

Phytocoenological survey along the Koloska stream (Balaton-felvidék region, Hungary)

By

B. PAPP

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Abstract: Investigation of the effects of karstwater decrease on the structural and abundance relations of vegetation types supplied by the Koloska karst stream was carried out. This study is a baseline survey in this valley and a few years later it may serve as a standard for the comparative investigations and phytoindication of karstwater level changes. Information about the water supply of the riparian vegetation and the disturbing effects can be obtained on the basis of the W (water requirement) and NC (nature conservation) spectra of the stands of communities.

INTRODUCTION

In recent years the karstwater level in the Transdanubian Central mountains has noticeably decreased due to mine-water extraction. Between 1978 and 1984 the decrease rate was 1-2 m per year in this region. Karstic springs at higher elevations dried off and the water output of lower beds has also decreased.

At the Department of Plant Taxonomy and Ecology of Eötvös Loránd University investigations on the effects of karstwater decrease on the structural and abundance relations of vegetation types supplied by karst streams have been initiated. The present study is connected with these examinations.

There was no earlier botanical survey of the Koloska valley before, so this study provides a basic record and in a few years can serve as a standard for comparative investigations and phytoindication of karstwater level changes.

MATERIALS AND METHODS

The Koloska valley is situated in the southwestern part of the Balaton-felvidék region of the Transdanubian Central mountains (Fig. 1). The valley opens 2 km from the Balaton lake, near Balatonarács. The direction of the valley at the beginning is north-south, further it becomes northwest-southeast. The distance

between the mouth of the valley and the Koloska karst spring is about 2.5 km. The study area is situated between the Koloska spring and Koloska restaurant, approximately 1.5 km long along the stream.

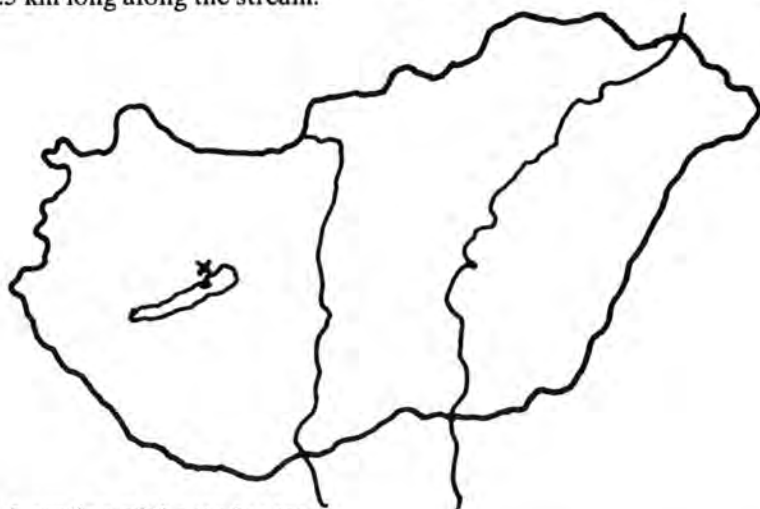


Fig. 1. Location of the study area

A total of 17 quadrats were sampled by BRAUN-BLANQUET's (1964) method, each of them was 2×2 m, except for the 16th quadrat, whose size was 10×10 m. This one was sampled in a willow swamp (*Calamagrosti-Salicetum cinereae*), which was characterized by the high cover of willow trees and shrubs.

The data were collected in May - June, 1988.

For the identification of plant communities studies of KOVÁCS (1957, 1962) and KOVÁCS and FELFÖLDY (1958, 1960) were used.

W and NC value diagrams of the important stands of the separated and identified communities were obtained using the flora lists by the method of ZÓLYOMI and PRÉCSÉNYI (1964), ZÓLYOMI *et al.* (1966) and SIMON (1988).

The W system of ZÓLYOMI classifies the species into 11 groups on the basis of their water requirement. The nature conservation (NC) values system of Simon arranges the Hungarian species into 10 groups. In groups 1-6 naturally occurring species can be found (unique (U), strictly protected species (KV), protected species (V), native constituents of communities (E), native species (K), native pioneers (TP)). In groups 7-10 indicators of degradation can be found: native disturbance tolerants (TZ), weeds (GY), crop plants (G), adventives (A).

The cover values (A-D) were transformed by the method of van der MAAREL (1979) to make them suitable for computer analysis. The data were processed using Czekanowski's similarity index (CZEKANOWSKI 1909) in cluster analyses of the SYNTAX III program (PODANI 1988).

The vegetation map was drawn on a 1:3500 scale. The boundaries of the stands of communities were determined during several walks in the area.

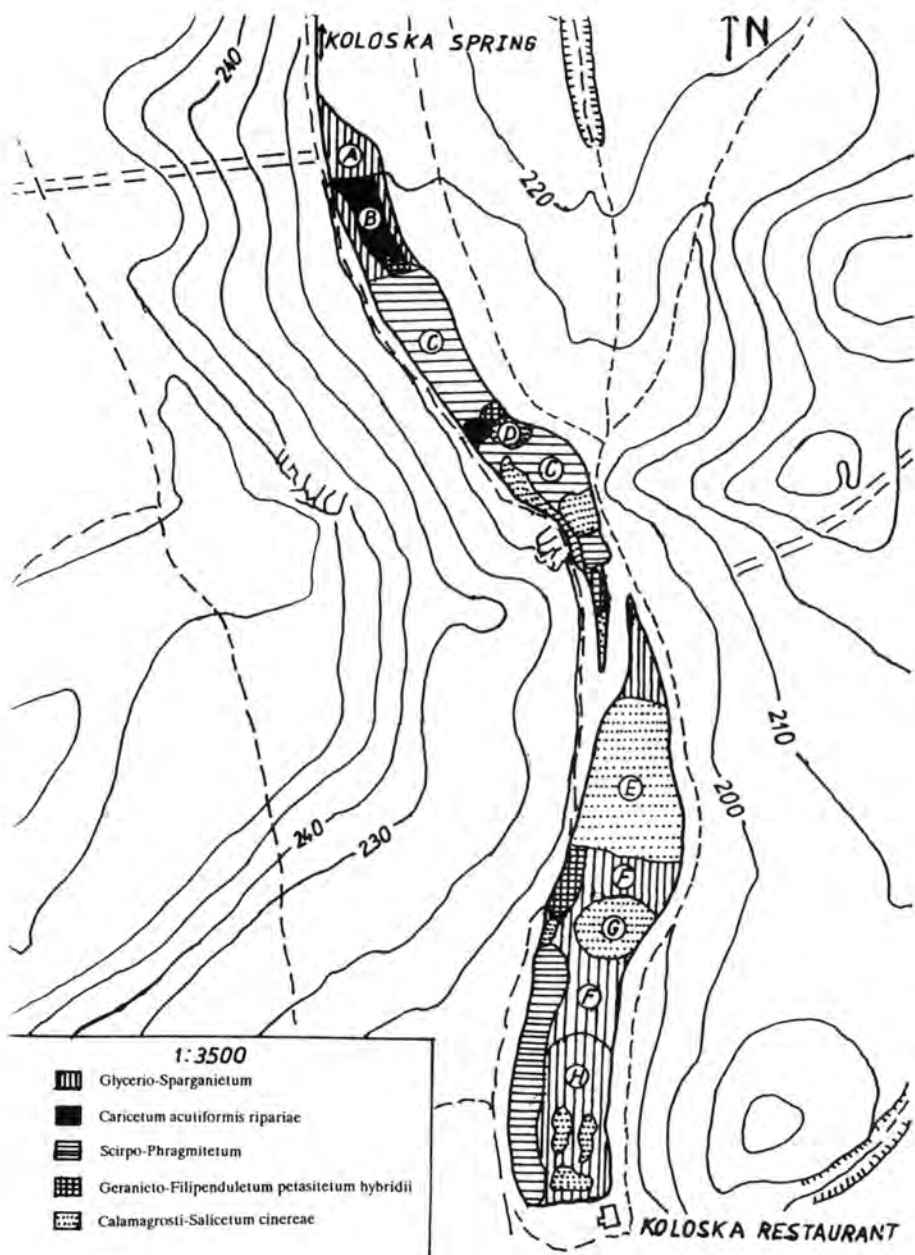


Fig. 2. Map of the vegetation

RESULTS

On the vegetation map (Fig. 2) the stands of the differentiated plant communities can be seen. A detailed description of each is presented below.

Glycerio-Sparganietum

This community can often be found by shallow, calcareous stream bed and along clear-water brooklets. Along the Koloska stream several well-developed stands of this association were observed. Two variants can be distinguished on the basis of species composition and abundance relations.

A large spot of the Glycerio-Sparganietum var. typicum (A) is situated in the upper part of the valley. This stand consists of many species: *Mentha longifolia*, *Eupatorium cannabinum*, *Scrophularia umbrosa*, *Sium erectum*, *Ranunculus repens*, *Lysimachia nummularia*, *Equisetum arvense* are the most abundant ones. There is a striking dominance of *Mentha longifolia*. Lots of mosses grow by the small brooklets, e.g. *Brachythecium rutabulum*, *Plagiomnium undulatum*, *Cratoneuron filicinum* and *Amblystegium juratzkanum*. A few individuals of *Glyceria plicata*, which is a characteristic species of this community, can also be found in this stand. The other characteristic species, *Sparganium erectum* is absent here, but it appears in the other variant (var. sparganietosum) of the Glycerio-Sparganietum (F, H) in the lower part of the valley.

The W value diagram of this stand (Fig. 3) shows that it consists of species with different water requirements. Although there is a large number of high W value ($W=8$ and 9) species, many $W=5$ and 7 value species can also be found here.

On the basis of the NC value diagram (Fig. 3), a high proportion (altogether above 50%) of disturbance tolerants (TZ) and weeds (GY) can be observed here beside the native components.

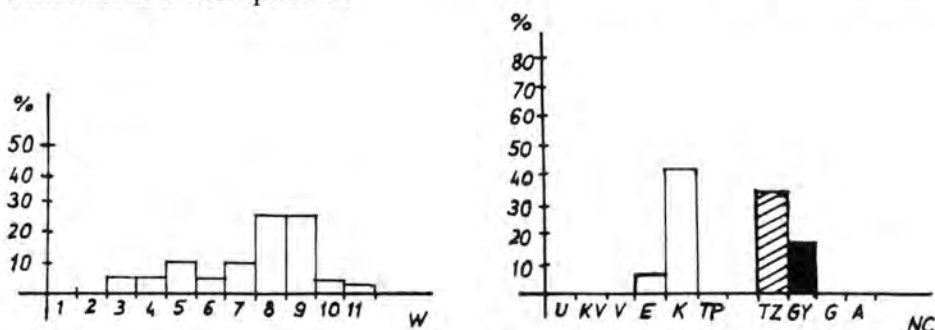


Fig. 3. W- and NC value scatter diagrams of Glycerio-Sparganietum var. typicum (A)

These facts can be explained by the mosaic structure of this area. The stream is divided into small brooklets, which enclose small drier outstanding spots, thus the microrelief is noticeably varied. The colonization of disturbance tolerants and

weeds may be due to the pollution of the stream. It is the first macrophytic community along the stream after a small artificial lake, which was formed by the spring and is frequently visited by tourists.

In the lower part of the valley another variant of the Glycerio-Sparganietum can be found: the var. sparganietosum. This community and the Glycerio-Sparganietum var. typicum share many species which occur with similar abundance e.g. *Mentha longifolia*, *Scrophularia umbrosa*, *Eupatorium cannabinum*. Yet the high cover values of *Carex acutiformis*, *Carex riparia*, *Equisetum palustre*, *Equisetum fluviatile* and the occurrence of *Mentha aquatica*, *Phragmites communis*, *Typha latifolia* indicate considerable differences between the two variants. Several individuals of *Sparganium erectum* (the other characteristic species) can be observed in the slowly running freshwater.

Further differences can be noted in the species composition of the stand of Glycerio-Sparganietum var. sparganietosum (H) which is situated near the Koloska restaurant. *Angelica silvestris*, *Cirsium canum*, *Calystegia sepium* appear with increasing abundance. Diversity increases, mainly due to colonization by several weed species.

In the W value diagram of Glycerio-Sparganietum var. sparganietosum (F), a large number of W=8, 9 and 10 value species can be observed (Fig. 4). This reflects the better water supply of the area as compared to the Glycerio-Sparganietum var. typicum (A). In the species composition of the stand of Glycerio-Sparganietum var. sparganietosum situated near the Koloska restaurant (H), many W=3, 5, 6 value species can be found beside the high proportion of W=8, 9 value species (Fig. 5). So this is a drier area than the upper part of the Glycerio-Sparganietum var. sparganietosum.

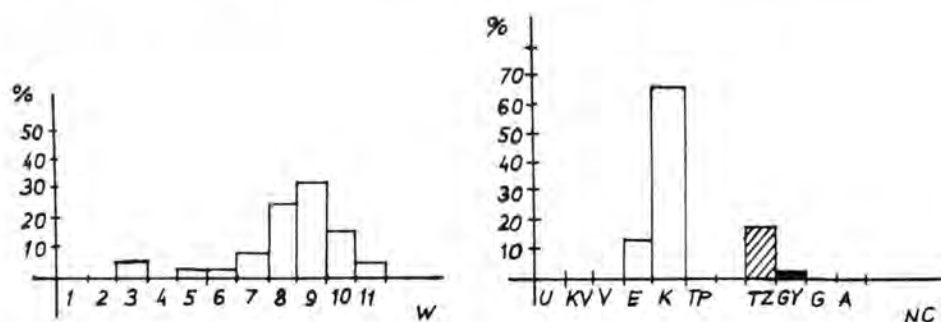


Fig. 4. W- and NC value scatter diagrams of Glycerio-Sparganietum var. sparganietosum (F)

The high proportion of native components (E+K) characterizes the Glycerio-Sparganietum var. sparganietosum on the basis of the NC value diagrams (Fig. 4). However in the stand situated near the Koloska restaurant (H), increasing quantity of disturbance tolerants (TZ) and weeds (GY) can be seen (Fig. 5).

The nearby Koloska restaurant and the tourist path are disturbance factors for the plant community of this area.

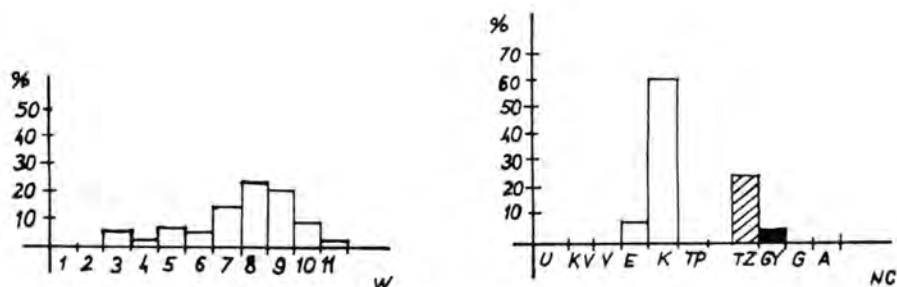


Fig. 5. W- and NC value scatter diagrams of *Glycerio-Sparganietum* var. *sparganietosum* (H)

Caricetum acutiformis ripariae

This is one of the most frequent *Magnocaricion* communities occurring along slowly running streams or in shallow stagnant water.

The *Caricetum acutiformis ripariae* (B) of Koloska stream is rather poor in species. *Carex acutiformis* and *Carex riparia* are the most important components. A few other species are present with lower abundance e.g. *Equisetum fluviatile*, *Eupatorium cannabinum*, *Scrophularia umbrosa*.

The distribution of W values (Fig. 6) shows that the water supply is sufficient in this habitat type, as large proportion of high W value (W=8, 9, 10) species are present.

In the NC value diagram (Fig. 6), high ratio of native components (E+K) can be observed. However, the proportion of the native disturbance tolerant species and weeds is also considerable, reaching almost 20% altogether.

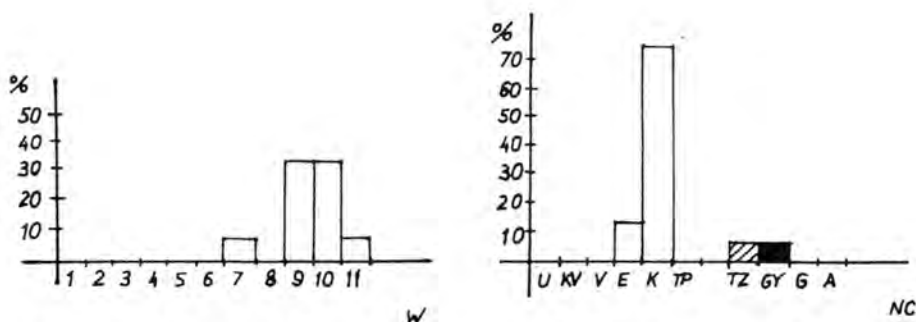


Fig. 6. W- and NC value scatter diagram of *Caricetum acutiformis ripariae*

Geranieto-Filipenduletum petasitetum hybridii

This community is quite common near ditches and streams with rich nutrient and nitrogen supply. Generally the stands of this communities are small in size and hence their species composition is greatly influenced by the surrounding communities.

Along the Koloska stream this community is represented in several small patches. In each of them *Petasites hybridus* dominates, while many individuals of Glycerio-Sparganion elements mix into this association e.g. *Epilobium hirsutum*, *Epilobium parviflorum*, *Eupatorium cannabinum*, *Lythrum salicaria*, *Mentha longifolia*, *Mentha aquatica*, *Equisetum palustre*, *Equisetum arvense*. A few Magnocaricion elements are also present e.g. *Carex acutiformis*, *Carex riparia*. Along the freshwater, where *Petasites hybridus* does not cover the surface completely, mosses, e.g. *Cratoneuron filicinum*, *Calliergonella cuspidata* grow.

Scirpo-Phragmitetum

This community generally occurs on river banks and lake shores where the stagnant water level is high in spring but later this habitat type becomes drier.

The stand of Scirpo-Phragmitetum (C) extends for a very long stretch along the stream in the Koloska valley. It is interrupted by several patches of willow trees and in the western part of the valley where the stream runs in a deeper bed, by small patches of Glycerio-Sparganietum and Geranieto-Filipenduletum petasitetum hybridii.

The appearance of the stand is rather uniform. *Phragmites communis* prevails in the community. *Carex acutiformis* and *Carex riparia* are present with high abundance. Several individuals of Glycerio-Sparganion elements can also be found e.g. *Lythrum salicaria*, *Equisetum fluviatile*, *Eupatorium cannabinum*, *Epilobium hirsutum*, *Epilobium parviflorum*, *Lysimachia vulgaris*, *Lysimachia nummularia*. Near the little brooklets many *Scrophularia umbrosa* and *Sium erectum* grow.

On the W value diagram (Fig. 7), the high proportion of W=8, 9, 10 value species can be seen indicating the good water supply of this stand similarly to the *Caricetum acutiformis ripariae* (B).

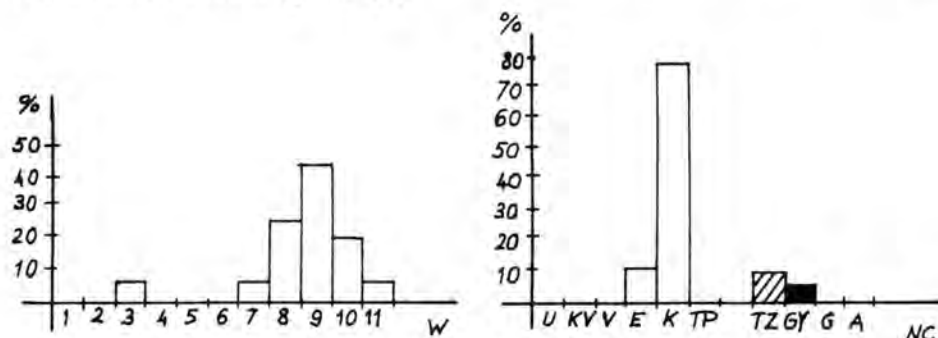


Fig. 7. W- and NC value scatter diagram of Scirpo-Phragmitetum

The NC value diagram (Fig. 7) shows high ratio of native components (E+K) and only a few native disturbance tolerants (TZ) and weeds (GY) can be found in this community.

Calamagrosti-Salicetum cinereae

This community often appears in marshes where the stagnant water level is high during almost all year around. The moisture and light conditions make possible the presence of species of shady forests and large numbers of mosses under the willow trees.

In the upper part of the Koloska valley two larger stands of Calamagrosti-Salicetum cinereae (D,E) can be found. The composition of these small forests is very diverse.

The forest canopy consists of *Salix fragilis* and *Salix cinerea*. In the shrub layer a lot of species from the surrounding drier forest (Orno-Quercetum pubescenti cerris, Cotino-Quercetum) were observed e.g. *Crataegus monogyna*, *Rosa canina*, *Cornus mas*, *Viburnum lantana*). In the herb layer the elements of Glycerio-Sparganion and Magnocaricion are abundant, e.g. *Lythrum salicaria*, *Eupatorium cannabinum*, *Lysimachia nummularia*, *Mentha aquatica*, *Carex acutiformis*, *Carex riparia*.

The W value diagram (Fig. 8 and 9) show that the lower W value (W=3, 4, 5) also plays an important role in the composition of these forests, in addition to the high proportion of W=9, 10 species. On the NC value diagram (Fig. 8 and 9) large

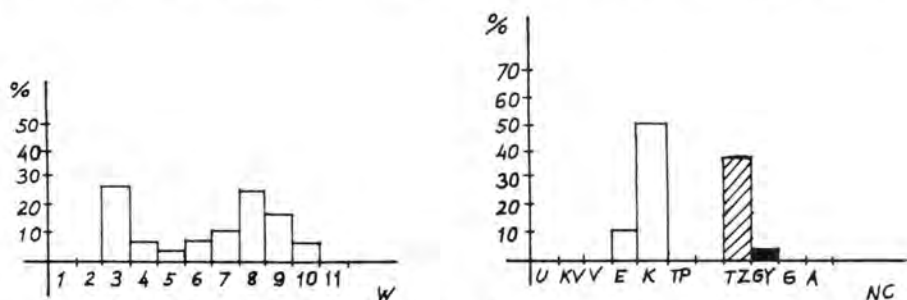


Fig. 8. W- and NC value scatter diagram of Calamagrosti-Salicetum cinereae (D)

number of native disturbance tolerants (TZ) and weeds (GY) can be noted beside the native elements. These places seem to be drier and slightly disturbed due to the nearby tourist path. Colonization by species of dry forests is also a cause of the wide spectra of W values.

The third major patch of Calamagrosti-Salicetum cinereae (G) is situated in the lower course of the stream. This is a typical stand of the Calamagrosti-Salicetum cinereae community. The tree layer consists of *Salix cinerea* and underneath young willow trees form the shrub layer. In the herb layer *Carex acutiformis*, *Carex riparia*, *Equisetum palustre*, *Angelica sylvestris*, *Eupatorium cannabinum*, *Scrophularia*

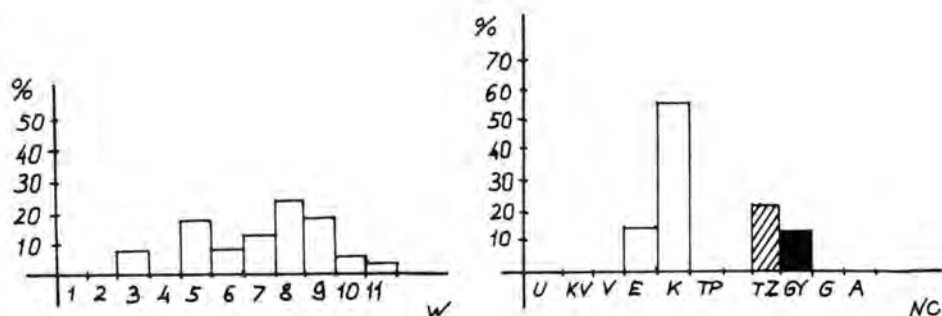


Fig. 9. W- and NC value scatter diagram of *Calamagrosti-Salicetum cinereae* (E)

umbrosa can be found in large numbers. The moss layer is well-developed. The principal constituents are *Plagiomnium undulatum*, *Calliergonella cuspidata*, *Brachythecium rutabulum*, *Cratoneuron filicinum*, *Pellia endiviifolia*.

According to the W value distribution (Fig. 10) the water supply of this area is better than in the two other sites of *Calamagrosti-Salicetum cinereae*. The proportion of W=8, 9, 10 value species is higher, W=3 value species are absent in this stand and the proportion of W=4, 5 value species is lower. The NC value diagram (Fig. 10) shows a large number of native components. No weed species were found in this area.

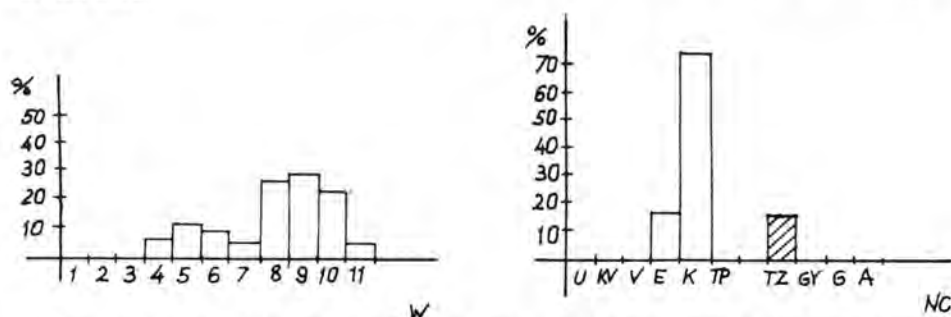


Fig. 10. W- and NC value scatter diagram of *Calamagrosti-Salicetum cinereae* (G)

RESULTS OF CLUSTER ANALYSIS

In Fig. 11 a few groups of relevés can be distinguished well. The samples can be seen on the Table 1. The 10th, 11th and 12th quadrats were sampled in the *Scirpo-Phragmitetum* (C) and the 6th, 7th, 8th and 9th relevés in the *Caricetum*

LOWER BOUND = 0.117
UPPER BOUND = 0.916

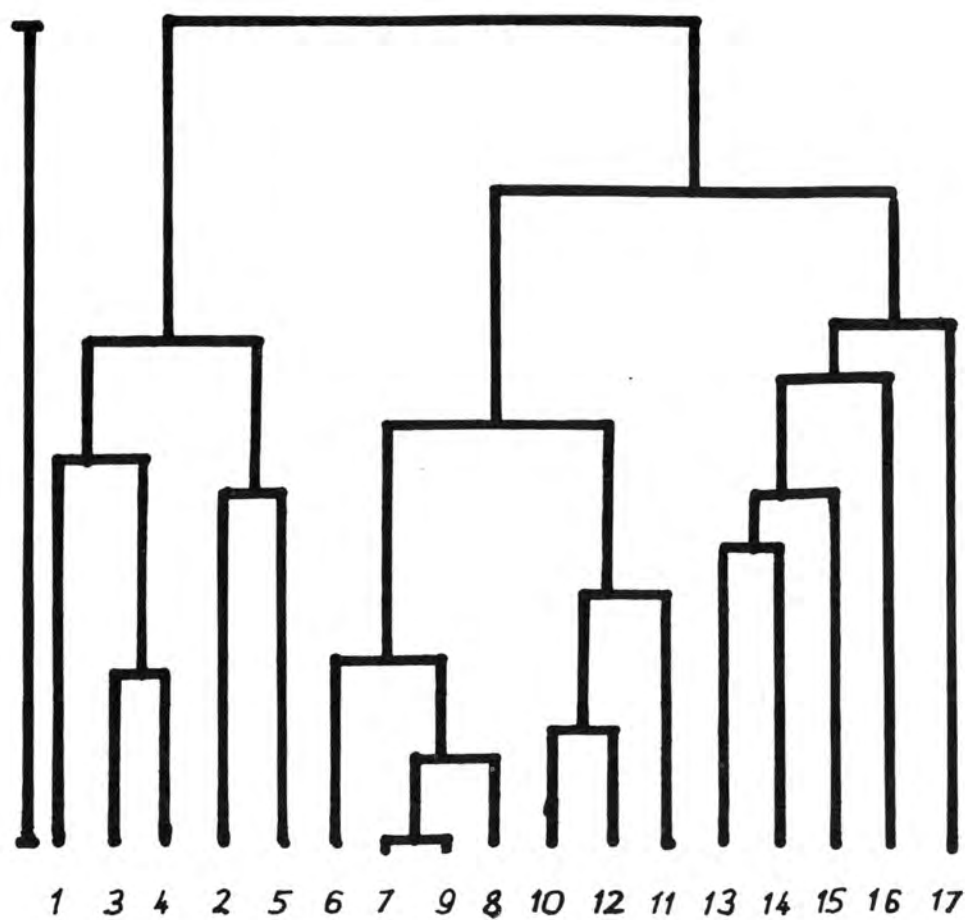


Fig. 11. Dendrogram of relevés

acutiformis ripariae (B). The samples in each group are closely connected and the two groups are also quite similar because of their common species.

The 1st, 2nd, 3rd, 4th and 5th relevés form a very separate group. These were sampled in the Glycerio-Sparganietum var. typicum (A). This community is very diverse and hence its relevés are generally not too similar to one another. The causes of the high diversity were mentioned earlier.

The 13th, 14th and 15th relevés were sampled in the Glycerio-Sparganietum var. sparganietosum (F). Samples of this community are somewhat similar to relevé No 16th sampled in a stand of Calamagrosti-Salicetum cinereae (G). This similarity is caused by the presence of the common species and their similar abundance relations in Glycerio-Sparganietum var. sparganietosum and the herb stratum of the Calamagrosti-Salicetum cinereae.

The 17th relevé was sampled in the Glycerio-Sparganietum var. sparganietosum stand (H) near the Koloska restaurant. It shows no close connection with any of other samples of the same community due to the changes in species composition and abundance relations observed in this area.

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Author's address: PAPP, B.

Botanical Department of the
Hungarian Natural History Museum
H-1476 Budapest, Pf.: 222
HUNGARY

Table 1. A-D values in the relevés (relevés 1-5 belong to stand A, 6-9 to B, 10-12 to C, 13-15 to F, 16 to G, 17 to H; for stands see Table 2)

Species \ relevés	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
<i>Acer campestre</i>																1	
<i>Agropyron caninum</i>		1															
<i>Agrostis alba</i>	+	1-2			+ -1						+				+	+	+
<i>Angelica sylvestris</i>	+ -1	+ -1														1-2	+ -1
<i>Artemisia vulgaris</i>	+																
<i>Athyrium filix-femina</i>																+	
<i>Calamagrostis epigeios</i>				+	+ -1												
<i>Caltha palustris</i>												+ -1				+	
<i>Calystegia sepium</i>	+	1					+		+	+ -1	+ -1	+		1		+	2
<i>Carex acutiformis</i>						1	4-5	4	4-5	2-3	1-2	3-4	4-5	3-4	1	1-2	5
<i>Carex riparia</i>						4-5	4-5	4	4-5	2-3	1-2	3-4		2	1	+	
<i>Carex vesicaria</i>	+ -1																
<i>Cirsium canum</i>													+				+ -1
<i>Cruciata ciliata</i>		+			+												+
<i>Cucubalus baccifer</i>																	+
<i>Dactylis glomerata</i>																	+
<i>Epilobium hirsutum</i>	1	+	+			1	+	+	+	+				+		1	
<i>Epilobium parviflorum</i>								+		+	+				+		+
<i>Equisetum arvense</i>			+	+	3	+						+					+
<i>Equisetum fluviatile</i>						+ -1	2	1-2	2-3	1	1-2	+	2				2-3
<i>Equisetum palustre</i>													2	3	3	2	
<i>Eupatorium cannabinum</i>		+ -1	+	+ -1	+	1-2	+ -1	2	1	+ -1	1	+	2	1-2	1-2	1-2	2
<i>Festuca arundinacea</i>																	+
<i>Galium aparine</i>	+	1			+												
<i>Galium palustre</i>																	+
<i>Glechoma hederacum</i>																	+
<i>Glyceria plicata</i>	1		+														
<i>Hedera helix</i>																	+
<i>Holcus lanatus</i>																	+
<i>Hypericum tetrapterum</i>								+					+ -1		+	+	+
<i>Juncus inflexus</i>	+ -1	+													+		+
<i>Lathyrus pratensis</i>													+	+	+		+
<i>Lychnis flos-cuculi</i>																	+

Species \ relevés	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
<i>Lycopus europaeus</i>		+		2									+		+	+	
<i>Lysimachia nummularia</i>	+ -1	1		+	1-2					+						+	+
<i>Lysimachia vulgaris</i>											+						
<i>Lythrum salicaria</i>						+	+	+	+ -1	1	+ -1	1		+	+	+	1-2
<i>Mentha aquatica</i>													+ -1	+	1-2	+	+
<i>Mentha longifolia</i>	3	2-3	5	5	4-5						2		1	2-3	1-2		1
<i>Myosoton aquaticum</i>		+															+
<i>Petasites hybridus</i>															1-2		+ -1
<i>Phragmites communis</i>										2-3	4	4		+ -1		+	+
<i>Prunella vulgaris</i>																+	
<i>Ranunculus repens</i>	2-3	1		+ -1	+											+	+
<i>Rubus caesius</i>		+ -1															
<i>Rumex conglomeratus</i>		+ -1															
<i>Salix cinerea</i>																5	+
<i>Scirpus sylvaticus</i>	1														1-2	+	
<i>Scrophularia umbrosa</i>	2	1-2	3	1-2	2	1-2	3	2	+ -1	2	2	1-2	1-2	+ -1	2	+ -1	+ -1
<i>Sium erectum</i>	3	1-2	3	3	+ -1			+		+ -1	1-2					+	+
<i>Solidago gigantea</i>		3-4		1	1												
<i>Sparganium erectum</i>													+	+			+
<i>Stachys palustris</i>															+		
<i>Stenactis strigosa</i>					+												
<i>Symphytum officinale</i>												+	+			+	+
<i>Torilis japonica</i>																	+
<i>Typha latifolia</i>															+ -1		
<i>Tussilago farfara</i>	+ -1																
<i>Urtica dioica</i>	+	1			+												
<i>Valeriana officinalis</i>										+							

Table 2. List of species of stands (W - value of water requirement; NC - nature conservation value; A - Glycerio-Sparganietum var. typicum; B - Caricetum acutiformis ripariae; C - Scirpo-Phragmitetum; D, E, G - Calamagrosti-Salicetum cinereae; F, H - Glycerio-Sparganietum var. sparganietosum)

Species	W	NC	A	B	C	D	E	F	G	H
<i>Acer campestre</i>	4	K					+		+	
<i>Achillea asplenifolia</i>	7	K								+
<i>Agropyron caninum</i>	6	K	+							
<i>Agrostis alba</i>	8	E	+		+		+	+	+	+
<i>Alliaria petiolata</i>	4	Tz	+							
<i>Angelica sylvestris</i>	8	K	+			+	+	+	+	+
<i>Arrhenatherum elatius</i>	5	Tz	+							
<i>Artemisia vulgaris</i>	4	Gy	+							
<i>Athyrium filix-femina</i>	5	K							+	
<i>Berberis vulgaris</i>	3	K				+				
<i>Calamagrostis epigeios</i>	3	Tz	+			+	+			+
<i>Caltha palustris</i>	9	K					+		+	
<i>Calystegia sepium</i>	9	K	+	+	+	+		+	+	+
<i>Carex acutiformis</i>	10	K	+	+	+	+		+	+	+
<i>Carex hirta</i>	7	Gy	+				+			

Species	W	NC	A	B	C	D	E	F	G	H
<i>Carex melanostachya</i>	10	E		+						
<i>Carex riparia</i>	10	K		+	+		+	+	+	
<i>Carex secalina</i>	7	Gy	+							
<i>Carex vesicaria</i>	10	K	+							
<i>Carex vulpina</i>	9	K	+							
<i>Carpinus betulus</i>	5	E					+			
<i>Centaurea pannonica</i>	5	Tz								+
<i>Cirsium canum</i>	7	K				+		+		+
<i>Clematis vitalba</i>	5	K					+			
<i>Cornus mas</i>	3	K				+	+			
<i>Cornus sanguinea</i>	4	K								+
<i>Crataegus monogyna</i>	4	K				+	+			+
<i>Cruciata ciliata</i>	3	Tz	+			+				+
<i>Cucubalus baccifer</i>	7	K					+			+
<i>Dactylis glomerata</i>	6	K						+		+
<i>Dactylorrhiza incarnata</i>	5	Tz						+		
<i>Epilobium hirsutum</i>	9	K	+	+	+			+		+
<i>Epilobium parviflorum</i>	9	K		+	+		+	+		+
<i>Equisetum arvense</i>	8	Gy	+	+	+	+				
<i>Equisetum arvense var. nemorale</i>	8	Gy						+		+
<i>Equisetum fluviatile</i>	10	K		+	+			+	+	+
<i>Equisetum palustre</i>	9	K			+	+		+	+	+
<i>Euonymus europaeus</i>	5	K								+
<i>Eupatorium cannabinum</i>	9	Tz	+	+	+	+	+	+	+	+
<i>Festuca arundinacea</i>	8	Tz								+
<i>Fraxinus excelsior</i>	5	K					+			
<i>Galium aparine</i>	5	Gy	+							
<i>Galium mollugo</i>	3	K				+		+		
<i>Galium palustre</i>	10	K							+	
<i>Galium uliginosum</i>	9	K	+							
<i>Glechoma hederacum</i>	6	K					+		+	
<i>Glyceria plicata</i>	9	Tz	+							
<i>Hedera helix</i>	5	K					+		+	
<i>Holcus lanatus</i>	5	K				+			+	+
<i>Humulus lupulus</i>	7	Tz	+							
<i>Hypericum tetrapterum</i>	7	K		+			+	+	+	+
<i>Juncus inflexus</i>	8	Tz	+			+		+		+
<i>Knautia drymeia</i>	6	K								+
<i>Lathyrus pratensis</i>	7	Tz			+	+		+		+
<i>Ligustrum vulgare</i>	4	E				+	+			
<i>Lonicera xylosteum</i>	5	K					+			
<i>Lychnis flos-cuculi</i>	8	Tz				+		+	+	+
<i>Lycopus europaeus</i>	9	K	+				+	+	+	+
<i>Lysimachia nummularia</i>	8	K	+		+	+	+	+	+	+
<i>Lysimachia vulgaris</i>	9	K			+					+
<i>Lythrum salicaria</i>	9	K		+	+	+	+	+	+	+
<i>Mentha aquatica</i>	9	K					+	+	+	+
<i>Mentha longifolia</i>	9	K	+		+			+		+
<i>Myosoton aquaticum</i>	8	Gy	+				+			+
<i>Odontites rubra</i>	5	K								+

Species	W	NC	A	B	C	D	E	F	G	H
<i>Pastinaca sativa</i>	6	Tz								+
<i>Petasites hybridus</i>	9	K			+			+		+
<i>Phragmites communis</i>	10	E			+			+	+	+
<i>Plantago major</i>	7	Gy					+			+
<i>Poa angustifolia</i>	3	E				+				
<i>Poa pratensis</i>	6	K	+							
<i>Poa trivialis</i>	9	Tz	+					+		
<i>Populus alba</i>	6	E					+			
<i>Potentilla reptans</i>	6	Tz				+				
<i>Prunella vulgaris</i>	6	Tz				+	+		+	
<i>Ranunculus acris</i>	7	Tz				+		+		+
<i>Ranunculus repens</i>	8	Tz	+			+	+	+	+	+
<i>Rhamnus catharticus</i>	3	K					+			
<i>Rosa canina</i>	3	Tz				+	+			
<i>Rubus caesius</i>	8	Tz	+				+			+
<i>Rumex conglomeratus</i>	7	Tz	+				+			
<i>Salix cinerea</i>	10	E				+	+	+	+	+
<i>Salix fragilis</i>	9	K				+	+			
<i>Sambucus nigra</i>	5	Gy					+			
<i>Scirpus sylvaticus</i>	9	E	+				+	+	+	
<i>Scrophularia umbrosa</i>	8	K	+	+	+		+	+	+	+
<i>Sium erectum</i>	11	K	+	+	+		+	+	+	+
<i>Solidago gigantea</i>	8	K	+	+			+	+		
<i>Sparganium erectum</i>	11	K						+		+
<i>Stachys palustris</i>	10	K						+		
<i>Stenactis annua</i>	8	Tz					+			
<i>Stenactis strigosa</i>	8	Tz	+							
<i>Symphytum officinale</i>	8	K			+	+		+	+	+
<i>Torilis japonica</i>	3	Tz								+
<i>Tussilago farfara</i>	5	Tz	+				+			
<i>Typha latifolia</i>	10	E		+				+		+
<i>Ulmus minor</i>	7	K								+
<i>Urtica dioica</i>	5	Gy	+				+			
<i>Valeriana dioica</i>	8	K			+		+	+		+
<i>Valeriana officinalis</i>	3	K				+		+		
<i>Veronica beccabunga</i>	9	K	+							
<i>Viburnum lantana</i>	4	K					+			
<i>Amblystegium riparium</i>			+		+	+	+			
<i>Amblystegium serpens</i> var. <i>juratzkanum</i>			+		+					
<i>Brachythecium rutabulum</i>			+			+	+		+	
<i>Brachythecium salebrosum</i>			+							
<i>Brachythecium velutinum</i>			+							
<i>Calliergonella cuspidata</i>						+			+	
<i>Cratoneuron filicinum</i>			+						+	
<i>Pellia endiviifolia</i>									+	
<i>Plagiomnium undulatum</i>			+						+	