Acta Botanica Hungarica 61(1–2), pp. 55–99, 2019
DOI: 10.1556/034.61.2019.1-2.7

DRAINED ASH SWAMP (*VERATRO ALBI-FRAXINETUM ANGUSTIFOLIAE*), A NEW ASSOCIATION IN THE NYÍRSÉG, NE HUNGARY

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(Received 29 March, 2017; Accepted 8 August, 2018)

This paper presents the phytosociological description of a drained swamp community, *Veratro albi-Fraxinetum angustifoliae*, so far found only in the Nyírség at Nyírábrány "Kiskőrises", "Mogyorósi-erdő"; Vámospércs "Jónásrész-Kőrises"; and Vámospércs "Jónásrész-Buzita". The habitat of the community is transitional between that of alder swamps (*Fraxino pannonicae-Alnetum glutinosae*), and hardwood riparian forests (*Fraxino pannonicae-Ulmetum*). The community is characterised by high proportions of character species of Alnion glutinosae and Molinion coerulei as well as Quercetea pubescentis-petraeae s. l., whereas character species of the order Fagetalia are almost completely absent. It hosts several rare, often threatened species, such as *Angelica palustris*, *Ophioglossum vulgatum*, *Trollius europaeus* and *Veratrum album*.

Key words: ash swamp, Great Hungarian Plain, Natura 2000, nature reserve, syntaxonomy

INTRODUCTION

Hardwood riparian forests have been the subject of our long-term research on the distribution, composition and geographical variation of the forest vegetation in Hungary. Hardwood riparian forests still occur in most lowland areas of Hungary under different environmental conditions and thus are particularly suitable for studying phytosociological differentiation and biogeographical relationships in the forest vegetation within the Carpathian Basin. During our work in the Nyírség, an extensive area in the northeastern part of Hungary covered with eolic sand, we found several *Fraxinus angustifolia* dominated forest stands that seemed to be different from all known forest communities described previously in the country (Figs 1–2). No similar forest community is known to exist in the European vegetation either (Braun-Blanquet 1964, Ellenberg 1986, Horvat 1938, Horvat *et al.* 1974, Mucina *et al.* 1993, Oberdorfer 1992*a*, *b*, Rodwell *et al.* 2002, Willner and Grabherr 2007*a*, *b*).

Because their species composition appeared to be substantially different from that of the *Fraxino pannonicae-Ulmetum* Soó in Aszód 1935 corr. Soó

1963, a community once widely distributed in similarly moist habitats across the country, and *Fraxino pannonicae-Alnetum* Soó et Járai-Komlódi in Járai-Komlódi 1958, we described it as a novel association under the name *Veratro albi-Fraxinetum angustifoliae* Kevey et Papp L. (Kevey 2008).

Unfortunately, this association has not been described in more detail, nor has a synoptic table of it been published since then. Here we are going to fill this gap by providing a detailed description of the community based on our sample material of ten relevés. Our primary goal is to substantiate the split of this new association from the rest of the hardwood riparian forests found in Hungary.

MATERIAL AND METHODS

Research area

The studied *Fraxinus angustifolia* dominated stands were found in four different forest areas in the Nyírség: the Mogyorósi-erdő and Kis-kőrises near the town of Nyírábrány, and the Jónásrész-Kőrises and Jónásrész-Buzita near the village of Nyíracsád. The stands were all found along the edge of local

Fig. 1. Veratro albi-Fraxinetum angustifoliae: Vámospércs "Jónásrész" with *Veratrum album* in the foreground (photo: L. Papp)

depressions where the habitat is characterised by high groundwater levels, which rises above the ground surface only in very wet periods. They either grow at the fringe of genuine alder swamps (*Fraxino pannonicae-Alnetum*) in the deepest parts of local depressions, or form the transition zone between these swamps and oak-ash-elm forests (*Fraxino pannonicae-Ulmetum*) growing on higher ground (Fig. 3). Since the ground is normally not covered with water throughout most of the vegetative period in their habitats, the soil contains only small amounts of peat that is generally decaying.

The three studied forest areas are all parts of the Natura 2000 network, and are also protected by national law. The Jónásrész "Kőrises" and "Buzita", and "Kis-kőrises" are state reserves, whereas the "Mogyorósi-erdő" is under strict protection.

Methods

Our sampling procedure followed the traditional quadrate method of the Zürich-Montpellier phytosociological school (Becking 1957, Braun-Blanquet 1964). Sample plots were designated visually by selecting the parts of a stand that seemed to be the most homogeneous in habitat characteristics,

Fig. 2. Veratro albi-Fraxinetum angustifoliae: Vámospércs "Jónásrész" with *Trollius europaeus* in the herb layer (photo: L. Papp)

vegetation structure and species composition, and showed no signs of human impact (including forest management). Because the traditionally used 400 m^2 plot size does not satisfy the requirement for minimal area (see Du Rietz 1921), our sample plots were 1600 m^2 in size except for one (1200 m^2). This size suffices the requirement of representativity in temperate deciduous forests (Kevey 2008).

Because forests in similarly mesic habitats tend to exhibit large phenological changes during the vegetative period, we sampled each stand twice (spring and summer) using the same plots. During sampling, we recorded all species within the sample quadrate and estimated their projected cover. We also estimated the height of each vegetation layer, and the trunk diameter of trees.

The raw data were compiled and arranged in a synoptic table by the NS software program (Kevey and Hirmann 2002), which also was used to calculate constancy values of each species, and proportions of species characteristic of a particular syntaxon. To assess the syntaxonomic relationship of the studied stands, we compared them to a representative material of the spatially adjacent *Fraxino pannonicae-Alnetum* and *Fraxino pannonicae-Ulmetum*, and all previously described communities growing in similar habitats in Hungary: *Ophioglosso-Betuletum pubescentis* (Vértesalja: Riezing and Szollát 2008–2009: 6 relevés); *Molinio-Alnetum glutinosae* (Tengelici-homokvidék: Kevey 2008: 20 relevés); *Molinio-Salicetum cinereae* (Szigetköz: Kevey 2008: 25 relevés). In doing so, we performed pairwise comparisons between sample sets and deter-

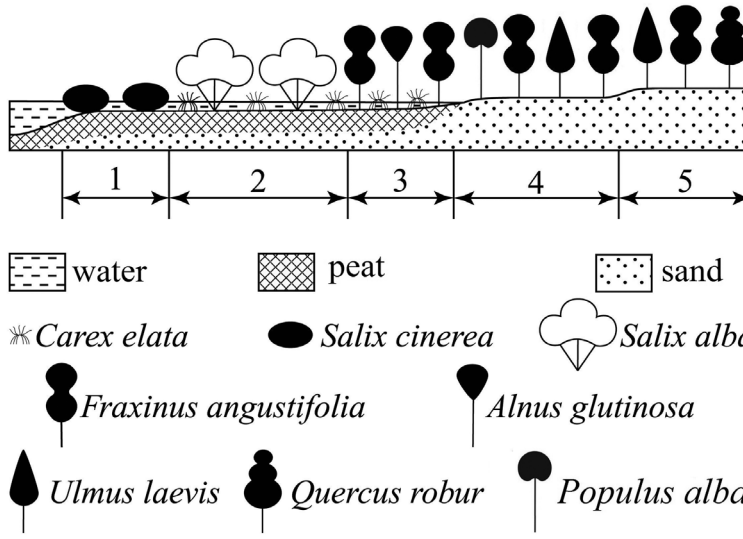

Fig. 3. Vegetation diagram of the "Mogyorósi-erdő" at Nyírábrány. 1 = *Calamagrostio-Salicetum cinereae*; 2 = *Carici elatae-Salicetum albae*; 3 = *Fraxino pannonicae-Alnetum glutinosae*; 4 = *Veratro albi-Fraxinetum angustifoliae*; 5: *Fraxino pannonicae-Ulmetum*. (Kevey original)

mined the set of differential species (species that differed in their constancy value by at least two steps) and the proportions of character species. We also carried out binary cluster and principal coordinates analyses (PCoA) with the help of the Syntax 2000 package (Podani 2001). The method of grouping in the cluster analyses was complete link, and the similarity coefficient in both types of analyses was that of Baroni-Urbani and Buser.

The names of plants and syntaxonomic categories follow the nomenclature of Király (2009) and that of Borhidi and Kevey (1996), Borhidi *et al.* (2012), and Kevey (2008), respectively. Designation of species as character species of phytosociological taxa is primarily adopted from Soó (1964, 1966, 1968, 1970, 1973, 1980) with some modifications based on more recent literature (see Borhidi 1993, 1995, Horváth *et al.* 1995) and our own research experience (Kevey ined.).

The order of syntaxa in the synoptic and statistical tables follows the modified syntaxonomic system of Soó (1980) according to the suggestions and results of Borhidi *et al.* (2012), Kevey (2008), Mucina *et al.* (1993) and Oberdorfer (1992*a, b*).

RESULTS

Physiognomy and structure

In the studied stands, the forest canopy was structured into two distinct layers. The upper layer was situated at about 20–28 m height and was rather dense with high (60–80%) projected cover. The most abundant (A–D: 3–4) tree species in this layer were *Fraxinus angustifolia* subsp. *danubialis* and *Populus alba*. They were also constant species across the samples.

The lower canopy layer was at the height of 12–20 m. The projected cover was rather variable among samples. It was made up of mostly tree-sized shrubs and young individuals of trees. The most abundant species in this layer was *Fraxinus angustifolia* subsp. *danubialis.*

Shrubs in the samples were 1.5–3.5 m tall, and formed a moderately dense layer with 25–70% cover value. It was composed of *Cornus sanguinea*, *Crataegus monogyna*, *Frangula alnus*, *Fraxinus angustifolia* subsp. *danubialis*, and *Ligustrum vulgare*. Only *Cornus sanguinea* and *Ligustrum vulgare* had rather high cover values. The layer of saplings was greatly variable in projected cover (1–50%).

All samples had an apparent herbaceous layer, which greatly varied in cover (35–85%). The most frequent species include *Angelica sylvestris*, *Brachypodium sylvaticum*, *Cucubalus baccifer*, *Filipendula ulmaria*, *Geranium palustre*, *Listera ovata*, *Lychnis flos-cuculi*, *Lysimachia nummularia*, *Moehringia trinervia*, *Poa trivialis*, *Scrophularia nodosa*, *Valeriana officinalis*, *Veratrum album*. Only two species (*Brachypodium sylvaticum* and *Convallaria majalis)* were locally abundant at places (Table 1).

Table 1
Veratro albi-Fraxinetum angustifoliae

		1	2	3	4	5	6	7	8	9	10	A–D	K	%
1. Querco-Fagea														
1.1. Salicetea purpureae														
1.1.1. Salicetalia purpureae														
1.1.1.1. Salicion albae														
Cucubalus baccifer (Cal,Ulm)	C	+	+	–	–	+	+	+	+	+	–	+	IV	70
Salix fragilis (Ai,Cal)	A1	+	–	–	2	–	–	–	1	+	–	+–2	II	40
	A2	–	–	–	1	–	–	–	–	–	–	1	I	10
	S	+	–	–	2	–	–	–	1	+	–	+–2	II	40
Humulus lupulus (Cal,Ate,Ai)	B1	–	–	–	+	–	–	–	–	–	–	+	I	10
	C	–	–	–	+	–	–	–	–	+	+	+	II	30
	S	–	–	–	+	–	–	–	–	+	+	+	II	30
1.2. Alnetea glutinosae														
1.2.1. Alnetalia glutinosae														
Betula pubescens (Qr,PQ)	A2	–	–	–	+	–	–	–	–	–	–	+	I	10
1.2.1.1. Alnion glutinosae														
Angelica palustris	C	–	–	–	+	–	+	+	+	–	–	+	II	40
Calamagrostis canescens (Pte)	C	–	–	–	–	–	–	–	–	+	–	+	I	10
1.3. Querco-Fagetea														
Brachypodium sylvaticum (Qpp)	C	3	3	5	2	3	2	4	2	3	3	2–5	V	100

Table 1 (continued)

		1	2	3	4	5	6	7	8	9	10	A–D	K	%
Cornus sanguinea (Qpp)	B1	2	1	2	3	3	2	2	3	3	2	1–3	V	100
	B2	+	+	1	2	+	+	2	+	1	+	+–2	V	100
	S	2	1	2	4	3	2	3	3	3	2	1–4	V	100
Crataegus monogyna (Qpp)	A2	+	+	–	–	–	–	–	–	–	2	+–2	II	30
	B1	2	2	+	–	+	1	+	+	+	+	+–2	V	90
	B2	+	+	+	+	+	+	+	+	+	+	+	V	100
	S	2	2	+	+	+	1	+	+	+	2	+–2	V	100
Geum urbanum (Epa,Cp,Qpp)	C	+	+	+	+	+	+	+	+	+	+	+	V	100
Ligustrum vulgare (Cp,Qpp)	B1	+	+	+	2	+	2	2	+	1	3	+–3	V	100
	B2	+	+	1	1	+	+	1	1	1	2	+–2	V	100
	S	+	+	1	2	+	2	2	1	2	4	+–4	V	100
Euonymus europaeus (Qpp)	B1	–	+	–	+	–	+	–	+	–	+	+	III	50
	B2	–	–	+	–	+	–	+	+	+	+	+	III	60
	S	–	+	+	+	+	+	+	+	+	+	+	V	90
Rhamnus catharticus (Qpp,Pru)	A2	–	–	–	–	–	+	–	–	–	–	+	I	10
	B1	–	–	–	–	+	+	+	–	+	+	+	III	50
	B2	+	+	+	+	+	+	+	–	+	+	+	V	90
	S	+	+	+	+	+	1	+	–	+	+	+–1	V	90
Scrophularia nodosa (GA,Epa)	C	+	–	+	+	+	+	+	+	+	+	+	V	90
Quercus robur (Ai,Cp,Qpp)	A1	–	–	–	–	1	1	2	–	–	2	1–2	II	40
	A2	–	–	+	–	–	–	–	–	–	+	+	I	20
	B1	–	–	–	–	–	–	+	–	–	–	+	I	10

Table 1 (continued)

		1	2	3	4	5	6	7	8	9	10	A–D	K	%
Quercus robur (Ai,Cp,Qpp)	B2	–	+	+	–	–	–	+	+	+	–	+	III	50
	S	–	+	+	–	1	1	2	+	+	2	+–2	IV	80
Ulmus minor (Ai,Ulm,Qpp)	A2	1	1	2	–	–	–	+	1	–	1	+–2	III	60
	B1	+	+	2	–	–	–	+	+	–	2	+–2	III	60
	B2	+	+	+	–	–	+	+	+	–	+	+	IV	70
	S	1	1	3	–	–	+	1	1	–	2	+–3	IV	70
Corylus avellana (Qpp)	A2	1	1	–	–	–	–	–	–	–	–	1	I	20
	B1	2	+	+	–	–	–	–	1	–	+	+–2	III	50
	B2	+	+	+	+	–	–	–	+	–	+	+	III	60
	S	2	1	+	+	–	–	–	1	–	+	+–2	III	60
Dactylis polygama (Qpp,Cp)	C	+	1	+	+	–	–	–	–	+	1	+–1	III	60
Geranium robertianum (Epa)	C	+	+	1	–	+	–	–	–	+	+	+–1	III	60
Veronica chamaedrys (Qpp,Ara)	C	–	–	–	+	+	+	+	+	+	–	+	III	60
Convallaria majalis (Qpp)	C	3	4	+	–	–	–	–	4	–	1	+–4	III	50
Populus tremula (Qr,Qc,Ber)	A1	+	–	–	–	–	–	–	–	1	–	+–1	I	20
	A2	1	–	+	–	–	–	–	–	–	–	+–1	I	20
	B1	+	–	–	–	–	+	–	–	–	–	+	I	20
	B2	–	–	+	–	–	–	–	–	+	+	+	II	30
	S	1	–	+	–	–	+	–	–	1	+	+–1	III	50
Ajuga reptans (MoA)	C	–	–	–	–	+	1	1	1	–	–	+–1	II	40
Campanula trachelium (Epa,Cp)	C	+	1	1	+	–	–	–	–	–	–	+–1	II	40

Table 1 (continued)

		1	2	3	4	5	6	7	8	9	10	A–D	K	%
Carex spicata (Qpp,Epa)	C	–	–	+	+	–	–	+	–	+	–	+	II	40
Heracleum sphondylium (Qpp,MoA)	C	+	+	+	+	–	–	–	–	–	–	+	II	40
Polygonatum latifolium (Qpp)	C	+	+	–	–	–	–	–	–	+	+	+	II	40
Cruciata glabra	C	+	+	+	–	–	–	–	–	–	–	+	II	30
Ranunculus auricomus agg. (MoA)	C	–	–	–	–	–	–	+	+	–	+	+	II	30
Carex divulsa	C	–	–	–	–	–	–	–	+	–	+	+	I	20
Fragaria vesca (Qpp,Epa)	C	–	–	–	–	+	–	–	–	+	–	+	I	20
Galeopsis pubescens (Qpp,Epa)	C	–	–	–	–	+	–	–	–	+	–	+	I	20
Veronica hederifolia subsp. *lucorum*	C	–	+	+	–	–	–	–	–	–	–	+	I	20
Acer campestre (Qpp)	A2	1	–	–	–	–	–	–	–	–	–	1	I	10
	B1	+	–	–	–	–	–	–	–	–	–	+	I	10
	B2	+	–	–	–	–	–	–	–	–	–	+	I	10
	S	1	–	–	–	–	–	–	–	–	–	1	I	10
Cephalanthera damasonium (Qpp)	C	–	–	–	–	+	–	–	–	–	–	+	I	10
Cephalanthera longifolia	C	–	–	–	–	+	–	–	–	–	–	+	I	10
Lapsana communis (Qpp,GA,Epa)	C	+	–	–	–	–	–	–	–	–	–	+	I	10
Mycelis muralis	C	–	–	–	–	+	–	–	–	–	–	+	I	10
Platanthera bifolia (Qpp,PQ,NC,Moa)	C	–	–	–	–	+	–	–	–	–	–	+	I	10
Poa nemoralis (Qpp)	C	+	–	–	–	–	–	–	–	–	–	+	I	10
Vicia sepium (Ara,Qpp)	C	–	–	–	–	–	–	+	–	–	–	+	I	10
Viola mirabilis (F,Qpp)	C	+	–	–	–	–	–	–	–	–	–	+	I	10

Table 1 (continued)

		1	2	3	4	5	6	7	8	9	10	A–D	K	%
1.3.1. Fagetalia sylvaticae														
Listera ovata (Ate,Ai)	C	–	+	+	–	+	+	+	+	+	+	+	IV	80
Moehringia trinervia	C	+	+	+	+	–	+	–	+	–	+	+	IV	70
Carex sylvatica	C	1	1	+	+	–	–	–	–	–	–	+–1	II	40
Stachys sylvatica (Epa)	C	+	1	+	+	–	–	–	–	–	–	+–1	II	40
Circaea lutetiana (Ai)	C	–	+	+	+	–	–	–	–	–	–	+	II	30
Milium effusum	C	+	+	–	–	–	–	–	–	–	–	+	I	20
Aegopodium podagraria (Ai,Cp)	C	+	–	–	–	–	–	–	–	–	–	+	I	10
Cardamine bulbifera	C	–	–	+	–	–	–	–	–	–	–	+	I	10
Carpinus betulus (Cp)	B2	–	–	–	–	+	–	–	–	–	–	+	I	10
Epipactis helleborine agg.	C	–	–	–	+	–	–	–	–	–	–	+	I	10
Galeopsis speciosa (Epn,Ai)	C	–	–	–	–	–	–	–	+	–	–	+	I	10
Polygonatum multiflorum (QFt)	C	+	–	–	–	–	–	–	–	–	–	+	I	10
1.3.1.1. Alnion incanae														
Fraxinus angustifolia subsp. *danubialis* (Ate)	A1	4	4	3	3	4	4	3	4	4	2	2–4	V	100
	A2	2	3	3	2	3	2	2	2	2	2	2–3	V	100
	B1	1	–	2	1	1	2	2	2	1	+	+–2	V	90
	B2	1	–	+	2	2	2	2	1	2	2	+–2	V	90
	S	5	5	5	4	5	5	5	5	5	3	3–5	V	100
Populus alba (Sal,AQ)	A1	1	2	2	1	2	1	1	1	2	3	1–3	V	100
	A2	–	–	1	1	–	–	–	–	–	+	+–1	II	30

Table 1 (continued)

		1	2	3	4	5	6	7	8	9	10	A–D	K	%
Populus alba (Sal,AQ)	B1	+	–	–	–	–	–	–	–	–	+	+	I	20
	B2	+	–	+	+	–	+	+	+	+	+	+	IV	80
	S	1	2	2	2	2	1	1	1	2	3	1–3	V	100
Viburnum opulus (Ate)	B1	–	–	–	1	–	–	–	–	–	+	+–1	I	20
	B2	+	+	+	1	+	+	+	+	+	1	+–1	V	100
	S	+	+	+	2	+	+	+	+	+	1	+–2	V	100
Frangula alnus (Ate,Qr,PQ)	B1	–	+	+	+	+	+	–	–	+	+	+	IV	70
	B2	–	–	+	–	+	+	+	+	+	+	+	IV	70
	S	–	+	+	+	+	+	+	+	+	+	+	V	90
Elymus caninus (Pna,Qpp)	C	+	+	+	+	+	–	–	–	–	+	+	III	60
Festuca gigantea (Cal,Epa)	C	–	+	+	–	–	–	1	–	–	+	+–1	II	40
Rumex sanguineus (Epa,Pna)	C	+	–	+	–	–	–	–	–	–	+	+	II	30
Carex remota	C	+	–	–	–	–	–	–	–	–	+	+	I	20
Equisetum hyemale (F)	C	+	–	–	–	–	–	–	–	–	+	+	I	20
Ribes rubrum	B1	–	–	–	–	–	–	–	–	–	+	+	I	10
	B2	–	+	–	–	–	–	–	–	–	–	+	I	10
	S	–	+	–	–	–	–	–	–	–	+	+	I	20
Ulmus laevis (Sal,Ulm)	A1	–	–	–	–	–	+	–	–	–	2	+–2	I	20
	A2	–	–	–	–	–	–	–	–	–	+	+	I	10
	B1	–	–	–	–	–	–	–	–	–	+	+	I	10
	B2	–	–	–	–	–	+	–	–	–	–	+	I	10
	S	–	–	–	–	–	+	–	–	–	2	+–2	I	20

Table 1 (continued)

		1	2	3	4	5	6	7	8	9	10	A–D	K	%
Malus sylvestris (Qpp)	B2	–	–	+	–	–	–	–	–	–	–	+	I	10
Padus avium	A2	–	–	–	–	–	–	–	–	–	+	+	I	10
	B1	–	–	–	–	–	–	–	–	–	+	+	I	10
	B2	–	–	–	–	–	–	–	–	–	+	+	I	10
	S	–	–	–	–	–	–	–	–	–	1	1	I	10
Viola elatior (Moa)	C	–	–	–	–	–	–	+	–	–	–	+	I	10
1.4. Quercetea pubescentis-petraeae														
Prunus spinosa (Pru,Prf)	B1	–	–	+	+	–	+	+	–	–	+	+	III	50
	B2	–	–	+	+	+	+	+	–	+	+	+	IV	70
	S	–	–	+	+	+	+	+	–	+	+	+	IV	70
Pyrus pyraster (Cp)	A1	–	–	–	–	–	–	1	–	–	–	1	I	10
	A2	–	–	+	–	–	1	2	+	+	–	+–2	III	50
	B1	–	–	–	–	–	–	+	+	–	–	+	I	20
	B2	–	+	–	–	+	+	–	–	–	–	+	II	30
	S	–	+	+	–	+	1	2	+	+	–	+–2	IV	70
Clinopodium vulgare	C	–	+	+	+	+	+	–	–	+	–	+	III	60
Betonica officinalis (MoA)	C	+	–	–	–	–	+	+	–	+	+	+	III	50
Carex michelii	C	+	–	–	–	+	–	–	–	+	–	+	II	30
Pulmonaria mollissima	C	–	–	+	+	+	–	–	–	–	–	+	II	30
Rosa canina agg. (Pru,Prf)	B1	–	–	+	–	–	–	–	–	–	–	+	I	10
	B2	–	+	+	+	–	–	–	–	–	–	+	II	30
	S	–	+	+	+	–	–	–	–	–	–	+	II	30

Table 1 (continued)

		1	2	3	4	5	6	7	8	9	10	A–D	K	%
Astragalus glycyphyllos	C	+	–	–	–	–	+	–	–	–	–	+	I	20
Lactuca quercina subsp. *sagittata*	C	+	–	–	–	–	+	–	–	–	–	+	I	20
Euonymus verrucosus (Pru)	B1	+	–	–	–	–	–	–	–	–	–	+	I	10
	B2	+	–	–	–	–	–	–	–	–	–	+	I	10
	S	+	–	–	–	–	–	–	–	–	–	+	I	10
Inula salicina (MoA,Fvg)	C	–	–	–	+	–	–	–	–	–	–	+	I	10
Melampyrum cristatum (Fvl)	C	–	–	–	–	–	–	–	–	–	+	+	I	10
Polygonatum odoratum (Fvl)	C	–	–	–	–	–	–	–	–	–	+	+	I	10
1.4.1. Quercetalia cerridis														
Gagea pratensis (Sea)	C	–	–	–	–	–	+	–	–	–	–	+	I	10
Trifolium medium	C	–	–	–	–	–	–	+	–	–	–	+	I	10
1.4.1.1. Aceri tatarici-Quercion														
Acer tataricum (Qpp)	B1	+	+	+	–	–	–	–	–	–	–	+	II	30
	B2	+	+	+	–	–	–	–	–	–	–	+	II	30
	S	+	+	+	–	–	–	–	–	–	–	+	II	30
2. Cypero-Phragmitea														
2.1. Phragmitetea														
Eupatorium cannabinum (Epa,Sal,Ate,Ai)	C	+	+	+	+	+	+	+	+	+	–	+	V	90
Carex acutiformis (Mag,Cgr,MoJ,Sal,Ate)	C	–	+	–	1	–	+	–	+	+	1	+–1	III	60
Iris pseudacorus (Sal,Ate,Ai)	C	–	+	+	–	–	+	+	+	–	–	+	III	50
Hypericum tetrapterum (FiC)	C	–	+	+	+	–	–	–	–	–	–	+	II	30
Lycopus europaeus (Moa,Cal,Bia,Spu,Ate)	C	–	–	–	–	–	–	–	+	+	+	+	II	30

Table 1 (continued)

		1	2	3	4	5	6	7	8	9	10	A–D	K	%
Sium latifolium (Sal,Ate)	C	–	–	+	–	–	–	–	–	1	+	+–1	II	30
Solanum dulcamara (Cal,Bia,Spu)	C	+	–	+	1	–	–	–	–	–	–	+–1	II	30
Galium palustre (Mag,MoJ,FPi,Spu,Ate)	C	–	–	–	+	–	–	–	–	+	–	+	I	20
Carex riparia (Mag,Cgr,MoJ,Sal,Ate)	C	–	–	–	–	–	–	–	–	+	–	+	I	10
Epilobium parviflorum (NG,MoJ,Moa,Ate)	C	–	–	–	–	–	–	–	–	+	–	+	I	10
Euphorbia palustris (Mag,Des,FiC,Bec,Ate)	C	–	–	–	–	–	–	–	–	–	+	+	I	10
Stachys palustris (Moa,Cal,Bin,Spu,Ate)	C	–	–	–	+	–	–	–	–	–	–	+	I	10
2.1.1. Nasturtio-Glycerietalia														
2.1.1.1. Glycerio-Sparganion														
Scrophularia umbrosa (Ai)	C	–	–	–	+	–	–	–	–	–	–	+	I	10
2.1.2. Magnocaricetalia														
2.1.2.1. Magnocaricion														
Carex otrubae (Cgr,MoJ,FPi,Ai)	C	–	–	+	–	–	–	–	+	+	–	+	II	30
3. Molinio-Arrhenatherea														
Lychnis flos-cuculi (Mag,Ate)	C	–	+	+	+	+	+	+	+	+	+	+	V	90
Poa trivialis (Pte,Spu,Ate,Ai)	C	+	+	+	+	–	+	+	+	–	–	+	IV	70
Cardamine pratensis (Mag,Des,Sal,Ate,Ai)	C	–	–	+	–	–	–	+	+	+	–	+	II	40
Vicia cracca (Mag,Sea,Aon,Qpp)	C	–	–	+	+	–	–	+	–	–	–	+	II	30
Lathyrus pratensis (Mag,Qpp)	C	–	–	–	–	–	–	+	–	+	–	+	I	20
Ranunculus acris	C	–	–	–	–	+	+	–	–	–	–	+	I	20
Pastinaca sativa (Arn)	C	–	–	–	–	–	–	–	–	–	+	+	I	10

Table 1 (continued)

		1	2	3	4	5	6	7	8	9	10	A–D	K	%
3.1. Molinio-Juncetea														
Veratrum album (Ate,Ai)	C	+	+	+	–	+	2	+	2	1	1	+–2	V	90
Cirsium canum (Mag,Ate,Ai)	C	–	–	+	+	+	–	+	–	+	+	+	III	60
Deschampsia caespitosa (Des,Sal,Ate,Ai)	C	–	–	–	–	+	2	1	1	+	+	+–2	III	60
Cirsium rivulare (Mag,Ate,Ai)	C	–	+	+	+	–	–	–	–	+	–	+	II	40
Symphytum officinale (Pte,Cal,Spu,Ate,Ai)	C	–	–	–	+	–	–	+	–	+	+	+	II	40
Selinum carvifolia (Mon,Ate,PQ)	C	–	–	–	–	+	–	–	–	+	–	+	I	20
Succisa pratensis (Mon,Tof,NC)	C	–	–	–	–	–	–	–	–	–	+	+	I	10
3.1.1. Molinietalia coeruleae														
Angelica sylvestris (Mag,Ate,Ai)	C	+	+	1	+	+	+	+	+	+	+	+–1	V	100
Valeriana officinalis (Mag,FiC)	C	–	–	–	+	+	+	+	+	+	+	+	IV	70
Ophioglossum vulgatum (NC,Arn)	C	–	–	–	–	+	+	+	+	+	+	+	III	60
Trollius europaeus (Ate)	C	–	+	–	+	–	+	+	+	+	–	+	III	60
Orchis militaris (FBt,Qpp)	C	–	–	–	–	+	+	–	–	–	–	+	I	20
3.1.1.1. Filipendulo-Cirsion oleracei														
Filipendula ulmaria (Moa,Sal,Ate,Ai)	C	+	+	1	1	+	+	+	+	+	+	+–1	V	100
Geranium palustre (Ate)	C	+	+	1	+	+	+	+	+	–	–	+–1	IV	80
4. Festuco-Bromea														
Campanula glomerata (Qpp)	C	–	–	–	+	–	–	+	–	+	–	+	II	30
5. Chenopodio-Scleranthea														
5.1. Secalietea														
Muscari comosum (FBt)	C	–	–	–	–	–	–	–	–	+	–	+	I	10

Table 1 (continued)

		1	2	3	4	5	6	7	8	9	10	A–D	K	%
5.2. Chenopodietea														
Arctium minus (Ar,Bia,Pla)	C	+	–	+	–	–	+	–	+	+	–	+	III	50
5.3. Galio-Urticetea														
5.3.1. Calystegietalia sepium														
5.3.1.1. Galio-Alliarion														
Chaerophyllum temulum	C	+	+	–	+	1	–	–	+	+	–	+–1	III	60
Alliaria petiolata (Epa)	C	–	–	–	–	+	+	–	+	–	–	+	II	30
5.3.1.2. Calystegion sepium														
Myosoton aquaticum (Pte,Spu,Ate,Ai)	C	–	+	–	+	–	–	–	–	–	–	+	I	20
Bryonia alba (Ar,GA)	C	–	–	+	–	–	–	–	–	–	–	+	I	10
Calystegia sepium (Pte,Bia,Pla,Spu,Ate)	C	–	–	–	–	–	–	–	–	–	+	+	I	10
5.4. Epilobietea angustifolii														
5.4.1. Epilobietalia														
Galeopsis bifida (Cal)	C	–	–	+	–	–	–	–	–	–	–	+	I	10
Salix caprea (US,QFt)	A2	–	–	–	–	–	–	–	–	–	+	+	I	10
6. Indifferens														
Equisetum arvense (MoA,Sea,Sal,Ate,Ai)	C	+	+	+	+	+	+	+	+	+	+	+	V	100
Galium aparine (Sea,Epa,QFt)	C	+	1	+	+	+	+	+	+	1	+	+–1	V	100
Lysimachia nummularia (Pte,MoJ,Bia)	C	+	+	+	+	+	+	+	+	1	+	+–1	V	100
Rubus caesius (Spu)	B2	+	+	1	1	1	1	–	+	+	1	+–1	V	90
Torilis japonica (Ar,GA,Epa,QFt)	C	+	+	+	+	+	+	+	+	+	–	+	V	90
Glechoma hederacea (MoA,QFt,Sal,Ai)	C	+	+	1	1	+	+	–	+	+	–	+–1	IV	80

Table 1 (continued)

		1	2	3	4	5	6	7	8	9	10	A–D	K	%
Taraxacum officinale agg. (MoA,ChS)	C	+	–	+	–	+	+	+	+	+	–	+	IV	70
Urtica dioica (Ar,GA,Epa,Spu)	C	–	–	–	+	+	+	+	+	+	–	+	III	60
Sambucus nigra (Epa,US,QFt)	B2	–	–	–	+	–	+	–	+	+	+	+	III	50
Caltha palustris (Mag,MoJ,Spu,Ate,Ai)	C	–	+	+	–	–	–	–	–	+	+	+	II	40
Galium mollugo (MoA,FBt,Qrp,Qpp)	C	–	–	+	+	–	–	+	–	–	+	+	II	40
Ranunculus repens (Pte,MoA,ChS,Spu,Ate)	C	–	–	–	+	–	–	–	+	+	+	+	II	40
Serratula tinctoria (MoA,MoJ,Qrp,Qpp,PQ)	C	–	–	–	–	–	+	–	–	+	–	+	I	20
Stellaria media (ChS,QFt,Spu)	C	–	+	+	–	–	–	–	–	–	–	+	I	20
Carex hirta (Pte,MoA,Pla)	C	–	–	–	+	–	–	–	–	–	–	+	I	10
Lamium album (Ar,GA,Cal)	C	–	–	–	–	–	–	–	+	–	–	+	I	10
Lysimachia vulgaris (Ai,Pte,SCn,MoJ,Sal)	C	–	–	–	–	–	–	–	–	–	+	+	I	10
Mentha aquatica (Pte,Moa,Spu,Ate,Ai)	C	–	–	–	–	–	–	–	–	–	+	+	I	10
Prunella vulgaris (Pte,MoA,ChS,QFt)	C	–	–	–	–	–	–	–	–	+	–	+	I	10
Pseudolysimachion longifolium (Des,FiC)	C	–	–	–	–	–	–	–	–	+	–	+	I	10
7. Adventiva														
Fraxinus pennsylvanica	A2	–	–	–	–	+	2	–	1	–	–	+–2	II	30
	B1	–	–	–	–	1	1	+	–	–	–	+–1	II	30
	B2	–	–	–	–	+	+	+	+	–	–	+	II	40
	S	–	–	–	–	1	2	+	1	–	–	+–2	II	40
Acer negundo	B1	–	+	–	–	–	–	–	–	–	–	+	I	10
	B2	–	+	+	–	–	–	–	–	–	–	+	I	20
	S	–	+	+	–	–	–	–	–	–	–	+	I	20

Table 1 (continued)

		1	2	3	4	5	6	7	8	9	10	A–D	K	%
Celtis occidentalis	B2	–	–	–	–	–	–	–	–	+	+	+	I	20
Echinocystis lobata	C	–	+	–	–	–	–	–	–	–	–	+	I	10
Parthenocissus inserta	B2	–	–	–	–	–	–	–	–	–	1	1	I	10
Robinia pseudo-acacia	B2	–	–	–	–	–	–	+	–	–	–	+	I	10
Vitis riparia	B1	–	–	–	–	–	–	–	–	–	+	+	I	10
	B2	–	–	–	–	–	–	–	–	–	+	+	I	10
	S	–	–	–	–	–	–	–	–	–	+	+	I	10

Frequency distribution of constancy classes

The ten samples included 22 constant (K: V) and 12 sub-constant K: IV) species. The number of accessorial (K: III), sub-accessorial (K: II), and accidental (K: I) species in the samples was 19, 37, and 69, respectively (see Table 1).

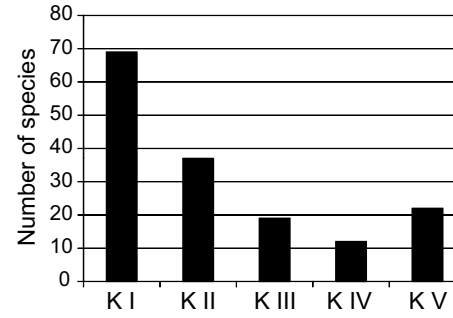

Fig. 4. Frequency distribution of species in different constancy classes in *Veratro albi-Fraxinetum angustifoliae*

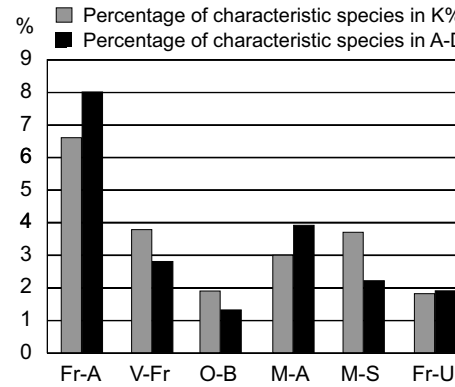

Fig. 5. Proportion of Alnetea glutinosae s. l. character species. Fr-A = *Fraxino pannonicae-Alnetum*, Nyírség (Kevey and Papp L. ined.: 5 relevés); V-Fr = *Veratro albi-Fraxinetum angustifoliae*, Nyírség (Kevey and Papp L. ined.: 10 relevés); Fr-U = *Fraxino pannonicae-Ulmetum*, Nyírség (Kevey *et al.* 2017: 20 relevés)

Table 2
Data of the relevés

	1	2	3	4	5	6	7	8	9	10
Number of sample plot	5932	5935	15808	15809	5921	5924	5927	5928	5930	15807
Year of first sampling 1	2004	2004	2005	2007	2004	2004	2004	2004	2004	2007
Month and day of first sampling 1	04.26	04.26	08.20	04.22	04.26	04.26	04.26	04.26	06.25	04.22
Year of first sampling 2	2004	2004	2007	2007	2004	2004	2004	2004	2007	2007
Month and day of first sampling 2	06.26	06.26	04.22	08.12	06.25	06.25	06.25	06.25	04.22	08.12
Altitude above sea level (m)	137	137	137	137	130	130	130	130	133	133
Exposition	0	0	0	0	0	0	0	0	0	0
Cover of upper canopy layer (%)	75	80	60	65	75	70	65	70	70	65
Cover of lower canopy layer (%)	30	40	60	25	40	40	40	25	20	40
Cover of shrub layer (%)	50	25	50	70	50	60	40	60	50	70
Cover of saplings (%)	3	1	15	50	25	25	40	5	30	40
Cover of understorey (%)	80	85	85	35	60	65	60	80	70	50
Height of upper canopy layer (m)	28	28	22	25	25	22	20	25	27	25
Height of lower canopy layer (m)	16	15	15	15	18	16	15	18	20	12
Height of shrub layer (m)	3	3,5	2,5	3	3	3	1,5	3	2,5	3
Mean trunk diameter (cm)	55	60	40	50	45	40	35	40	45	50
Area of sample plot (m^2)	1600	1600	1600	1600	1600	1600	1200	1600	1600	1600

Location: 1–4: Nyírábrány "Mogyorósi-erdő"; 5–8: Nyíracsád "Jónásrész-Kőrises"; 9: Nyíracsád; "Jónásrész-Buzita"; 10: Nyírábrány "Kis-kőrises"

Type of baserock: 1–10: sand. Soil type: peaty soil with decaying peat.

Authors: 1–3, 5–10, Kevey and Papp L. ined.; 4 : Kevey ined.

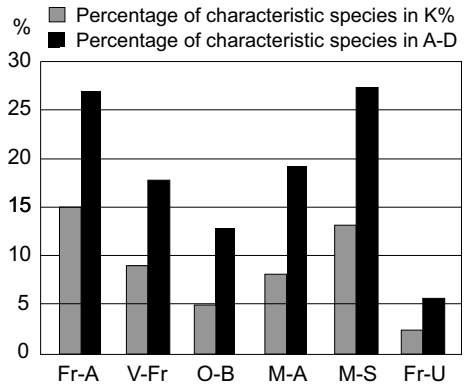

Fig. 6. Proportion of Salicetea purpureae s. l. character species. Fr-A = *Fraxino pannonicae-Alnetum*, Nyírség (Kevey and Papp L. ined.: 5 relevés); V-Fr = *Veratro albi-Fraxinetum angustifoliae*, Nyírség (Kevey and Papp L. ined.: 10 relevés); Fr-U = *Fraxino pannonicae-Ulmetum*, Nyírség (Kevey *et al.* 2017: 20 relevés)

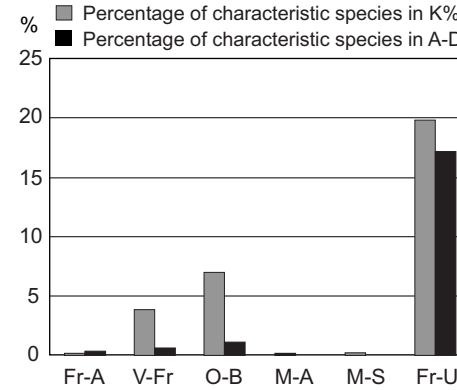

Fig. 7. Proportion of Alnion incanae s. l. character species. Fr-A = *Fraxino pannonicae-Alnetum*, Nyírség (Kevey and Papp L. ined.: 5 relevés); V-Fr = *Veratro albi-Fraxinetum angustifoliae*, Nyírség (Kevey and Papp L. ined.: 10 relevés); Fr-U = *Fraxino pannonicae-Ulmetum*, Nyírség (Kevey *et al.* 2017: 20 relevés)

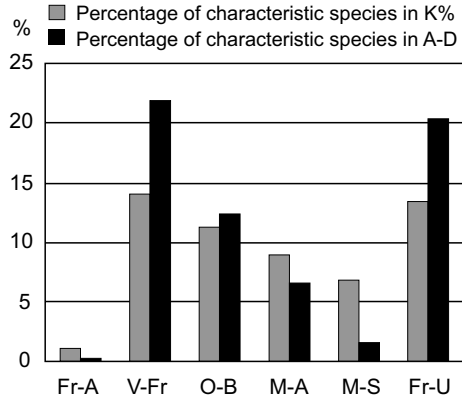

Fig. 8. Proportion of Fagetalia character species. Fr-A = *Fraxino pannonicae-Alnetum*, Nyírség (Kevey and Papp L. ined.: 5 relevés); V-Fr = *Veratro albi-Fraxinetum angustifoliae*, Nyírség (Kevey and Papp L. ined.: 10 relevés); Fr-U = *Fraxino pannonicae-Ulmetum*, Nyírség (Kevey *et al.* 2017: 20 relevés)

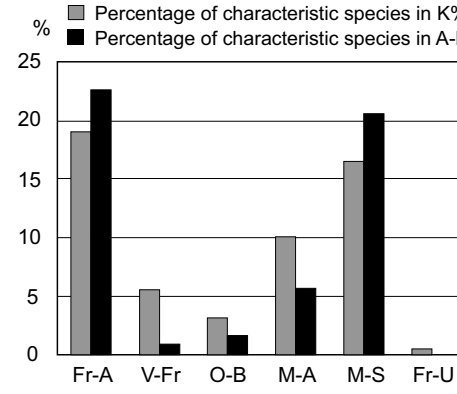

Fig. 9. Proportion of Phragmitetea s. l. character species. Fr-A = *Fraxino pannonicae-Alnetum*, Nyírség (Kevey and Papp L. ined.: 5 relevés); V-Fr = *Veratro albi-Fraxinetum angustifoliae*, Nyírség (Kevey and Papp L. ined.: 10 relevés); Fr-U = *Fraxino pannonicae-Ulmetum*, Nyírség (Kevey *et al.* 2017: 20 relevés)

Table 3
Percentages of characteristic species in *Veratro albi-Fraxinetum angustifoliae* and five similar associations selected for comparison

	Percentage of characteristic species in K%						Percentage of characteristic species in A-D					
	Fr-A	V-Fr	O-B	M-A	M-S	Fr-U	Fr-A	V-Fr	O-B	M-A	M-S	Fr-U
Querco-Fagea	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Salicetea purpureae	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Salicetalia purpureae	8.2	2.0	1.5	3.6	3.8	1.3	2.2	0.5	0.2	2.5	4.6	0.3
Salicion triandrae	0.0	0.0	0.0	0.1	0.5	0.0	0.0	0.0	0.0	0.0	1.8	0.0
Salicion albae	6.6	3.3	1.9	3.0	3.7	1.6	8.0	2.7	1.3	3.9	2.2	1.9
Populenion nigro-albae	0.0	0.5	0.0	0.0	0.0	0.2	0.0	0.1	0.0	0.0	0.0	0.0
Salicion albae s. l.	6.6	3.8	1.9	3.0	3.7	1.8	8.0	2.8	1.3	3.9	2.2	1.9
Salicetalia purpureae s. l.	14.8	5.8	3.4	6.7	8.0	3.1	10.2	3.3	1.5	6.4	8.6	2.2
Salicetea purpureae s. l.	14.8	5.8	3.4	6.7	8.0	3.1	10.2	3.3	1.5	6.4	8.6	2.2
Alnetea glutinosae	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alnetalia glutinosae	13.9	8.2	5.0	7.4	7.6	2.3	25.4	17.7	13.0	18.5	15.5	5.6
Alnion glutinosae	1.1	0.8	0.0	0.7	1.0	0.0	1.7	0.1	0.0	0.8	11.7	0.0
Alnetalia glutinosae s. l.	15.0	9.0	5.0	8.1	8.6	2.3	27.1	17.8	13.0	19.3	27.2	5.6
Alnetea glutinosae s. l.	15.0	9.0	5.0	8.1	8.6	2.3	27.1	17.8	13.0	19.3	27.2	5.6
Querco-Fagetea	2.7	13.0	9.8	4.9	2.1	20.7	0.2	21.9	12.8	6.0	0.8	25.4
Fagetalia sylvaticae	0.3	3.9	7.0	0.2	0.3	19.9	0.0	0.7	1.2	0.0	0.0	17.2
Alnion incanae	12.9	9.8	5.2	6.0	5.1	8.1	21.0	20.8	1.5	17.1	13.4	13.8
Alnenion glutinosae-incanae	0.9	0.0	0.0	0.5	0.0	0.0	6.2	0.0	0.0	12.8	0.0	0.0
Ulmenion	0.0	0.8	0.3	0.4	0.3	1.1	0.0	0.9	0.0	0.1	0.1	1.2
Alnion incanae s. l.	13.8	10.6	5.5	6.9	5.4	9.2	27.2	21.7	1.5	30.0	13.5	15.0

Table 3 (continued)

	Percentage of characteristic species in K%						Percentage of characteristic species in A-D					
	Fr-A	V-Fr	O-B	M-A	M-S	Fr-U	Fr-A	V-Fr	O-B	M-A	M-S	Fr-U
Fagion sylvaticae	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eu-Fagenion	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0
Carpinenion betuli	0.1	2.5	1.8	1.1	0.4	4.1	0.0	2.7	0.2	0.2	0.1	5.6
Tilio-Acerenion	0.0	0.0	0.6	0.1	0.0	0.5	0.0	0.0	0.1	0.0	0.0	0.4
Fagion sylvaticae s. l.	0.1	2.5	2.4	1.2	0.4	4.9	0.0	2.7	0.3	0.2	0.1	6.0
Aremonio-Fagion	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	1.1
Fagetalia sylvaticae s. l.	14.2	17.0	14.9	8.3	6.1	34.4	27.2	25.1	3.0	30.2	13.6	39.3
Quercetalia roboris	0.6	0.6	1.3	0.5	0.2	0.5	0.1	0.1	11.4	0.1	0.1	0.1
Quercion robori-petraeae	0.0	0.2	0.4	0.4	0.3	0.0	0.0	0.0	0.1	0.1	0.1	0.0
Quercetalia roboris s. l.	0.6	0.8	1.7	0.9	0.5	0.5	0.1	0.1	11.5	0.2	0.2	0.1
Querco-Fagetea s. l.	17.5	30.8	26.4	14.1	8.7	55.6	27.5	47.1	27.3	36.4	14.6	64.8
Quercetea pubescentis-petraeae	1.1	14.1	11.3	9.0	6.9	13.5	0.1	21.9	12.4	6.6	1.6	20.4
Orno-Cotinetalia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Orno-Cotinion	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Orno-Cotinetalia s. l.	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Quercetalia cerridis	0.1	0.4	0.0	0.2	0.2	0.3	0.0	0.1	0.0	0.1	0.0	0.0
Quercion farnetto	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	1.1
Quercion petraeae	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0
Aceri tatarici-Quercion	0.5	0.8	0.1	0.2	0.3	0.7	0.1	1.7	0.0	0.0	0.2	0.9
Quercetalia cerridis s. l.	0.6	1.2	0.1	0.4	0.5	1.6	0.1	1.8	0.0	0.1	0.2	2.0

Table 3 (continued)

	Percentage of characteristic species in K%						Percentage of characteristic species in A-D					
	Fr-A	V-Fr	O-B	M-A	M-S	Fr-U	Fr-A	V-Fr	O-B	M-A	M-S	Fr-U
Prunetalia spinosae	0.0	1.1	1.1	1.2	0.5	0.4	0.0	0.2	0.1	0.6	0.1	0.0
Berberidion	0.1	0.2	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Prunion fruticosae	0.0	0.5	0.7	0.8	0.3	0.2	0.0	0.1	0.1	0.2	0.0	0.0
Prunetalia spinosae s. l.	0.1	1.8	1.8	2.1	0.8	0.7	0.0	0.4	0.2	0.8	0.1	0.0
Quercetea pubescentis-petraeae s. l.	1.8	17.1	13.2	11.5	8.2	15.9	0.2	24.1	12.6	7.5	1.9	22.4
Querco-Fagea s. l.	49.1	62.7	48.0	40.4	33.5	76.9	65.0	92.3	54.4	69.6	52.3	95.0
Abieti-Piceea	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Vaccinio-Piceetea	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Pino-Quercetalia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pino-Quercion	0.4	0.6	2.0	0.9	0.6	0.2	0.0	0.1	11.5	0.2	0.1	0.0
Pino-Quercetalia s. l.	0.4	0.6	2.0	0.9	0.6	0.2	0.0	0.1	11.5	0.2	0.1	0.0
Vaccinio-Piceetea s. l.	0.5	0.6	2.0	0.9	0.6	0.3	0.0	0.1	11.5	0.2	0.1	0.0
Abieti-Piceea s. l.	0.5	0.6	2.0	1.0	0.6	0.4	0.0	0.1	11.5	0.2	0.1	0.0
Lemno-Potamea	1.2	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Hydrochari-Lemnetea	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hydrocharietalia	0.8	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Lemnion minoris	0.8	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Hydrocharietalia s. l.	1.6	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0
Hydrochari-Lemnetea s. l.	1.6	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0
Potametea	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lemno-Potamea s. l.	3.2	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0

Table 3 (continued)

	Percentage of characteristic species in K%						Percentage of characteristic species in A-D					
	Fr-A	V-Fr	O-B	M-A	M-S	Fr-U	Fr-A	V-Fr	O-B	M-A	M-S	Fr-U
Cypero-Phragmitea	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Phragmitetea	11.6	2.6	1.4	5.2	7.5	0.4	8.8	0.4	0.5	3.4	16.6	0.0
Phragmitetalia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Phragmition	1.3	0.0	0.0	0.2	0.1	0.0	0.6	0.0	0.0	0.1	0.0	0.0
Phragmitetalia s. l.	1.3	0.0	0.0	0.2	0.1	0.0	0.6	0.0	0.0	0.1	0.0	0.0
Nasturtio-Glycerietalia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Glycerio-Sparganion	1.0	0.1	0.0	0.3	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Nasturtio-Glycerietalia s. l.	1.0	0.1	0.0	0.3	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Magnocaricetalia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Magnocaricion	3.6	2.5	1.6	3.6	5.7	0.1	7.0	0.4	0.7	1.4	2.2	0.0
Caricenion rostratae	0.0	0.0	0.0	0.5	1.9	0.0	0.0	0.0	0.0	0.1	0.8	0.0
Caricenion gracilis	1.5	0.3	0.2	0.3	1.3	0.0	6.0	0.1	0.4	0.7	0.9	0.0
Magnocaricion s. l.	5.1	2.8	1.8	4.4	8.9	0.1	13.0	0.5	1.1	2.2	3.9	0.0
Magnocaricetalia s. l.	5.1	2.8	1.8	4.4	8.9	0.1	13.0	0.5	1.1	2.2	3.9	0.0
Phragmitetea s. l.	19.0	5.5	3.2	10.1	16.5	0.5	22.5	0.9	1.6	5.7	20.5	0.0
Isoëto-Nanojuncetea	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nanocyperetalia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nanocyperion flavescentis	0.7	0.0	0.1	0.3	0.7	0.0	0.1	0.0	0.0	0.1	0.1	0.0
Nanocyperetalia s. l.	0.7	0.0	0.1	0.3	0.7	0.0	0.1	0.0	0.0	0.1	0.1	0.0
Isoëto-Nanojuncetea s. l.	0.7	0.0	0.1	0.3	0.7	0.0	0.1	0.0	0.0	0.1	0.1	0.0
Cypero-Phragmitea s. l.	19.7	5.5	3.3	10.4	17.2	0.5	22.6	0.9	1.6	5.8	20.6	0.0

Table 3 (continued)

	Percentage of characteristic species in K%						Percentage of characteristic species in A-D					
	Fr-A	V-Fr	O-B	M-A	M-S	Fr-U	Fr-A	V-Fr	O-B	M-A	M-S	Fr-U
Oxycocco-Caricea nigrae	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scheuchzerio-Caricetea nigrae	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scheuchzerio-Caricetalia nigrae	0.3	0.0	0.2	0.2	0.3	0.0	0.0	0.0	0.0	0.1	0.2	0.0
Scheuchzerio-Caricetea nigrae s. l.	0.3	0.0	0.2	0.2	0.3	0.0	0.0	0.0	0.0	0.1	0.2	0.0
Oxycocco-Caricea nigrae s. l.	0.3	0.0	0.2	0.2	0.3	0.0	0.0	0.0	0.0	0.1	0.2	0.0
Molinio-Arrhenatherea	1.4	4.0	5.4	4.9	8.3	1.5	0.1	0.7	0.7	0.8	1.8	0.3
Molinio-Juncetea	3.8	2.3	4.7	8.3	10.8	0.4	5.8	0.9	22.6	11.8	7.5	0.0
Tofieldietalia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Caricion davallianae	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tofieldietalia s. l.	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Molinietalia coeruleae	1.7	2.2	2.0	2.3	3.2	0.3	0.3	0.3	0.3	0.5	1.1	0.0
Molinion coeruleae	0.0	0.1	0.4	0.4	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.0
Deschampsion caespitosae	0.9	0.4	0.4	1.2	3.5	0.1	0.2	0.2	0.7	2.4	2.8	0.0
Filipendulo-Cirsion oleracei	0.0	1.7	0.6	1.1	0.9	0.3	0.0	0.3	0.1	0.2	0.3	0.0
Alopecurion pratensis	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Molinietalia coeruleae s. l.	2.7	4.4	3.4	5.0	7.7	0.7	0.5	0.8	1.2	3.2	4.2	0.0
Molinio-Juncetea s. l.	6.5	6.7	8.2	13.5	18.5	1.1	6.3	1.7	23.8	15.0	11.7	0.0
Arrhenatheretea	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Arrhenatheretalia	0.0	0.4	0.6	0.3	0.3	0.3	0.0	0.0	0.1	0.0	0.0	0.0
Arrhenatherion elatioris	0.0	0.4	0.6	0.4	0.4	0.0	0.0	0.0	0.2	0.1	0.1	0.0
Cynosurion cristati	0.0	0.0	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 3 (continued)

	Percentage of characteristic species in K%						Percentage of characteristic species in A-D					
	Fr-A	V-Fr	O-B	M-A	M-S	Fr-U	Fr-A	V-Fr	O-B	M-A	M-S	Fr-U
Arrhenatheretalia s. l.	0.0	0.8	1.5	0.8	0.7	0.3	0.0	0.0	0.3	0.1	0.1	0.0
Arrhenatheretea s. l.	0.0	0.8	1.5	0.8	0.7	0.3	0.0	0.0	0.3	0.1	0.1	0.0
Nardo-Callunetea	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nardetalia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nardo-Agrostion tenuis	0.0	0.4	0.5	0.5	0.0	0.2	0.0	0.0	0.1	0.1	0.0	0.3
Nardetalia s. l.	0.0	0.4	0.5	0.5	0.0	0.2	0.0	0.0	0.1	0.1	0.0	0.3
Nardo-Callunetea s. l.	0.0	0.4	0.5	0.5	0.0	0.2	0.0	0.0	0.1	0.1	0.0	0.3
Calluno-Ulicetea	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Vaccinio-Genistetalia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Calluno-Genistion	0.0	0.0	0.0	0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.3
Vaccinio-Genistetalia s. l.	0.0	0.0	0.0	0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.3
Calluno-Ulicetea s. l.	0.0	0.0	0.0	0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.3
Molinio-Arrhenatherea s. l.	7.9	11.9	15.6	19.8	27.5	3.3	6.4	2.4	24.9	16.0	13.6	0.9
Puccinellio-Salicornea	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Festuco-Puccinellietea	0.1	0.0	0.4	0.2	0.8	0.0	0.1	0.0	0.0	0.7	1.1	0.0
Festuco-Puccinellietalia	0.6	0.2	0.3	0.5	0.8	0.0	0.1	0.0	0.0	0.1	0.1	0.0
Juncion gerardi	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Beckmannion eruciformis	0.0	0.0	0.0	0.1	0.5	0.0	0.0	0.0	0.0	0.0	0.2	0.0
Festuco-Puccinellietalia s. l.	0.7	0.2	0.4	0.7	1.3	0.0	0.2	0.0	0.0	0.1	0.3	0.0
Artemisio-Festucetalia pseudovinae	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Festucion pseudovinae	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 3 (continued)

	Percentage of characteristic species in K%						Percentage of characteristic species in A-D					
	Fr-A	V-Fr	O-B	M-A	M-S	Fr-U	Fr-A	V-Fr	O-B	M-A	M-S	Fr-U
Artemisio-Festucetalia pseudovinae s. l.	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Festuco-Puccinellietea s. l.	0.0	0.2	0.8	0.9	2.2	0.0	0.0	0.0	0.0	0.8	1.4	0.0
Puccinellio-Salicornea s. l.	0.7	0.2	0.8	0.9	2.2	0.0	0.2	0.0	0.0	0.8	1.4	0.0
Festuco-Bromea	0.0	0.2	0.5	0.3	0.5	0.0	0.0	0.0	0.1	0.0	0.1	0.0
Festucetea vaginatae	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Festucetalia vaginatae	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Festucion vaginatae	0.0	0.1	0.0	0.9	0.9	0.0	0.0	0.0	0.0	0.1	0.4	0.0
Festucetalia vaginatae s. l.	0.0	0.1	0.0	0.9	0.9	0.0	0.0	0.0	0.0	0.1	0.4	0.0
Festucetea vaginatae s. l.	0.0	0.1	0.0	0.9	0.9	0.0	0.0	0.0	0.0	0.1	0.4	0.0
Festuco-Brometea	0.0	0.4	1.7	1.2	0.8	0.1	0.0	0.1	0.4	0.2	0.1	0.0
Festucetalia valesiacae	0.0	0.2	0.2	0.2	0.4	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Festucion rupicolae	0.0	0.0	0.9	0.6	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.0
Cynodonto-Festucenion	0.0	0.0	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Festucion rupicolae s. l.	0.0	0.0	1.2	0.7	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.0
Festucetalia valesiacae s. l.	0.0	0.2	1.4	0.9	0.5	0.0	0.0	0.0	0.1	0.1	0.1	0.0
Brometalia erecti	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cirsio-Brachypodion	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Brometalia erecti s. l.	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Festuco-Brometea s. l.	0.0	0.6	3.1	2.1	1.3	0.2	0.0	0.1	0.5	0.3	0.2	0.0
Festuco-Bromea s. l.	0.0	0.9	3.6	3.3	2.7	0.2	0.0	0.1	0.6	0.4	0.7	0.0

Table 3 (continued)

	Percentage of characteristic species in K%						Percentage of characteristic species in A-D					
	Fr-A	V-Fr	O-B	M-A	M-S	Fr-U	Fr-A	V-Fr	O-B	M-A	M-S	Fr-U
Chenopodio-Scleranthea	0.5	0.6	1.0	1.1	0.9	0.2	0.0	0.1	0.1	0.2	0.2	0.0
Secalietea	0.5	0.9	0.3	0.9	0.8	0.6	0.0	0.2	0.0	0.1	0.1	0.1
Oryzetea sativae	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oryzetalia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oryzion sativae	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oryzetalia s. l.	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oryzetea sativae s. l.	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chenopodietea	0.1	0.2	1.0	0.7	0.1	0.5	0.0	0.0	0.1	0.1	0.0	0.1
Onopordetalia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Onopordion acanthii	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
Onopordetalia s. l.	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
Chenopodietea s. l.	0.0	0.2	1.7	0.7	0.1	0.0	0.0	0.0	0.2	0.1	0.0	0.0
Artemisietea	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Artemisietalia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Arction lappae	0.5	0.8	1.6	1.0	0.0	1.1	0.1	0.1	0.2	0.2	0.0	0.1
Artemisietalia s. l.	0.5	0.8	1.6	1.0	0.0	1.1	0.1	0.1	0.2	0.2	0.0	0.1
Artemisietea s. l.	0.5	0.8	1.6	1.0	0.0	1.1	0.1	0.1	0.2	0.2	0.0	0.1
Galio-Urticetea	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Calystegietalia sepium	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Galio-Alliarion	0.4	2.3	3.6	1.8	0.0	3.9	0.1	0.4	0.6	0.4	0.0	0.6

Table 3 (continued)

	Percentage of characteristic species in K%						Percentage of characteristic species in A-D					
	Fr-A	V-Fr	O-B	M-A	M-S	Fr-U	Fr-A	V-Fr	O-B	M-A	M-S	Fr-U
Calystegion sepium	5.0	1.5	1.2	2.5	1.9	0.9	3.1	0.5	0.2	0.8	2.3	0.1
Calystegietalia sepium s. l.	5.4	3.8	4.8	4.3	1.9	4.8	3.2	0.9	0.8	1.2	2.3	0.7
Galio-Urticetea s. l.	5.4	3.8	4.8	4.3	1.9	4.8	3.2	0.9	0.8	1.2	2.3	0.7
Bidentetea	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bidentetalia	3.1	0.8	0.4	1.8	1.7	0.5	0.9	0.2	0.1	0.5	0.6	0.0
Bidention tripartiti	0.7	0.0	0.0	0.2	0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.0
Chenopodion rubri	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bidentetalia s. l.	4.1	0.8	0.4	2.0	1.8	0.5	1.1	0.2	0.1	0.5	0.6	0.0
Bidentetea s. l.	4.1	0.8	0.4	2.0	1.8	0.5	1.1	0.2	0.1	0.5	0.6	0.0
Plantaginetea	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Plantaginetalia majoris	0.5	0.3	0.9	1.0	1.0	0.2	0.1	0.0	0.1	0.3	0.3	0.0
Agropyro-Rumicion crispi	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Plantaginetalia majoris s. l.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Plantaginetea s. l.	0.5	0.3	0.9	1.2	1.1	0.2	0.1	0.0	0.1	0.3	0.3	0.0
Epilobietea angustifolii	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Epilobietalia	1.8	4.5	5.7	2.3	0.9	6.1	0.2	0.8	1.6	0.7	0.2	1.4
Epilobion angustifolii	0.0	0.1	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0
Epilobietalia s. l.	1.8	4.6	5.7	2.3	0.9	6.3	0.2	0.8	1.6	0.7	0.2	1.4
Epilobietea angustifolii s. l.	1.8	4.6	5.7	2.3	0.9	6.3	0.2	0.8	1.6	0.7	0.2	1.4
Urtico-Sambucetea	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 3 (continued)

	Percentage of characteristic species in K%						Percentage of characteristic species in A-D					
	Fr-A	V-Fr	O-B	M-A	M-S	Fr-U	Fr-A	V-Fr	O-B	M-A	M-S	Fr-U
Sambucetalia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sambuco-Salicion capreae	0.1	0.3	0.6	0.3	0.0	0.4	0.0	0.0	0.9	0.1	0.0	0.3
Sambucetalia s. l.	0.1	0.3	0.6	0.3	0.0	0.4	0.0	0.0	0.9	0.1	0.0	0.3
Urtico-Sambucetea s. l.	0.1	0.3	0.6	0.3	0.0	0.4	0.0	0.0	0.9	0.1	0.0	0.3
Chenopodio-Scleranthea s. l.	13.8	12.3	17.0	13.8	7.5	14.6	4.7	2.3	4.0	3.4	3.7	2.7
Indifferens	3.6	3.8	4.7	4.9	5.9	2.9	0.4	0.8	1.6	1.9	4.3	0.8
Adventiva	0.5	1.9	4.9	5.3	2.4	1.0	0.0	1.1	1.0	1.6	3.0	0.2

Fr-A: *Fraxino pannonicae-Alnetum*, Nyírség (Kevey, Papp L. et Lendvai ined.: 5 rel.); V-Fr: *Veratro albi-Fraxinetum angustifoliae*, Nyírség (Kevey et Papp L. ined.: 10 rel.); O-B: *Ophioglosso-Betuletum pubescentis*, Vértesalja (Riezing *et. al.* 2009: 6 rel.); M-A: *Molinio-Alnetum glutinosae*, Mezőföld (Kevey 2008: 20 rel.); M-S: *Molinio-Salicetum cinereae*, Szigetköz (Kevey 2008: 20 rel.) Fr-U: *Fraxino pannonicae-Ulmetum*, Nyírség (Kevey et Papp L. ined.: 20 rel.)

The frequency distribution of species in the five constancy categories, from I to V, follows a characteristic pattern. The highest frequency value at I steeply drops to II, then decreases further with diminishing increments to IV, where it reaches its minimum. At V, its value is again higher (Fig. 4). This patterns is only typical of phytosociological samples that are representative of the sampled vegetation unit (see Kevey 2008).

Proportion of character species

As usual in temperate deciduous forests in Central Europe, the species characteristic of the Querco-Fagetea class or syntaxa within it play a substantial role (30.8%) in the species composition of these *Fraxinus angustifolia* dominated stands. They are followed by the character species of SE European dry oak woods, Quercetea pubescentis-petraeae s. l. (17.1%) despite the rather mesic habitat, and Alnetea glutinosae s. l., Molinio-Juncetea s. l., Salicetea s. l., and Phragmitetea s. l. in decreasing order. Within the Querco-Fagetea class, Fagetalia s. l. and Alnion incanae species attain the highest proportions.

In comparison to other communities, it is noteworthy that character species proportions in all but two syntaxa were typically intermediate between those in *Fraxino pannonicae-Alnetum* and

Table 4
Differential species in *Veratro albi-Fraxinetum angustifoliae* and *Fraxino pannonicae-Alnetum*

	V-Fr	Fr-A
Constant species		
Crataegus monogyna	V	–
Euonymus europaeus	V	–
Filipendula ulmaria	V	–
Geum urbanum	V	–
Ligustrum vulgare	V	–
Lychnis flos-cuculi	V	–
Rhamnus catharticus	V	–
Scrophularia nodosa	V	–
Torilis japonica	V	–
Veratrum album	V	–
Angelica sylvestris	V	I
Equisetum arvense	V	I
Galium aparine	V	I
Brachypodium sylvaticum	V	II
Cornus sanguinea	V	II
Lysimachia nummularia	V	II
Viburnum opulus	V	II
Frangula alnus	V	III
Populus alba	V	III
Alnus glutinosa	–	V
Lemna minor	–	V
Oenanthe aquatica	–	V
Salix cinerea	–	V
Carex riparia	I	V
Galium palustre	I	V
Lycopus europaeus	II	V
Salix fragilis	II	V
Solanum dulcamara	II	V
Symphytum officinale	II	V
Carex acutiformis	III	V
Sub-constant species		
Cucubalus baccifer	IV	–
Geranium palustre	IV	–
Moehringia trinervia	IV	–
Prunus spinosa	IV	–
Pyrus pyraster	IV	–
Taraxacum officinale agg.	IV	–
Ulmus minor	IV	–
Valeriana officinalis	IV	–
Listera ovata	IV	I
Quercus robur	IV	I
Glechoma hederacea	IV	II
Alisma plantago-aquatica	–	IV
Sparganium erectum	–	IV
Calystegia sepium	I	IV
Lysimachia vulgaris	I	IV
Mentha aquatica	I	IV
Stachys palustris	I	IV
Sium latifolium	II	IV
Accessorial species		
Betonica officinalis	III	–
Chaerophyllum temulum	III	–
Cirsium canum	III	–
Clinopodium vulgare	III	–
Convallaria majalis	III	–
Corylus avellana	III	–
Dactylis polygama	III	–
Elymus caninus	III	–
Geranium robertianum	III	–
Ophioglossum vulgatum	III	–
Trollius europaeus	III	–
Veronica chamaedrys	III	–
Arctium minus	III	I
Deschampsia caespitosa	III	I
Populus tremula	III	I

Table 4 (continued)

	V-Fr	Fr-A
Sambucus nigra	III	I
Bidens tripartita	–	III
Carex vesicaria	–	III
Glyceria maxima	–	III
Impatiens noli-tangere	–	III
Lythrum salicaria	–	III
Salix alba	–	III
Sub-accessorial species		
Acer tataricum	II	–
Alliaria petiolata	II	–
Angelica palustris	II	–
Campanula glomerata	II	–
Campanula trachelium	II	–
Carex michelii	II	–
Carex spicata	II	–
Carex sylvatica	II	–
Circaea lutetiana	II	–
Cirsium rivulare	II	–
Cruciata glabra	II	–
Fraxinus pennsylvanica	II	–
Galium mollugo	II	–
Heracleum sphondylium	II	–
Hypericum tetrapterum	II	–
Polygonatum latifolium	II	–
Pulmonaria mollissima	II	–
Ranunculus auricomus agg.	II	–
Rosa canina agg.	II	–
Rumex sanguineus	II	–
Stachys sylvatica	II	–
Vicia cracca	II	–
Chenopodium polyspermum	–	II
Myosotis nemorosa	–	II
Persicaria hydropiper	–	II
Poa palustris	–	II
Scutellaria galericulata	–	II
Teucrium scordium	–	II
Thelypteris palustris	–	II
Typha latifolia	–	II
Number of differential species	68	32

V-Fr = *Veratro albi-Fraxinetum angustifoliae* (Kevey and Papp L. ined.: 10 rel.); Fr-A = *Fraxino pannonicae-Alnetum* (Kevey, Papp L. and Lendvai ined.: 5 rel.)

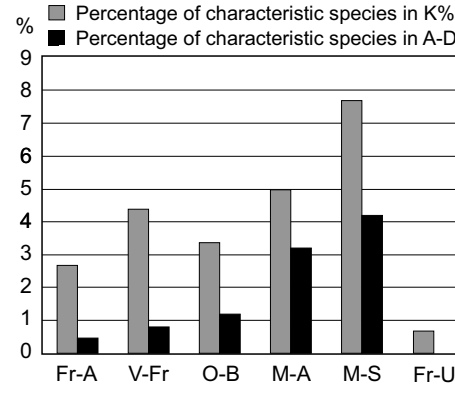

Fig. 10. Proportion of Molinio-Juncetea s. l. character species. Fr-A = *Fraxino pannonicae-Alnetum*, Nyírség (Kevey and Papp L. ined.: 5 relevés); V-Fr = *Veratro albi-Fraxinetum angustifoliae*, Nyírség (Kevey and Papp L. ined.: 10 relevés); Fr-U = *Fraxino pannonicae-Ulmetum*, Nyírség (Kevey *et al.* 2017: 20 relevés)

Table 5
Differential species in *Veratro albi-Fraxinetum angustifoliae* and *Fraxino pannonicae-Ulmetum*

	V-Fr	Fr-U
Constant species		
Angelica sylvestris	V	–
Equisetum arvense	V	–
Filipendula ulmaria	V	–
Lychnis flos-cuculi	V	–
Eupatorium cannabinum	V	I
Frangula alnus	V	I
Veratrum album	V	I
Rhamnus catharticus	V	II
Lysimachia nummularia	V	III
Populus alba	V	III
Viburnum opulus	V	III
Ranunculus ficaria	–	V
Viola reichenbachiana	–	V
Acer campestre	I	V
Milium effusum	I	V
Polygonatum multiflorum	I	V
Ajuga reptans	II	V
Circaea lutetiana	II	V
Stachys sylvatica	II	V
Chaerophyllum temulum	III	V
Convallaria majalis	III	V
Corylus avellana	III	V
Geranium robertianum	III	V
Sambucus nigra	III	V
Sub-constant species		
Geranium palustre	IV	–
Valeriana officinalis	IV	–
Glechoma hederacea	IV	I
Poa trivialis	IV	I
Prunus spinosa	IV	I
Pyrus pyraster	IV	I
Taraxacum officinale agg.	IV	I
Chelidonium majus	–	IV
Pulmonaria officinalis	–	IV
Carpinus betulus	I	IV
Lapsana communis	I	IV
Ulmus laevis	I	IV
Veronica hederifolia subsp. *lucorum*	I	IV
Viola mirabilis	I	IV
Alliaria petiolata	II	IV
Carex sylvatica	II	IV
Festuca gigantea	II	IV
Accessorial species		
Betonica officinalis	III	–
Carex acutiformis	III	–
Cirsium canum	III	–
Iris pseudacorus	III	–
Ophioglossum vulgatum	III	–
Trollius europaeus	III	–
Clinopodium vulgare	III	I
Deschampsia caespitosa	III	I
Elymus caninus	III	I
Populus tremula	III	I
Actaea spicata	–	III
Bromus ramosus agg.	–	III
Fallopia dumetorum	–	III
Hedera helix	–	III
Lilium martagon	–	III
Tilia cordata	–	III
Tilia tomentosa	–	III
Carex divulsa	I	III
Carex remota	I	III

Table 5 (continued)

	V-Fr	Fr-U
Sub-accessorial species		
Angelica palustris	II	–
Campanula glomerata	II	–
Carex michelii	II	–
Carex otrubae	II	–
Carex spicata	II	–
Cirsium rivulare	II	–
Galium mollugo	II	–
Hypericum tetrapterum	II	–
Lycopus europaeus	II	–
Pulmonaria mollissima	II	–
Sium latifolium	II	–
Symphytum officinale	II	–
Vicia cracca	II	–
Allium ursinum	–	II
Anemone ranunculoides	–	II
Cerasus avium	–	II
Chaerophyllum aromaticum	–	II
Colchicum autumnale	–	II
Corydalis cava	–	II
Dryopteris filix-mas	–	II
Euphorbia amygdaloides	–	II
Galeobdolon luteum	–	II
Galium odoratum	–	II
Impatiens noli-tangere	–	II
Lathraea squamaria	–	II
Sanicula europaea	–	II
Scilla vindobonensis	–	II
Viola suavis s. l.	–	II
Number of differential species	41	47

V-Fr = *Veratro albi-Fraxinetum angustifoliae* (Kevey and Papp L. ined.: 10 rel.); Fr-U = *Fraxino pannonicae-Ulmetum*, Nyírség (Kevey and Papp L. ined.: 20 rel.)

Table 6
Differential species in *Veratro albi-Fraxinetum angustifoliae* and *Ophioglosso-Betuletum*

	V-Fr	O-B
Constant species		
Cornus sanguinea	V	–
Filipendula ulmaria	V	–
Fraxinus angustifolia subsp. *danubialis*	V	–
Lychnis flos-cuculi	V	–
Lysimachia nummularia	V	–
Scrophularia nodosa	V	–
Populus alba	V	I
Equisetum arvense	V	II
Galium aparine	V	II
Acer pseudo-platanus	–	V
Arctium lappa	–	V
Carex flacca	–	V
Chelidonium majus	–	V
Cirsium oleraceum	–	V
Clematis vitalba	–	V
Cynoglossum officinale	–	V
Dactylis glomerata	–	V
Fallopia dumetorum	–	V
Galium odoratum	–	V
Molinia coerulea	–	V
Phragmites australis	–	V
Quercus cerris	–	V
Ranunculus polyanthemos	–	V
Sanguisorba officinalis	–	V

Table 6 (continued)

	V-Fr	O-B
Solidago gigantea	–	V
Acer campestre	I	V
Acer negundo	I	V
Betula pubescens	I	V
Galeopsis pubescens	I	V
Lapsana communis	I	V
Lysimachia vulgaris	I	V
Mycelis muralis	I	V
Ranunculus acris	I	V
Selinum carvifolia	I	V
Serratula tinctoria	I	V
Circaea lutetiana	II	V
Festuca gigantea	II	V
Fraxinus pennsylvanica	II	V
Galium mollugo	II	V
Humulus lupulus	II	V
Rosa canina agg.	II	V
Stachys sylvatica	II	V
Carex acutiformis	III	V
Chaerophyllum temulum	III	V
Deschampsia caespitosa	III	V
Geranium robertianum	III	V
Ophioglossum vulgatum	III	V
Sambucus nigra	III	V
Urtica dioica	III	V
Sub-constant species		
Geranium palustre	IV	–
Glechoma hederacea	IV	–
Listera ovata	IV	–
Ulmus minor	IV	–
Valeriana officinalis	IV	–
Poa trivialis	IV	I
Quercus robur	IV	I
Prunus spinosa	IV	II
Achillea millefolium	–	IV
Cardamine impatiens	–	IV
Cerasus avium	–	IV
Festuca rubra	–	IV
Alliaria petiolata	II	IV
Accessorial species		
Arctium minus	III	–
Betonica officinalis	III	–
Cirsium canum	III	–
Clinopodium vulgare	III	–
Convallaria majalis	III	–
Corylus avellana	III	–
Dactylis polygama	III	–
Elymus caninus	III	–
Iris pseudacorus	III	–
Populus tremula	III	–
Trollius europaeus	III	–
Veronica chamaedrys	III	–
Agrimonia eupatoria	–	III
Colchicum autumnale	–	III
Dianthus superbus	–	III
Mentha pulegium	–	III
Poa angustifolia	–	III
Rubus fruticosus agg.	–	III
Tussilago farfara	–	III
Lathyrus pratensis	I	III
Sub-accessorial species		
Acer tataricum	II	–
Ajuga reptans	II	–
Angelica palustris	II	–
Caltha palustris	II	–
Campanula glomerata	II	–
Campanula trachelium	II	–
Cardamine pratensis	II	–

Table 6 (continued)

	V-Fr	O-B		V-Fr	O-B
Carex michelii	II	–	*Sium latifolium*	II	–
Carex otrubae	II	–	*Symphytum officinale*	II	–
Carex spicata	II	–	*Vicia cracca*	II	–
Carex sylvatica	II	–	*Agrostis stolonifera*	–	II
Cirsium rivulare	II	–	*Bromus ramosus* agg.	–	II
Cruciata glabra	II	–	*Euphorbia cyparissias*	–	II
Heracleum sphondylium	II	–	*Phleum pratense*	–	II
Hypericum tetrapterum	II	–	*Valeriana dioica*	–	II
Lycopus europaeus	II	–	*Viola reichenbachiana*	–	II
Pulmonaria mollissima	II	–	Number of differential species	52	59
Ranunculus auricomus agg.	II	–			
Rumex sanguineus	II	–			
Salix fragilis	II	–			

V-Fr = *Veratro albi-Fraxinetum angustifoliae* (Kevey and Papp L. ined.: 10 rel.); O-B = *Ophioglosso-Betuletum*

Fraxino pannonicae-Ulmetum, which reflects the transitional habitat of *Veratro albi-Fraxinetum angustifoliae* between the former two (Table 3, Figs 5–10). The two exceptions are the *Quercetea pubescentis-petraeae* s. l. and *Molinio-Juncetea* s. l. species. The proportion of the former is the highest not only among the three, but among all six communities, whereas that of the latter is the highest among the three hardwood riparian forest associations, but is the smallest among all drained swamp communities. The distribution of character species proportions in *Veratro albi-Fraxinetum pannonicae* are rather different from the latter communities. The largest differences are found in the character species of Phragmitetea s. l., Molinio-Juncetea s. l., Galio-Urticetea s. l., Epilobietea s. l., Salicetea purpureae s. l., Alnetea glutinosae s. l., Querco-Fagetea s. l., Fagetalia, Alnion incanae s. l. and Quercetea pubescentis-petraeae s. l. (Table 4).

The occurrence of introduced aliens (*Fraxinus pennsylvanica*, *Acer negundo*, *Celtis occidentalis*, *Echinocystis lobata*, *Parthenocissus inserta*, *Robinia pseudoacacia*, *Vitis riparia*) in the association is apparent (Table 1), but compared to other associations in the region, their proportion is low (1.9%).

Number of differentiating species

The number of differentiating species (species for which the difference between their constancy values in the compared two communities equals or exceeds two) in *Veratro albi-Fraxinetum angustifoliae* is greater than 40 in all pairwise comparisons. The highest number of differentiating species (68) was

Table 7
Differential species in *Veratro albi-Fraxinetum angustifoliae* and *Molinio-Alnetum glutinosae*

	V-Fr	M-A
Constant species		
Filipendula ulmaria	V	–
Fraxinus angustifolia subsp. *danubialis*	V	–
Scrophularia nodosa	V	–
Lychnis flos-cuculi	V	I
Torilis japonica	V	I
Veratrum album	V	I
Euonymus europaeus	V	II
Populus alba	V	II
Geum urbanum	V	III
Ligustrum vulgare	V	III
Lysimachia nummularia	V	III
Viburnum opulus	V	III
Alnus glutinosa	–	V
Molinia coerulea	–	V
Poa pratensis	–	V
Salix cinerea	–	V
Sanguisorba officinalis	–	V
Solidago gigantea	–	V
Valeriana dioica	–	V
Calystegia sepium	I	V
Celtis occidentalis	I	V
Lysimachia vulgaris	I	V
Ranunculus acris	I	V
Lycopus europaeus	II	V
Ranunculus repens	II	V
Solanum dulcamara	II	V
Vicia cracca	II	V
Carex acutiformis	III	V
Cirsium canum	III	V
Deschampsia caespitosa	III	V
Iris pseudacorus	III	V
Sambucus nigra	III	V

	V-Fr	M-A
Sub-constant species		
Geranium palustre	IV	–
Listera ovata	IV	–
Moehringia trinervia	IV	–
Glechoma hederacea	IV	I
Ulmus minor	IV	II
Pyrus pyraster	IV	III
Asclepias syriaca	–	IV
Carex flacca	–	IV
Cynoglossum hungaricum	–	IV
Equisetum palustre	–	IV
Lythrum salicaria	–	IV
Phragmites australis	–	IV
Potentilla reptans	–	IV
Ranunculus polyanthemos	–	IV
Sonchus palustris	–	IV
Galium palustre	I	IV
Mentha aquatica	I	IV
Selinum carvifolia	I	IV
Stachys palustris	I	IV
Caltha palustris	II	IV
Rosa canina agg.	II	IV
Accessorial species		
Clinopodium vulgare	III	–
Convallaria majalis	III	–
Corylus avellana	III	–
Trollius europaeus	III	–
Betonica officinalis	III	I
Dactylis polygama	III	I
Elymus caninus	III	I
Ophioglossum vulgatum	III	I
Veronica chamaedrys	III	I
Carex elata	–	III

Table 7 (continued)

	V-Fr	M-A
Galium boreale	–	III
Galium verum	–	III
Genista tinctoria subsp. *elata*	–	III
Phalaris arundinacea	–	III
Euphorbia palustris	I	III
Succisa pratensis	I	III
Sub-accessorial species		
Acer tataricum	II	–
Ajuga reptans	II	–
Angelica palustris	II	–
Campanula glomerata	II	–
Campanula trachelium	II	–
Cardamine pratensis	II	–
Carex otrubae	II	–
Carex spicata	II	–
Carex sylvatica	II	–
Cirsium rivulare	II	–
Cruciata glabra	II	–
Heracleum sphondylium	II	–
Pulmonaria mollissima	II	–
Ranunculus auricomus agg.	II	–
Rumex sanguineus	II	–
Stachys sylvatica	II	–
Agrimonia eupatoria	–	II
Allium angulosum	–	II
Bromus sterilis	–	II
Carex paniculata	–	II
Cirsium arvense	–	II
Cirsium vulgare	–	II
Dactylis glomerata	–	II
Festuca pratensis	–	II
Gentiana pneumonanthe	–	II
Iris sibirica	–	II
Leucojum aestivum	–	II
Morus alba	–	II
Padus serotina	–	II
Phytolacca americana	–	II
Pulicaria dysenterica	–	II
Salix alba	–	II
Salix rosmarinifolia	–	II
Scirpoides holoschoenus	–	II
Scutellaria galericulata	–	II
Thalictrum flavum	–	II
Trifolium montanum	–	II
Number of differential species	43	63

V-Fr = *Veratro albi-Fraxinetum angustifoliae* (Kevey and Papp L. ined.: 10 rel.); M-A = *Molinio-Alnetum glutinosae*, Mezőföld (Kevey 2008: 20 rel.)

found in the comparison to the alder swamp (*Fraxino-Alnetum glutinosae*), whereas the smallest number (41) occurred in relation to *Fraxino pannonicae-Ulmetum* (Tables 5–8).

Number of protected species

The stands of *Veratro albi-Fraxinetum angustifoliae* host numerous rare, threatened, or otherwise protected plant species. These are: *Veratrum album* (K: V), *Listera ovata* (K: IV) *Ophioglossum vulgatum*, *Trollius europaeus* (both

K: III), *Betula pubescens*, *Cephalanthera damasonium*, *C. longifolia*, *Epipactis helleborine* agg., *Equisetum hyemale* (incl. *Equisetum* × *moorei*), *Orchis militaris*, *Platanthera bifolia* (all K: I).

Similarity relations in multivariate analyses

In the cluster analysis with complete linkage algorithm, the ten samples of *Veratro albi-Fraxinetum angustifoliae* grouped with the samples of *Fraxino pannonicae-Ulmetum*. The rest of the samples formed the sister cluster of this group. In this cluster, samples of the alder swamp (*Fraxino pannonicae-Alnetum)* were the sister cluster of the three drained swamp communities (*Ophioglosso-Betuletum pubescentis*, *Molinio-Alnetum*, *Molinio-Salicetum cinereae*) (Fig. 11). The result in the analysis with the group-average algorithm differed only in the placement of one of the drained swamp communities (*Ophioglosso-Betuletum*

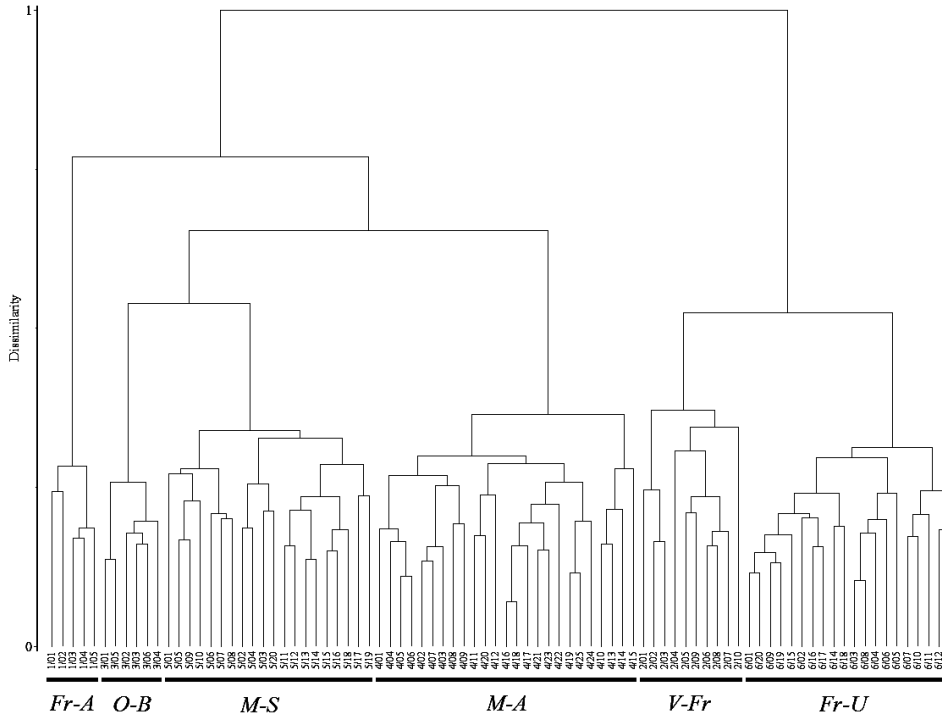

Fig. 11. Binary dendrogram of alder swamp, hardwood riparian forest and drained swamp communities I (method: complete link; coefficient: Baroni-Urbani and Buser). 1/1–5 = *Fraxino pannonicae-Alnetum*, Nyírség (Kevey and Papp L. ined.); 2/1–10 = *Veratro albi-Fraxinetum angustifoliae*, Nyírség (Kevey and Papp L. ined.); 3/1–6 = *Ophioglosso-Betuletum pubescentis*, Vértesalja (Riezing and Szollát 2008–2009); 4/1–25 = *Molinio-Salicetum cinereae*, Szigetköz (Kevey 2008); 5/1–20 = *Molinio-Alnetum glutinosae*, Mezőföld (Kevey 2008); 6/1–20 = *Fraxino pannonicae-Ulmetum*, Nyírség (Kevey *et al.* 2017)

pubescentis) as a sister group of the *Veratro albi-Fraxinetum* and *Fraxino pannonicae-Ulmetum* cluster (Fig. 12). The dissimilarity level of the *Veratro albi-Fraxinetum* and *Fraxino pannonicae-Ulmetum* was very similar, though slightly smaller than those between the *Ophioglosso-Betuletum* and *Molinio-Alnetum* (complete linkage), and *Molinio-Alnetum* and *Molinio-Salicetum cinereae* (group average).

The result of the PCoA is in agreement with the above. In the plane of axes one and two, the samples of *Veratro albi-Fraxinetum* were adjacent to both, *Fraxino pannonicae-Ulmetum* and *Ophioglosso-Betuletum pubescentis* (Fig. 13). However, the position of the latter changed substantially in the plane of axes one and three, while the spatial relation of the samples of *Veratro albi-Fraxinetum* and *Fraxino pannonicae-Ulmetum* essentially did not change (Fig. 14).

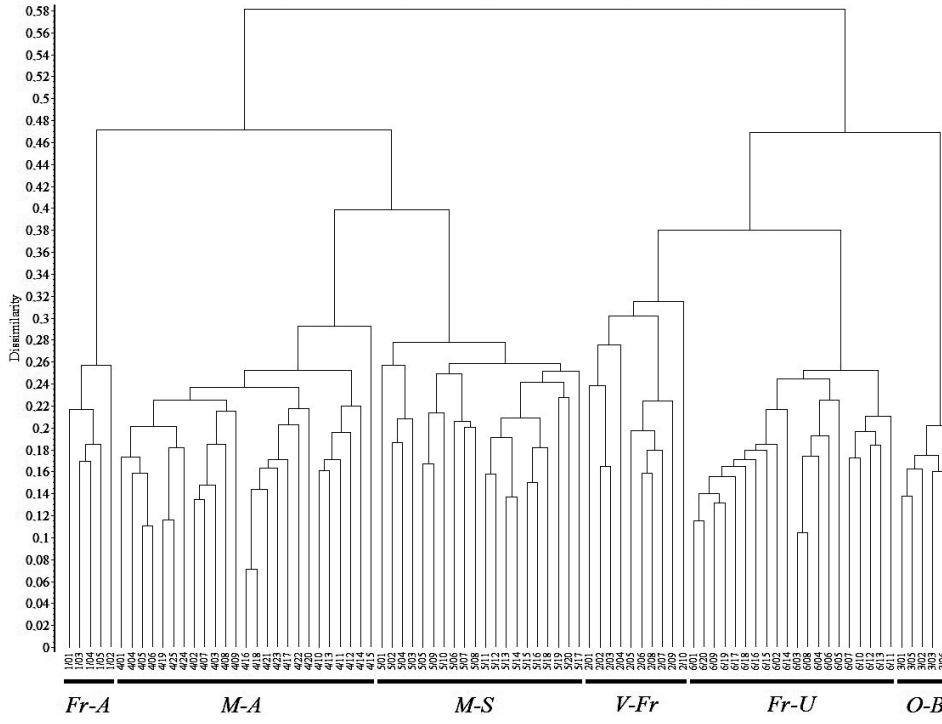

Fig. 12. Binary dendrogram of alder swamp, hardwood riparian forest and drained swamp communities II (method: group average; coefficient: Baroni-Urbani and Buser). 1/1–5: *Fraxino pannonicae-Alnetum*, Nyírség (Kevey and Papp L. ined.); 2/1–10: *Veratro albi-Fraxinetum angustifoliae*, Nyírség (Kevey and Papp L. ined.); 3/1–6: *Ophioglosso-Betuletum pubescentis*, Vértesalja (Riezing and Szollát 2008–2009); 4/1–25: *Molinio-Salicetum cinereae*, Szigetköz (Kevey 2008); 5/1–20: *Molinio-Alnetum glutinosae*, Mezőföld (Kevey 2008); 6/1–20: *Fraxino pannonicae-Ulmetum*, Nyírség (Kevey *et al.* 2017)

DISCUSSION

Field observations on habitat characteristics of *Veratro albi-Fraxinetum angustifoliae* suggested its transitional nature between *Fraxino pannonicae-Alnetum* and *Fraxino pannonicae-Ulmetum*. It is likely that this community develops from *Fraxino pannonicae-Alnetum* as organic and inorganic deposits accumulate and the habitat gradually dries out. During this process, most species of the Lemno-Potametea s. l. class, and also many Phragmitetea s. l. and Alnetea glutinosae s. l. species disappear or are replaced by Molinietalia s. l., Quercо-Fagetea and Quercetea pubescenti-petraeae species. This genealogic relationship would manifest itself in similarities in species composition and character species proportions to both associations.

It also seemed reasonable to assume that this association may be closely related to drained swamp communities based on their similarities in habitat conditions. The habitat of these communities may be covered with water in wet periods, but the soil is typically not saturated with water most of the time. This allows the establishment of Molinietalia and Quercetea species in relatively high proportions. These communities also share a number of additional

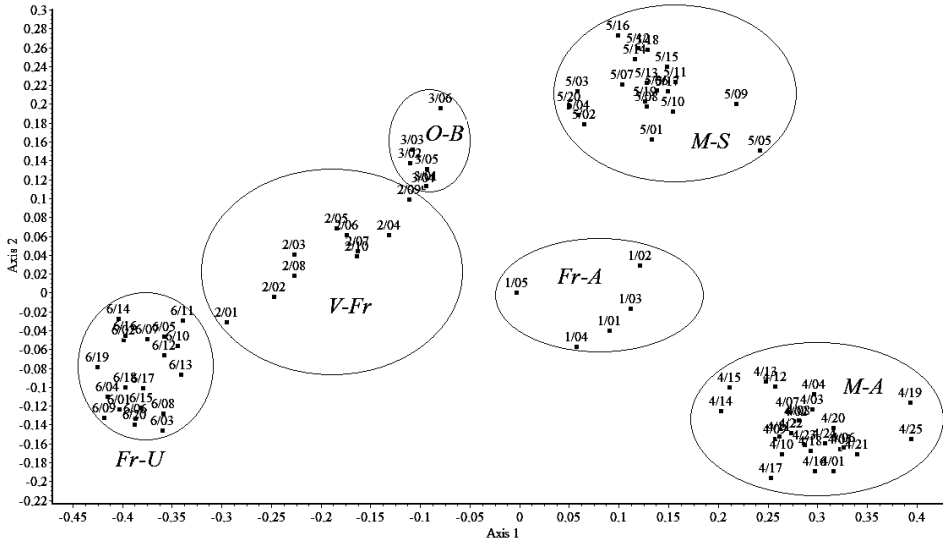

Fig. 13. Ordination diagram (axes 1 and 2) of alder swamp, hardwood riparian forest and drained swamp communities I (method: principal coordinates analysis; coefficient: Baroni-Urbani and Buser). 1/1–5: *Fraxino pannonicae-Alnetum*, Nyírség (Kevey and Papp L. ined.); 2/1–10: *Veratro albi-Fraxinetum angustifoliae*, Nyírség (Kevey and Papp L. ined.); 3/1–6: *Ophioglosso-Betuletum pubescentis*, Vértesalja (Riezing and Szollát 2008–2009); 4/1–25: *Molinio-Salicetum cinereae*, Szigetköz (Kevey 2008); 5/1–20: *Molinio-Alnetum glutinosae*, Mezőföld (Kevey 2008); 6/1–20: *Fraxino pannonicae-Ulmetum*, Nyírség (Kevey *et al.* 2017)

features including the relatively high proportions of Phragmitetea and Alnetalia glutinosae, and the low proportion of Fagetalia elements.

Despite these similarities, the *Veratro albi-Fraxinetum angustifoliae* cannot be identified with any of the studied associations, but is best recognised as a novel association. Its distinctiveness is supported by a suite of evidence, including the number of differentiating species, the distribution of character species proportions, and the dissimilarity in floristical composition. In our

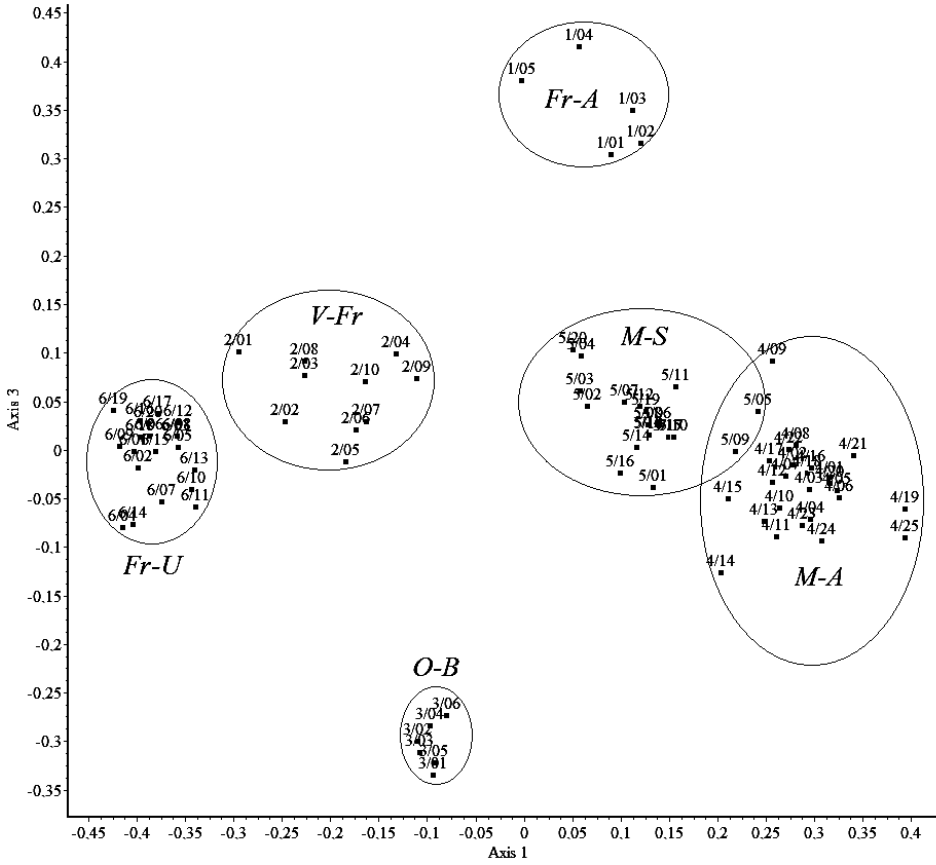

Fig. 14. Ordination diagram (axes 1 and 3) of alder swamp, hardwood riparian forest and drained swamp communities II (method: principal coordinates analysis; coefficient: Baroni-Urbani and Buser). 1/1–5: *Fraxino pannonicae-Alnetum*, Nyírség (Kevey and Papp L. ined.); 2/1–10: *Veratro albi-Fraxinetum angustifoliae*, Nyírség (Kevey and Papp L. ined.); 3/1–6: *Ophioglosso-Betuletum pubescentis,* Vértesalja (Riezing and Szollát 2008–2009); 4/1–25: *Molinio-Salicetum cinereae*, Szigetköz (Kevey 2008); 5/1–20: *Molinio-Alnetum glutinosae*, Mezőföld (Kevey 2008); 6/1–20: *Fraxino pannonicae-Ulmetum*, Nyírség (Kevey *et al.* 2017)

opinion, the amount of differences in these features are sufficiently high to designate this community as a distinct association.

Whereas the *Veratro albi-Fraxinetum angustifoliae* is best treated as a new association, its syntaxonomic affinity is rather difficult to ascertain. Owing to its intermediate characteristics in many respects, it could be placed either in the Alnetea or the Querco-Fagetea class. The Molinio-Betuletea class by Passarge and Hofmann (1968), which includes strongly acidophilic communities distributed over the more humid western and northern parts of Europe, may be excluded for this reason. Based on preliminary data, Kevey (2008) placed the *Veratro albi-Fraxinetum angustifoliae* in the class Alnetea glutinosae, within an alliance Molinio-Alnion glutinosae, established for basiphilic drained swamp communities.

*

Abbreviations: A1 = upper forest canopy layer; A2 = lower forest canopy layer; Ai = Alnion incanae; Aon = Alnion glutinosae; AQ = Aceri tatarici-Quercion; Ar = Artemisietea; Ara = Arrhenatheretea; Arn = Arrhenatherion elatioris; Ate = Alnetea glutinosae; B1 = shrub layer; B2 = saplings; Bec = Beckmannion eruciformis; Ber = Berberidion; Bia = Bidentetea; Bin = Bidention tripartiti; C = herbaceous layer; Cal = Calystegion sepium; Cgr = Caricenion gracilis; ChS = Chenopodio-Scleranthea; Cp = Carpinenion betuli; Des = Deschampsion caespitosae; Epa = Epilobietea angustifolii; Epn = Epilobion angustifolii; F = Fagetalia sylvaticae; FBt = Festuco-Brometea; FiC = Filipendulo-Cirsion oleracei; FPi = Festuco-Puccinellietalia; Fr-A = alder swamp (*Fraxino pannonicae-Alnetum*); Fr-U = hardwood riparian forest (*Fraxino pannonicae-Ulmetum*); Fvg = Festucetea vaginatae; Fvl = Festucetalia valesiacae; GA = Galio-Alliarion; incl. = inclusive; ined. = ineditum (unpublished); M-A = drained alder swamp (*Molinio-Alnetum glutinosae*); M-S = drained willow swamp (*Molinio-Salicetum cinereae*); Mag = Magnocaricetalia; Moa = Molinietalia coeruleae; MoA = Molinio-Arrhenatherea; MoJ = Molinio-Juncetea; Mon = Molinion coeruleae; NC = Nardo-Callunetea; NG = Nasturtio-Glycerietalia; O-B = drained birch swamp (*Ophioglosso-Betuletum pubescentis*); Pla = Plantaginetea; Pna = Populenion nigro-albae; PQ = Pino-Quercetalia; Prf = Prunion fruticosae; Pru = Prunetalia spinosae; Pte = Phragmitetea; Qc = Quercetalia cerridis; QFt = Querco-Fagetea; Qpp = Quercetea pubescentis-petraeae; Qr = Quercetalia roboris; Qrp = Quercion robori-petraeae; S = summa (sum); Sal = Salicion albae; SCn = Scheuchzerio-Caricetea nigrae; Sea = Secalietea; s. l. = sensu lato (in the broad sense); Spu = Salicetea purpureae; s. str. = sensu stricto (in the narrow sense); Tof = Tofieldietalia; Ulm = Ulmenion; US = Urtico-Sambucetea, V-Fr = drained ash swamp (*Veratro albi-Fraxinetum angustifoliae*).

*

Acknowledgements – We thank László Papp junior and Endre Papp for their help during our fieldwork, and the two anonymous reviewers for their help improving the manuscript.

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