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STUDIES ON THE VEGETATION DYNAMICS OF NANOCYPERION COMMUNITIES I. CHARACTERISTIC INDICATOR VALUES AND CLASSIFICATION AND ORDINATION OF STANDS

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Abstract

The results of vegetation dynamic studies performed on cenoses of Nanocyperion nature, standing close to the *Cypero — Juncetum* and *Dichostylidi — Gnaphalietum* associations can well be interpreted with the help of the characteristic indicator values. The seasonal changes taking place in the cenoses are manifested in the decrease of the mean W-value as well as the relief-dependent development of the N-value. The decrease of the mean W-value of the cenoses is the consequence of the drying out of the biotope and the accomodation to this. The development of N-values is explaned by the varying succession types at the higher and lower reliefs.

The general statements of the present paper analyse the conditions of applicability of the characteristic indicator values. The application of the indicator values should be preceded by detailed preliminary investigations, however, the analysis of the causes of deviations of the indicator values from literary data makes possible the drawing of conclusions concerning the structural characteristics of the community in certain cases.

The demonstration of the deviations of the indicator value is made possible by statistic mathematical methods, in a given case by the reciprocal averaging ordination technique. The search for the causes of deviations is aimed at the exclusion of certain factors as possible causes.

Introduction

The Nanocyperion-like cenoses — owing to the fast changes taking place in them — are particularly suitable for vegetation dynamic studies. It is due to the adaptability to the short vegetation period that both the settlement and the penetration of foreign elements, and with this the decomposition of the Nanocyperion associations, take place rapidly. In our case (and in general) the short vegetation period was ensured by the long-lasting water-covering. While the slowly changing associations have to be moved from their relative stability with perturbations originating from drastic external influence, e.g. selective exstirpation with herbicides (FEKETE—VIRÁGH 1982), the river-bed Nanocyperion stands can also be studied under natural conditions from the viewpoint of vegetation dynamics. They are dynamic enough to be able demonstrate actual, mathematically evaluable changes within a short time and so perform quantitative vegetation dynamic studies, even without external influence. In the case of selective exstirpation populations, population groups fall out of the system, thus the direction of dislocation and the mode of regression may give rise to problems. The advantage of the dynamic studying of natural states is that the structure of the cenoses associations is free from external influence. The results obtained for the Nanocyperion cenoses may be adapted to slowly changing, perhaps even economically more important, other communities. In the interest of setting up the analogues for adaptation, the changes taking place in the Nanocyperion communities and the causes of the changes should be described.

The studied area is located in the channel of the Körös river, at a distance of one kilometre from the barrage at Békésszentandrás. The fluctuation of the water level is particularly great because of the barrage, and this creates favourable conditions for the development of mud vegetation. This section of the channel at Körös river has not yet been thoroughly investigated. Studies on areas located closest to this region include a report on the vegetation at Tiszazug (TÍMÁR—BODROGKÖZY 1959). The area section where vegetation dynamic studies have been performed is about 100 m².

In general, it could be said that such areas are the most suitable for studies of this nature, the parts of which are discrete, well separeted from each other, and there is no specific direction in cenoses belonging to various plots, at the same time the succeeding plots can be arranged in a continuous row along some continuous variable, e. g. humidity gradient determined by relief. It can be seen from the map of the area that these conditions are given with good approach (Fig. 1).

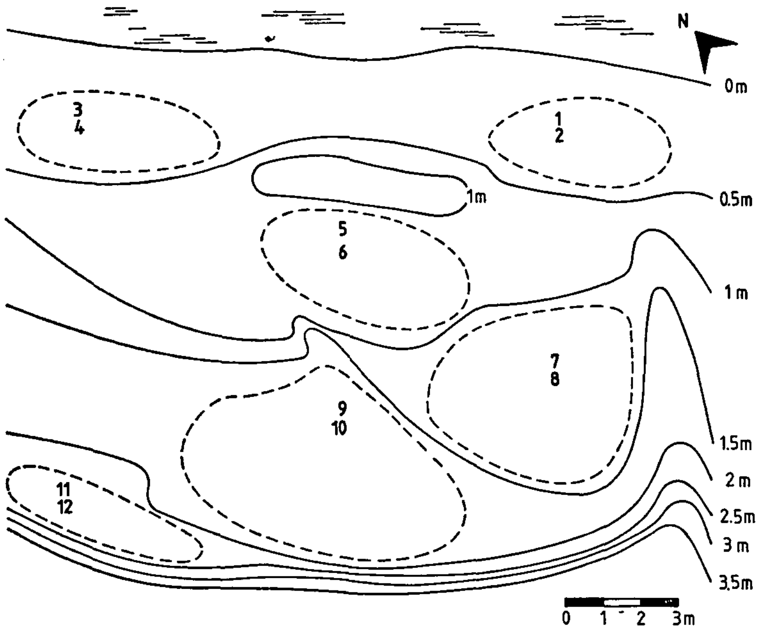

Fig. 1. The studied area on September 6, 1982. The complete area is 250 m². 100 m² of which is a section processed in vegetation dynamic studies. The plotted areas are mostly horizontal, divided from each other by steep berms. The probable cause of the reliefs' formation is the uneven sinking taking place due to the effect of the undermining following the landslip of the steep bank

The six plotting areas marked by dotted lines on the map are found at five differing reliefs. The various plots are separated from each other by steep berms, and of reliefs being almost horizontal. Therefore, the vegetation on these is of even cover and composition. The relief-distribution also implies a certain kind of shift in time, as regarding the main lines similar processes take place at the various reliefs, however, the divergency of the transformations is of determinative significance in the ordination studies of the stands. The relevés were taken at two times: September 6, 1982, the level lines refer to this date; and October 30. Earlier stands are indicated by odd numbers. Between the two points of time, the level had dropped consistently by one metre.

Materials and Methods

The cenologic table gives the relative partial-covering of the species in percentage. The traditional A—D values are not of acceptable accuracy from viewpoint of the further calculations. Considerable differences can be experienced in the total covering of the various relevés, thus it is expedient to use the values referring to 100% in the ordination and classification techniques. Since the studies firstly tend towards shifts of proportions, these are best emphasized by supplementing to 100%.

In the cluster analysis, the combination of the similarity values calculated with the CZEKANOWSKI-index was performed by weighted average method. The CZEKANOWSKI-index is:

$$S_{jk} = \frac{2 \sum_i \min \left\{ x_{ij}, x_{ik} \right\}}{\sum_i x_{ij} + x_{ik}}$$

where S_{jk} is the similarity of two — j and k-objects, stands

x_{ij} and x_{ik} are the concrete values in j and k stands referring to the adequate, i^{th} attribute; partial coverings of species.

The ordination of the cenoses was accomplished by the reciprocal averaging method. The method belongs to the correspondancy analyses, the basis of which is that. "the species-scores are averages of the stand-scores and reciprocally the stand-scores are averages of the species-scores" (HILL 1973). Therefore, as the end result of an ordination process the species and the stands also become ordinated. The joint ordination does not mean logical advantage for either of these. The causes of the method selection become evident in the second half, as the main advantage of the method is that, contrary to the PCA-ordination, it gives the "markedly meaningfull' ordination of the species, while the ordination of the stands does not give essentially better results. Compared to other ordination techniques, it could be determined that in the case of reciprocal averaging the end result of the ordination only depends on the data of the contingence table, while, for example in the case of polar ordination (PO), the extremity is subjectively determined in the case of PCA various results are obtained with the application of differing transformations and transformation-combinations (GAUCH—WHITTAKER—WENTWORTH 1977).

The methods applied in the soil proceedings were the following: the determination of the soil fractions refer to the mechanic composition of the soils, performed by the hydrometric method. The binding of the soil could be concluded by determining the restriction number of ARANY and the hy values. The measurings of pH and $CaCO_3$ belong to the investigations concerning chemical reaction, the former was performed with the use of electric pH meter, the latter by calcimetre of SCHLEIBLER. The humus was determined with dichromatic method with photometric evaluation. The total salt content of the soil was demonstrated on the basis of measuring the electric conductivity (BALLENEGGER-DI GLÉRIA 1960).

Vegetation of the area

In the beginning, the predominance of the Nanocyperion character-species was characteristic to the cenoses occuring in the area. These formed the following associations:

— *Cypero-Juncetum bufonii* Soó et CSŰRÖS (27) 44,

— *Dichostylidi-Gnaphalietum uliginosi* (*Horvatić* 31) Soó et TÍMÁR 47.

Later, the coverings by the Bidentetea character-species relatively increased, as the consequence of which certain cenoses transformed into Bidentetea associations:

— *Echinochloo-Bidentetum* Soó 71,

— *Polygono-Bidentetum* (FELFÖLDY 43),

— *Dichostylidi-Chenopodietum rubri* (TÍMÁR 47) Soó 71

Owing to the favourable living conditions rapidity is the decisive role in becoming populous, therefore mixed plant associations develop; the different relevés — especially at the later point of time — can only be identified with various associations with difficulty.

The changes in the composition of the vegetation are observable on Table 1.

Results

Classification of stands according to species coverings

The most direct manner of comparing the changes experienced in the cenoses is the classification according to species coverings.

According to the dendrogram of the classification (Fig. 2), the relevés situated at deeper relief, taken at the earlier date, are well separated, and also well separated on high similarity level. In their later state the stands show greater similarity to the higher reliefs' earlier and each others later state, resp., than to their own earlier state. This fact shows the fast transformation of the cenoses developing at the areas just becoming dry. In the case of the cenoses on higher relief, apart from the slighter simi-

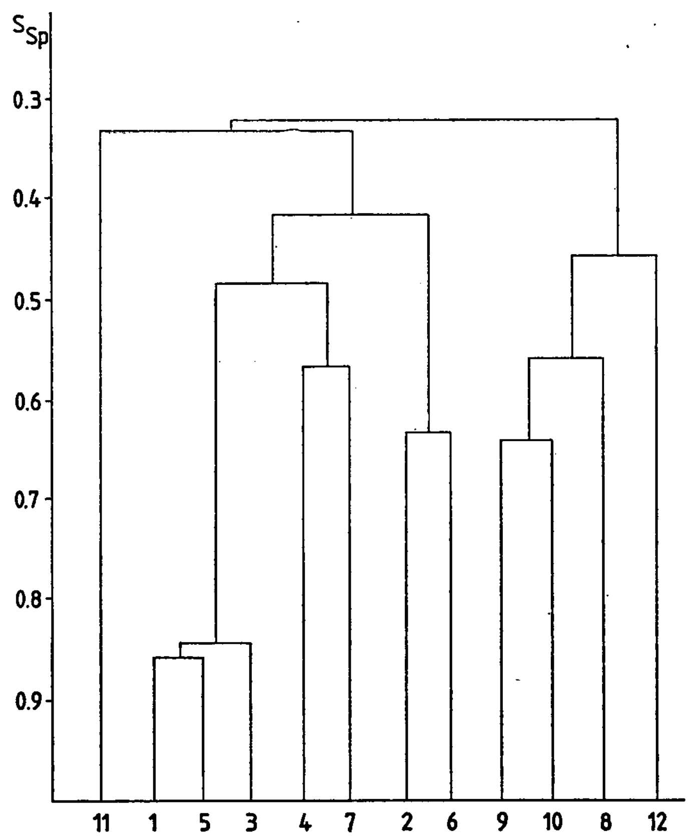

Fig. 2. Dendrogram of the cluster analysis according to species composition. Intensive changes take place at the lower relief, the changes in species composition slow down at higher relief

larity, the phenomenon also occured that the stand was the most similar to its on later state. The changes were less intensive at the higher areas.

The causes of the changes could not be concluded merely on the basis of the cenoses. Considering Table 1, it could be determined that the process taking place on the lower relief manifested in the repression of the Nanocyperion elements. The slower changes of the cenoses found at higher relief are mainly the consequences of the long-lasting occurence of the Chenopodio-Scleranthea, within this the Bidentetea species.

Table 1

CIV W	CIV N	Species / Number of stand:	01	02	03	04	05	06	07	08	09	10	11	12
10	6	*Cyperus fuscus*	20	2	17	10	20	4	11	+	17	+	58	+
10	5	*Dichostylis micheliana*	36	2	43	6	38	+	11	+	9	+	2	+
9	5	*Gnaphalium uliginosum*	8	5	5	17	6	9	8	+	3	+	1	5
6	5	*Rumex stenophyllus*	4	21	2	7	2	17	1	4		4		2
9	6	*Veronica anagallis-aquatica*	2	3	1	+	+		3	2				
7	5	*Potentilla supina*		5		2		4		1		2		
9	6	*Polygonum hydropiper*								8	+	6		
8	4	*Rorippa sylvestris*	4	9	4	22	5	34	8	3	9	10	6	1
7	6	*Plantago major*	8	9	9	3	10	9	4	6	9	10	17	4
9	6	*Echinochloa crus-galli*	2	3	2	2	3	3	1	14	13	13	6	20
2	7	*Portulaca oleracea*					1	+			3	2		
5	8	*Amaranthus lividus*	+	4	+	1	2	7	2	+	3	+	2	3
5	9	*Chenopodium album*		1		+			+	4	4	8		2
7	8	*Chenopodium polyspermum*			+		2		2		3			+
7	9	*Chenopodium rubrum*	5	2	2	17	3	4	12	4	5	7	+	2
9	7	*Polygonum lapathifolium*	2	+	1	+	3	+	15	26	3	4	+	3
9	5	*Lythrum salicaria*	7	17	7	4	4	3	8	8	7	10	+	8
8	5	*Lythrum virgatum*		+	1	+		+	3	2	4	3		
7	6	*Tanacetum vulgare*		4		1	1	3	1	5	+	4		+
8	5	*Agrostis stolonifera*		+		4		1		+	+	6	+	10
9	8	*Bidens tripartita*		1		1	+	2	1	6	+	1	+	15
8	7	*Xanthium italicum*		2	3	+			8	6	1	1	3	10
10	6	*Salix triandra (juv.)*		1	1				+	+	4	4	3	+
		Total covering (%)	20	85	20	75	60	95	30	90	70	85	85	80

Alisma lanceolatum 8+ ; *Amaranthus retroflexus* 2+, 4+, 10.2, 12.2; *Atriplex hastata* 2+, 4+, 8+ ; *Chenopodium chenopodioides* 3.3, 4+, 9.1, 10.1; *Ch. ficifolium* 7.1, 8.1, 9.1, 10.1; *Ch. glaucum* 9+, 10+ ; *Chlorocyperus glomeratus* 2+, 4+, 5+, 6+ ; *Cirsium arvense* 11+, 12.5; *Heleochloa alopecuroides* 5+ ; *Juncus bufonius* 4.1; *J. effusus* 2.1, 4+ ; *Limosella aquatica* 2+, 4+ ; *Lycopus europaeus* 6+, 10+ ; *Malva neglecta* 10+ ; *Matricaria maritima* ssp. *inodora* 2+, 4+, 8+, 10+ ; *Oenanthe aquatica* 1+, 2.4, 7+, 8+, 10+ ; *Ranunculus sceleratus* 4.1; *Sonchus asper* 8+, 10+ ; *Typhoides arundinacea* 11.2, 12.5; *Urtica dioica* 6+, 10+ ; *Veronica beccabunga* 1.2, 2.4, 3+, 4+.

CIV — Characteristic indicator value
W — Water (Moisture) figure
N — Nitrogen figure

Classification according to the W-characteristic indicator value

The indicator values determined by ZÓLYOMI and his co-workers serve as the base of classification (ZÓLYOMI et al. 1967). The cluster analysis is performed according to the combined partial covering values of the plant species characterised by identical indicator value.

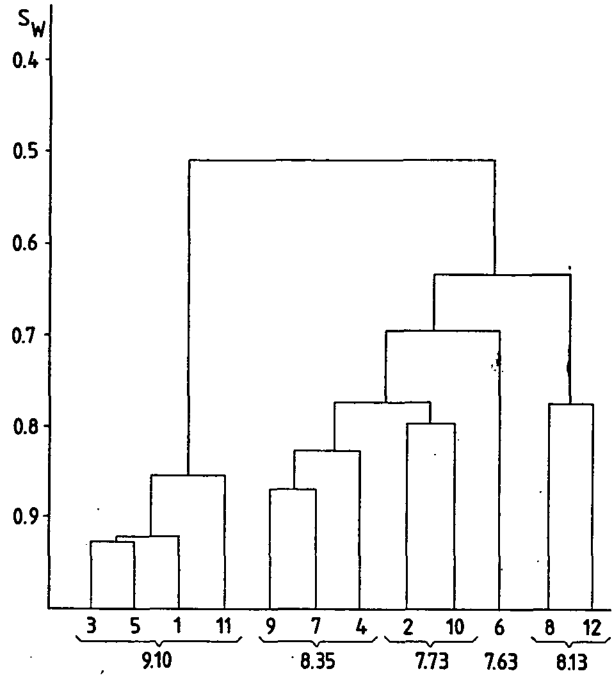

Fig. 3. Dendrogram of cluster analysis of species groups formed after the combination of speces with identical W-indicator values. The mean indicator values are higher in the groups of the earlier stands

The stands can be divided into two groups by classification on the basis of indicator value according to water demand, or rather hygrofrequency (Fig. 3).

The groups of stands, as well as their smaller units, can also be characterized numerically with the average of the mean indicator values reckoned for the stands. Mean indicator value for one stand:

$$W_j = \frac{D_1W_1 + D_2W_2 + \dots + D_nW_n}{D_1 + D_2 + \dots + D_n} = \frac{\sum_{i=1}^{n} D_{ij}W_i}{\sum_{i=1}^{n} D_{ij}}$$

where W_j is the mean indicator value of the j^{th} stand
W_i is the indicator value of i^{th} species
D_{ij} is the weighting of the indicator value of the i^{th} species on the basis of the dominancy value
n is the number of species

The cenoses standing mainly of Nanocyperion elements can be well separated: 1, 3, 5, 11. Compared to the rest of the groups the average of the mean indicator values is also essentially higher: 9, 10. Comparing the results of the classification according to species covering and W-value, a number of substantial deviations can be found besides the similarities, referring to the fact that apart from the appearence of species with less water-demand (less hygrofrequent) and the repression of those with greater water-demand, other factors also play a role in the transformation of the cenoses.

Ordination of stands on the basis of the covering values of species

Another way of comparing the changes in the characteristic indicator values and the abundancy-dominancy of the species is the ordination performed on the basis of the covering values of the species. The search for such a line in the ordination figure along which the mean indicator values as environmental gradient labels — belonging to the corresponding stand, arrayed at the foot-end of the perpendicular projection of the stand — can be ranged in order of a certain direction. (The direction of the searched straight line does not necessarily correspond to the direction of the axis.)

The ordination of the cenoses was performed with the reciprocal averaging technique (HILL 1973). The results of the ordination can be seen on Fig. 4. It is observable that the early stands labelled with circles can be found at small axis values. In contrast to the dendrogram according to species, the 11th relevé is in good connection with the rest of the earlier stands. The early stands of lower relief and the 11th relevé are grouped at the rather low values of the 1. axis, and the 7th and 9th from the early relevés at medium values. In the case of the later ones, at least the axis values is high, one of thus considerable separation is detectable in the situation of the early and late cenoses, but differentation is also great according to which axis value is high; this divides the later cenoses into two groups: the 2., 4., 6. are found at the lower areas of sampling, and the 8., 10., 12. at the higher ones.

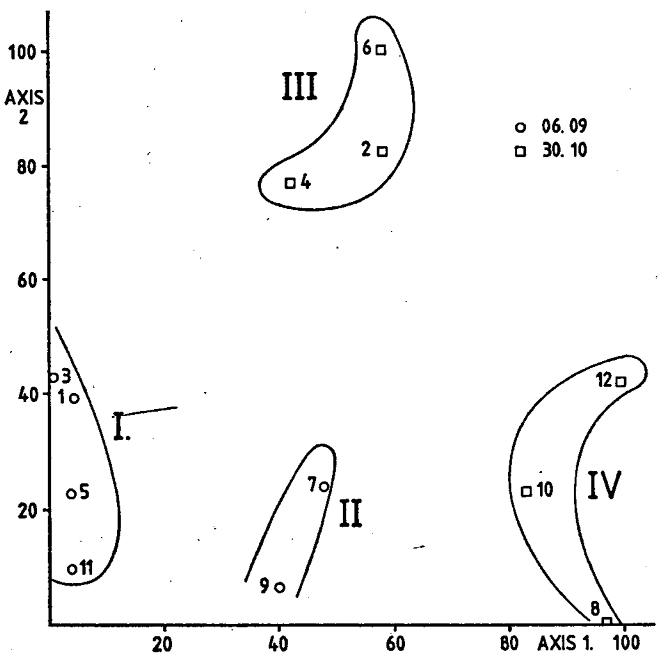

Fig. 4. Reciprocal averaging ordination of the stands. I. early stands of lower relief and stand 11. II. early stands of higher relief. III. later stands of lower relief. IV. later stands of higher relief

W-value and the ordination

On the ordination figure, in the bisector of the axis, a straight line (labelled with W) is drawable, on which perpendiculars from the points representing the cenoses can be drawn. The foot-ends of the perpendiculars are situated on W-straight line approximately in the order of the mean W indicator values of the cenoses in hand (Fig. 5).

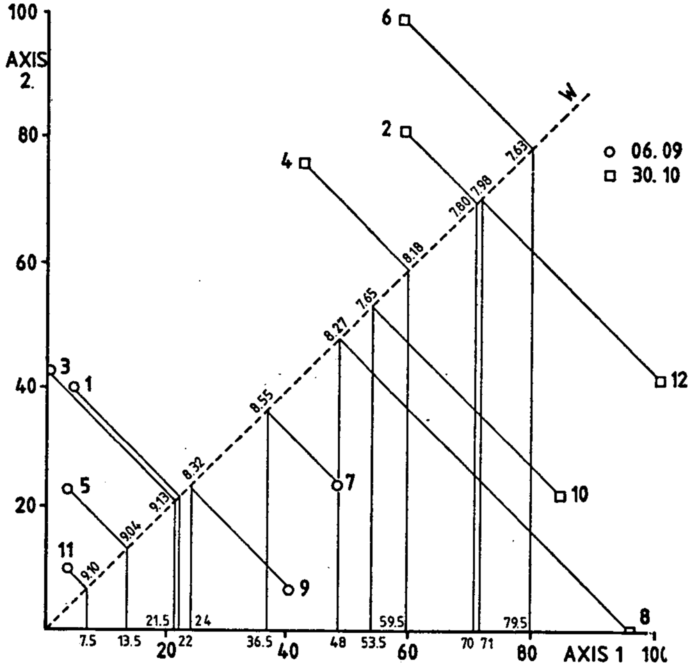

Fig. 5. Connection between W mean indicator values and the ordination I. The average indicator values characteristic to the object, written to the foot-ends of the perpendiculars falling on the W-straight line from the point representing stand, can put in order along the W-straight line, which is the principal component

Perfect linearity can not be expected from the situation of the points on the W-straight line, since the giving of the indicator values and the estimation of the cover are burdened with mistakes, and this influences both the results of the ordination and the given mean indicator values. Despite this, the situation of the various indicator value domains can well be circumscribed: the greatest indicator value averages (9.30—9.04) can be found at the low values of the axis-projection (7.5—22), the medium ones at the average projection values (24—60), and the low indicator value averages (7.63—7.98) at the high axis-projection values (70—80).

Not only the actual state of the cenoses, but also the degree of changes can be concluded from the ordination figure. Dividing the cenoses' distance of the foot-ends of the projections perpendicular to the W-straight line by the change in the calculated mean indicator values, a constant value is obtained with slight dispersion; besides the differentation of the prominent value (Sváb 1981).

Table 2

	A	B	A/B	$\bar{x}$ − A/B
1—2	4.12	1.33	3.10	+0.47
3—4	3.24	0.95	3.41	+0.16
5—6	5.61	1.41	3.98	−0.41
7—8	1.00	0.28	3.57	0.00
9—10	2.55	0.67	3.81	−0.24
11—12	5.48	1.12	(4.89)	

$$\bar{x}=3.57$$

$$s=\sqrt{\frac{\sum(\bar{x}-A/B)^2}{n-1}}=0.34$$

$$V=\frac{s}{\bar{x}}=9.52\%$$

A — relative distance on W-straight line
B — difference of mean indicator value between the early and later stands
s — dispersion
V — dispersion coefficient

The relationship between the ordination figure and the indicator values could be made more expressive by demonstrating the foot-ends' projection perpendicular to the axis (W-projection) in the function of the indicator values (Fig. 6).

From the 12 relevés, 10 fall to one straight line with good approach and 2 to a straight line close to parallel with the former. The two prominent relevés are the early and later cenoses of the same area. This fact gives rise to certain problems.

It can be seen from the comparison of Fig. 6 and Table 2, that in the 9—10 transitions the dispersion of the values compared to each other of the degrees of the changes (the change in the mean indicator value and the change readable from the ordination figure) is a low value, at the same time the changes is attained at lower level of almost half an indicator value than expectable. It could be determined on the base of the species' covering values that there is no such species, the faulty indicator value of which would be responsible in itself for the lower mean values.

Presuming that the ordination of the 9th and 10th stands was performed at the place determined by the actual indicator values — this could be decided by a similar study according to nitrogen-demand, which, however, is not exact — it could be assumed that in the two stands the selected indicator values are in general lower by half a unit than the actual W-indicator values. It seems as if the plants of the 9th and 10th relevés are greater water-demand than presumed, by the traditional interpretation of the indicator values.

On the other hand, it is striking that the values of the perpendicular projections of the points representing the mentioned stands, falling directly to the 1. axis, fit well to the drawn straight line in the CIVw-W projection system of co-ordinates. Moreover, in such way the fit to the N-straight line is also more exact. (cp. point 6).

All these are warnings for the circumspect use of the indicator values. Concerning this, it could be mentioned that in a hyroecological system of greater disintegration (Bodrogközy 1982) a definite shift is demonstrable between the W-indicator values described for various species on the basis of the Ellenberg-type (Central-West-European) as well as Hungarian studies (Ellenberg 1979). Such difference

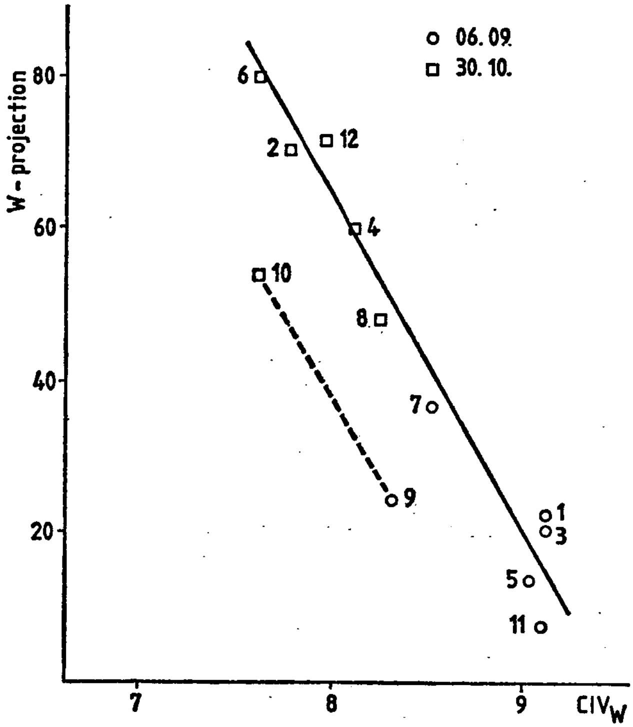

Fig. 6. Connection between W mean indicator value and the ordination II. The points representing the cenoses fall to one straight line, with the exception of one site of plotting. The dispersion coefficient of the tangents of the straight lines connecting the early and later stands — with the separation of the prominent value (11—12 stands): 9.76%. The deviation from the dispersion coefficient of the distance — mean indicator value difference is due to the errors of measuring of the relative distance in the ordination figure. CIV_w is W mean characteristic indicator value, W projection: the objects' projection falling to the axis of the foot-ends of the projections perpendicular to the W. The exact values of both can be read from Fig. 5.

may also develop within small areas. Regarding large areas, the probable cause of the indicator value-deviations is the adaptation due to abiotic differences, the cause of which can be experienced within small areas may also be owing to the role played by inter-, or intraspecific effects arising between the plant individuals.

Nevertheless, the abiotic factors also have be taken into consideration. Because of the small distances the differences of the microclimate are negligible, and similarity, the parameters connected with the soil's economy of water supplies do not show essential variations. The results of the studies in respect to the soil are observable on Table 3.

The demonstration of the inter-, or intraspecific competition requires thorough studying, mainly in connection with niche segregation (FEKETE—PRÉCSÉNYI 1976). The performance of such studies encounters difficulties on Nanocyperion-like associations, at least under natural circumstances, due to the low stability.

In a given case the average indicator value deviation most likely arises from the frequency character of the indicator values. The basic mass of the relevés considered during the determination of the various species' — mainly Chenopodio-Scle-

Table 3

Cenoses	Depth of soil (cm)	Soil fraction			$CaCO_3$ (%)	pH	Humus (%)	Total salts	hy	K_A
		Sand	Silt	Clay						
1—2	0—10	30	35	35	1.57	7.25	3.11	0.078	1.404	54
	10—20	25	35	40	1.44	7.38	2.81	0.078	1.684	54
	20—30	15	41	44	1.30	7.30	3.41	0.080	1.843	55
7—8	0—10	18	42	40	1.56	7.23	3.03	0.094	1.764	58
	10—20	25	35	40	1.62	7.28	3.11	0,094	1.731	58
	20—30	21	36	43	1 80	7.38	3.20	0.092	1.901	56
9—10	0—10	21	38	41	1.56	7.24	2.94	0.106	1.714	54
	10—20	28	32	40	1.28	7.32	2.94	0.090	1.714	54
	20—30	28	32	40	1.28	7.35	2.51	0.085	1.689	53

ranthea elements — indicator values does not represent the section mass of the relevés originating from the Nanocyperion associations. The frequency of the section mass is maximal at an indicator value differing from that of the basic mass.

Classification according the N characteristic indicator value

On the basis of the deviations of the W characteristic indicator values and the dendrograms of the cluster analysis according to species coverings, it can be assumed that the species component-transformation taking place due to the effect of drier conditions does not explain complately the changes developing in the cenoses, although this is without doubt the most important. Therefore the studies should be extended to the further indicator values. Under flood-plain, watercourse conditions the R-value, the parameter indicating the reaction-tolerance of the plants has no importance, this is referred to by the large partial covering of the populations indifferent from this point of view. A similar situation can also be determined concerning the T-value, the indicator value referring to temperature demand.

However, classification according to the N characteristic indicator value, i.e the parameter indicating nitrogen demand, is effective (Fig. 7). The applied N-values were established with the adequate modification of the values given by Soó (Soó 1964—80).

The cluster analysis according to the N-value divides the cenoses into two groups. The stands 1—6 are characteristic of the small ratio of the nitrofrequent species, stands 7—10 and 12 can be characterized by high mean indicator values. Stand 11 can be contrasted with the rest on low similarity level in the dendrogram. Comparing the dendrogram prepared according to the N characteristic indicator values, with the dendrogram prepared according to species coverings, they manifest a similarity of high degree. The group of less nitrofrequent cenoses are also separated on the dendrogram according to species. The separation is only partly explained by the great similarity in covering of the various species (cp. classification according to W). Stand 11 shows slight similarity at both places with the rest of the stands. The nitrofrequent cenoses also separate during the course of cluster analysis according to species. It is characteristic that both earlier and later cenoses belong to the various groups.

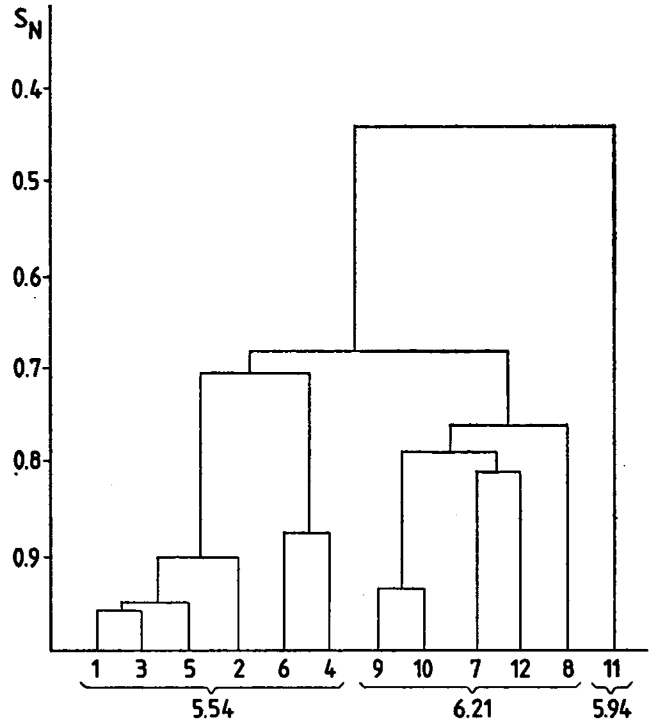

Fig. 7. Dendrogram of cluster analysis according to species combined on the basis of identical N-values. The combination does not change significantly the structure of the dendrogram of classification according to species covering. Besides the general effect caused by drying out, the dendroram of the classification regarding species covering is formed by the differentiating effect of the appearing nitrofrequent plant species

N-value and the ordination

In the ordination figure, a straight line can be drawn perpendicular to W, along which the cenoses can be divided into three groups on the basis of the mean N-values belonging to the various stands (Fig. 8). Elements of these groups correspond to the results of the classification according to N. The N-values are less exact than the W-values, thus it cannot be expected that the projections of the foot-ends of the perpendiculars falling on the N-line from the objects would give such a well definable straight line on the axis in the function of the indicator values (cp. point 4). Nevertheless, the separation of the various groups is striking. The first group belongs to small axis-1 projection of the N-straight line (20—40 intervals), the average of the mean indicator values belonging here is 5.54. The other large group of the stands belongs to high projection — value (60—100 intervals), the average here is 6.21. The 11^{th} stand is found between the two mentioned groups in respect to average indicator value as well as on the ordination figure.

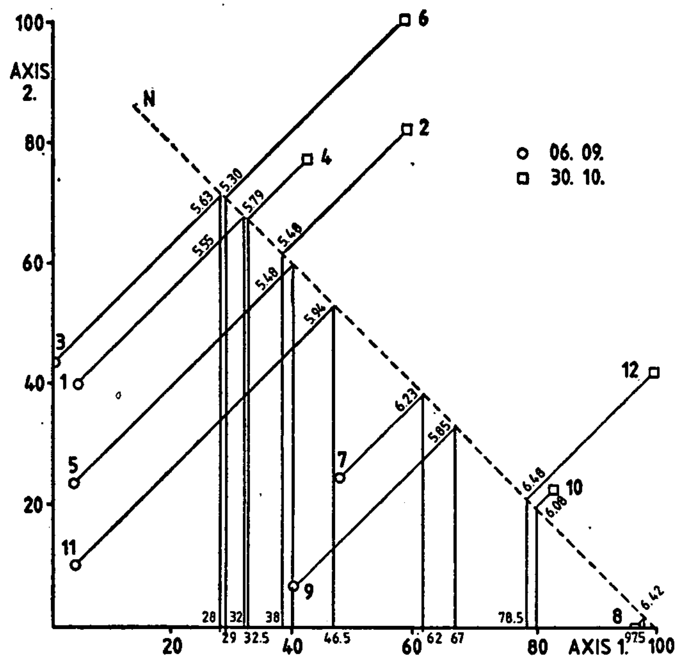

Fig. 8. Connection between the N mean indicator values and the ordination. The cenoses' N mean indicator values (analogously with the W-value) form groups arranged according to size along the N-straight line, as second principal component

Conclusions

The changes in the species component ratios of the cenoses reflect the draining of the area well (Fig. 9). While every earlier stand is found at the higher values of the W straight line, the later ones shifted towards the lower values. From the viewpoint of the appearence of the nitrofrequent species the cenoses can sharply be divided into two groups. The ratio of the nitrofrequent species hardly changes in those of lower relief (interior primary succession — change in aspect), intensive nitrofrequent inflow is manifest into those of higher relief (exterior primary succession — primary succession taken in the traditional sense). The transitional state is represented by the 7th and 9th stands, it is presumable that an earlier sampling brought closer these cenoses to the rest of the cenoses taken on September 6.

It can be established that in their early state the cenoses of the studied area were composed of hygrofrequent, less nitrofrequent, mainly Nanocyperion elements. Parallel with the progress of the vegetation period and the draining of the area the hygrofrequent species are repressed, their expansion slows down, thus there is an increase of species which are more tolerant to drier conditions. On higher relief a significant percentage of these are nitrofrequent species, mainly Bidentetea elements. On lower relief the proportion — increase is typical of the non-nitrofrequent, mainly later appearing, less hygrofrequent Nanocyperion species, the non Bidentetea species belonging to the Chenopodio-Scleranthea division as well as the species classable both among the Nanocyperion and Bidentetea association-groups.

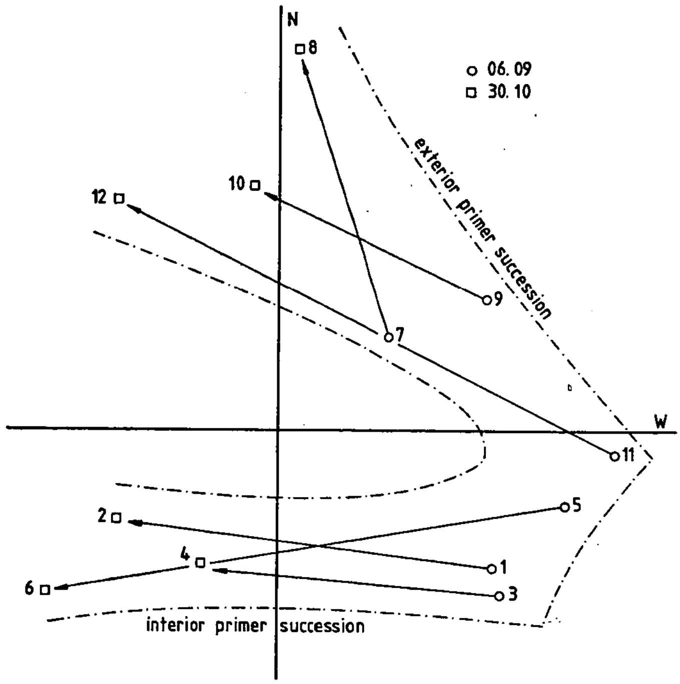

Fig. 9. Interpretation of the transformation of the cenoses in the function of the principal components. W: the vegetation accomodates to the continuous draining in composition. N: the succession types of the higher and lower reliefs are divergent

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Vegetációdinamikai vizsgálatok Nanocyperion jellegű növénytársulásokban I.

A felvételek klasszifikációja és ordinációja, valamint a karakterisztikus indikátor értékek

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Nanocyperion jellegű, *Cypero-Juncetum* és *Dichostylidi-Gnaphalietum* asszociációkhoz közel álló cönózisokon végzett vegetációdinamikai vizsgálatok eredményei a karakterisztikus indikátorértékek segítségével jól értelmezhetők. A cönózisokban bekövetkező szezonális változások az átlagos W-érték csökkenésében, valamint az N-érték térszintől függő alakulásában nyilvánulnak meg. A cönózisok átlagos W-érték csökkenése a biotóp kiszáradásának a következménye, az N-értékek kialakulását a magasabb és az alacsonyabb térszín szukcessziójának eltérő típusa magyarázza.

A dolgozat általánosítható megállapításai a karakterisztikus indikátorértékek alkalmazhatóságának feltételeit elemzik. Az indikátorértékek alkalmazását számos részletre kiterjedő elővizsgálatnak kell megelőznie, viszont az indikátorértékek irodalmi adatoktól való eltérése okainak elemzése egyes esetekben lehetővé teszi a társulás strukturális sajátosságaira vonatkozó következtetések levonását.

Az indikátorérték eltérések kimutatása statisztikus matematikai módszerekkel, adott esetben reciprocal averaging ordinálási technikával lehetséges. Az eltérések okainak keresése egyes faktoroknak mint lehetséges okoknak kizárására irányult.

Вегетационно динамическое исследование над раститеьными сообществами Nanocyperion I.
Рийомы их классификации и ординации, а также оценки характерных их индикаторов

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Резюме

Результаты вегетационнодинамических исследований над Nanocyperion: *Cypero-Juncetum* и *Dichostylidi-Gnaphalietum* становятся хорошо понятными при оценке их характерных индикаторов.

Сезонные изменения в сообществах сокращение средней *W*-цены, а также И-цены, зависят от формирования рельефа.

Снижение средней *W*-цены в сообществах является причиной высыхания биотопа, причем образование И-ценов находитсяв зависимости от сукцессии на более низком и высоком рельефе.

В основном работа анализирует основные условия возможностей использования характерных индикаторов.

Ispitivanje dinamike vegetacije sa karakteristikama Nanocyperion zajednice I
Klasifikacija i ordinacija uzoraka kao i vrednosti karakterističnih indikatora

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Abstrakt

Rezultati ispitivanja dinamike vegetacije *Cypero-Juncetum* i *Dichostylidi-Gnaphalietum*, asocijacija sa bliskim karakteristikama Nanocyperion zajednici, moguće je uspešno vrednovati pomoću karakterističnih indikatornih osobina. Sezonske promene u zajednicama se javljaju u opadanju W vrednosti, kao i na promenama N vrednosti u funkciji prostora. Opadanje W vrednosti zajednica je posledica isušivanja biotopa. N vrednosti su uslovljene tipovima sukcesija na različitim nivoima.

U radu se analiziraju uslovi primenljivosti uopštenih konstatacija karakterističnih indikatora. Analiza uzoraka odstupanja vrednosti indikatora u odnosu na podatke iz literature, u izvesnim slučajevima omogućuje donošenje pretpostavki o strukturalnim osobenostima zajednica. Prikaz odstupanja vrednosti indikatora matematičko-statističkim metodama je u datom slučaju bio moguć ordinacionim „reciprocal averaging" tehničkim postupkom. Traganje za uzrocima odstupanja je usmereno ka elimisanju pojedinih faktora, kao mogućih uzročnika.