundinacea* 5, *Calystegia sepium* 2, *Lythrum salicaria* 1, *Urtica dioica* +.

Conclusions

The communities of *Nymphaetum albo-luteae*, *Phragmitetum vulgaris*, *Typhetum angustifoliae*, *T. latifoliae*, *Sparganietum erecti*, *Caricetum gracilis* and stands with *Phalaroides arundinacea* were found in the vicinity of the Hlohovec Town. There were 7 vegetation units, documented by 21 recent relevés. They occurred in the stagnant and

slow-flowing waters of the river oxbows, in the ceased (silted) river oxbows, in the littoral zone of the open water areas and in the deeper terrain depressions.

The association of *Phragmitetum vulgaris* was the most abundant community in the studied area. The *Nymphaetum albo-luteae* and the *Caricetum gracilis* were the rarest communities. In natural habitats of the studied area I treat these communities as vulnerable ones.

The communities were created by dominant species and by the diagnostic species of the classes *Potametea* and *Phragmito-Magnocaricetea*.

The recorded vulnerable and endangered species were *Berula erecta* (VU), *Bolboschoenus maritimus* s.s. (EN), *Butomus umbellatus* (VU), *Myriophyllum verticillatum* (VU), *Nuphar lutea* (VU), *Sagittaria sagittifolia* (LR:nt) and *Teucrium scordium* (VU).

Stands with *Phragmites australis* were adapted to the secondary habitats – in the depressions of the fields.

At present the stands of the communities are endangered especially by draining localities and consequent succession. These factors have an impact on floristical composition and structure of stands.

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References

- BRAUN-BLANQUET, J., 1964: Pflanzensoziologie. Grundzüge der Vegetationskunde. Ed. 3. Springer, Wien et New York. 865 pp.
- FERÁKOVÁ, V., OTTINGER, O., VALENČÍK, M., 1966: Sedlisko nad Hlohovcom – významná lokalita xerotermnej flóry a fauny. *Ochr. Přír.*, Praha, 9: 139 – 140.
- FERÁKOVÁ, V., 1967: Bemerkungen zur Flora der Umgebung der Stadt Hlohovec in der Slowakei. *Acta Fac. Rer. Natur. Univ. Comen.*, Bratislava, 14: 229 – 277.
- FERÁKOVÁ, V., HROMADOVÁ, L., LEHOTSKÁ, D., LEHOTSKÝ, V., OTTINGER, O., PLEVA, J., VALENČÍK, M., ZELENAY, Š., 1968: Hlohovec a jeho okolie. *Obzor*, Bratislava. 264 pp.
- FERÁKOVÁ, V., MAGLOCKÝ, Š., MARHOLD, K., 2001: Červený zoznam papraďorastov a semenných rastlín Slovenska (december 2001). - In: Baláž, D., Marhold, K., Urban, P. (eds.), Červený zoznam rastlín a živočíchov Slovenska, *Ochr. Přír.*, Banská Bystrica, 20 (Suppl.): 44 – 77.
- FUTÁK, J., 1966: Fytogeografické členenie Slovenska. - In: Futák, J. (ed.), *Flóra Slovenska I*. SAV, Bratislava, pp. 533 – 538.
- FUTÁK, J., 1984: Fytogeografické členenie Slovenska. - In: Bertová, L. (ed.), *Flóra Slovenska IV/1*. Veda, Bratislava, pp. 418 – 420.
- HENNEKENS, S. M., 1996a: TURBOVEG. Software package for input, processing and presentation of phytosociological data. Users guide. Version July 1996. University of Lancaster.
- HENNEKENS, S. M., 1996b: MEGATAB. A visual editor for phytosociological tables. Version 1.0, October 1996. Giesen and Geurts ulft.

- MALOVCOVÁ, M., 2005: *Berula erecta*, *Myriophyllum verticillatum*, *Sagittaria sagittifolia*, *Teucrium scordium*. In: Zaujímavejšie floristické nálezy. *Bull. Slov. Bot. Spoločn.*, Bratislava.
- MALOVCOVÁ, M., 2006: *Butomus umbellatus*, *Carex paniculata*. - In: Zaujímavejšie floristické nálezy. *Bull. Slov. Bot. Spoločn.*, Bratislava.
- MALOVCOVÁ-STANÍKOVÁ, M., 2003: Nová lokalita asociácie *Charetum hispidae* Margelof 1947 v blízkom okolí Hlohovca. *Acta Rer. Natur. Mus. Nat. Slov.*, Bratislava, 49: 52 – 54.
- MALOVCOVÁ-STANÍKOVÁ, M., 2004: Potvrdenie výskytu asociácie *Charetum hispidae* Margelof 1947 v blízkom okolí Hlohovca. *Acta Rer. Natur. Mus. Nat. Slov.*, Bratislava, 50: 44 – 46.
- MARHOLD, K., HINDÁK, F. (eds.), 1998: Zoznam nižších a vyšších rastlín Slovenska. Veda, Bratislava. 687 pp.
- OŤAHELOVÁ, H., 1995: *Potametea*. - In: Valachovič, M. (ed.), Rastlinné spoločenstvá Slovenska. 1. Pionierska vegetácia. Veda, Bratislava, pp. 153 – 179.
- OŤAHELOVÁ, H., HRIVNÁK, R., VALACHOVIČ, M., 2001: *Phragmito-Magnocaricetea*. - In: Valachovič, M. (ed.), Rastlinné spoločenstvá Slovenska. 3. Vegetácia mokradí. Veda, Bratislava, pp. 53 – 183.
- RIPKA, J., 1999: Vegetácia a flóra vybraných vodných nádrží v okrese Topoľčany (Nitriansky kraj). Diplomová práca, mscr. [Depon. in Botanický ústav SAV, Bratislava].
- VAVRO, R., 1979: Predbežné výsledky floristickej inventarizácie lužných lesov na osi diaľnice okresu Trnava. *Vlast. a Metod. Spravodaj okr. Trnava*, Trnava, pp. 56 – 65.
- VAVRO, R., 1986: Vzácne a ohrozené druhy rastlín v lužných lesoch. *Spravodajca komisie pre ŽP a OV SZOPK*, Trnava, pp. 28 – 29.

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