Verh. SIEEC X. Budapest 1983

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Some methodical aspects of the congruence of carabid communities with various types of phytocenoses

The results of investigations on the congruence of zoo- and phytocenoses obtained until today are so contravening, but always seriuosly supported, that the question arises, if a revision of the methodical basis is more desirable than the accumulation of further material. Actually, two concepts of phytocenology coexist. The first one is represented by the BRAUN-BLANQUET's school and the second one by some concepts of RAZUMOVSKIJ and before all by the ZLATNÍK's school. The BRAUN-BLANQUET's school describes the status quo of the vegetation and, on the basis of observed differences, it constitutes individual syntaxa and creates a hierarchical system of them, similarly as the botanists do. This approach results in large number of syntaxa which can be expected to be highly discordant with the canoses of any other group of organisms due to different requirements to abiotical factors, degree of anthropotolerance, speed of succession, ecological niches occupied, individual minimy areas, ability to create and to hold insular population etc. This approach, however, could give many valuable information about the course of succession, if the syntaxa obtain time dimension.

Contrary, the ZLATNÍK's school considers only the natural communities corresponding with the constant conditions of an ecotope to be a real basis for constituing independent units. All other plant cenoses, before all that man influenced, are considered to be successional stadia of the natural ones and they are ranked together with them into the same units. They are supposed to restore their original structure, if the influence of the anthropogenous or other unpredictable factors is stopped. So, seemingly rather different cenoses can be ranked into the same unit and, consecutively, the congruence of such units with the units of cenoses of other organisms can be expected to be higher than in the BRAUN-BLANQUETian ones. In the anthropogenously changed landscape, this fact can be of a great importance, because the anthropogenous structural changes in cenoses influence deeply the results of clustering and classifying them. So different degree of congruence of taxocenoses of different organisms groups can be reached if the typological (BRAUN-BLANQUETian) or geobiocenological (ZLATNIKian) approaches and reference units are applied.

It can be demonstrated by the model of degradation process of a cenosis. This model consists of real carabid communities arranged in an idealized gradient of anthropogenous pressure from the free landscape, cross suburbs towards the centre of a town (Fig. 1) and of clustering them (Fig. 2). The natural cenoses are characterized by high alpha-diversity, by balanced abundance in individual species and by high total individual number. At the beginning degradation, such a cenosis reacts by the increase in abundance of 1 to 2 most tolerant and usually most abundant species, and by the decrease in abundance of the less abundant ones. The total individuals number, however, remains unchanged. In the following stadium also the species, in which the abundance has increased, lose their position. The alpha-diversity and total individuals number decrease in such a cenosis. In the final stadium, the abundance of all species decreases to the minimum and the alpha-diversity rises due to balanced abundance in the individual species. During the degradation the number of original species decreases continuously and some species from the surrounding can penetrate such cenosis. Their number depends from the beta- and delta-diversity. According to experiences, the number of the species selected to increase in their abundance in the initial stage of degradation of cenoses is relatively limited in a group and landscape. So the differences existing between the natural cenoses can be wipped off during a short period, even in a reservation (Fig. 3) and rather unexpected combinations of cenoses can occur in a single cluster (5 F

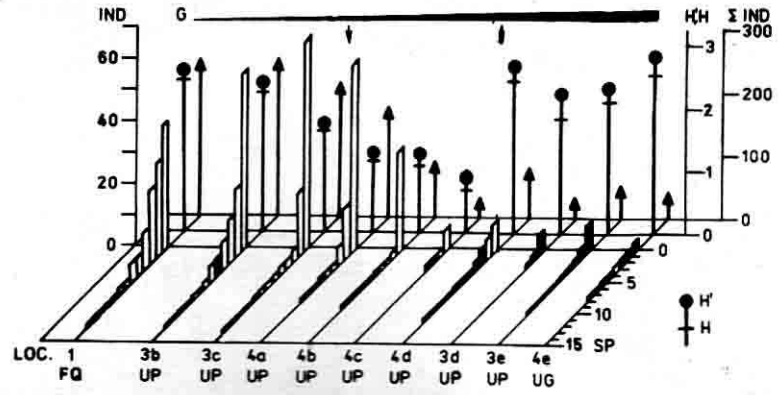

Fig. 1. Gradient of structural changes during degradation of carabid cenoses of beech-oak forests (IND - individuals number of each species, SP species number, IND total number of individuals in each cenosis, H' - shannon Wiener's and H - Brillouin's index of alpha-diversity, UP - urban park, UG - urban garden, G - gradient of anthropogenous pressure)

paup. - 5 SM II - 3a UP; 6a-c PM - 2 FQ '71 - '81; Fig. 2). So rather related cenoses can be classified as remote and vice versa.

The anthropogenous structural changes in a cenosis can influence strikingly the form of the similarity dendrogram and many artefacious changes can be obtained by the selection of similarity indices. If the indices for the evaluating qualitative characters are used, the natural cenoses form close clusters on high similarity levels and those influenced ones join them successively in dependence from the degree of anthropogenous disappearing original species. So the "chain-effect-shaped"

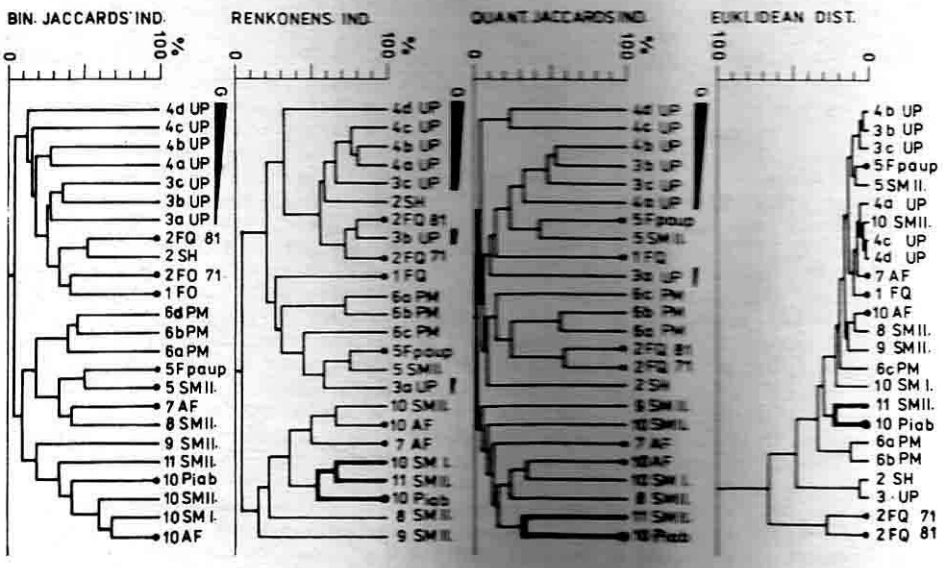

Fig. 2. Group average clustering of carabid communities according four similarity indices (symbols as in fig. 1)

clusters arise. If the quantitative or overlap indices are used, the "chaining" is inverse and the most influenced, convergent cenoses form close clusters on high similarity levels (Fig. 2). The low balanced abundances of all species in completely destroyed cenoses (under the condition that such animal aggregation can be considered still to be a cenosis) result in very closed clusters common with the natural cenoses with low secundary productivity, if some metrics are applied (Fig. 2). The above facts can play a considerable role in the judging the congruence of zoo- and phytocenoses because other similarity criteria and indices used in phyto- and zoocenology.

The ability to hold and to restore the original species spectrum supposed in ZLATNÍK's concept can lead to rather disgruent cases of parallel classification of phyto- and zoocenoses. In some coniferous monocultures, especially in that of Picea abies, we find no specific faunula of Carabids, but always a derivate of the faunula of the previous geobiocenosis due to preserving the most essential factor determining the existence of them (Fig. 2). The carabids from Norway spruce monocultures form common clusters with one of the natural cenoses, before all with those, which are most close geographically. Only two cenoses from Norw. spruce monocultures form there one common cluster and one cenosis from the monoculture forms twice the common cluster with the cenosis from natural Piceetum (Fig. 2). Another example represents the carabids in Špilberk and Kalvária (Tab. 1). Both localities were deforested for a long period (Špilberk at least more than 600 years) and afforested secondarily. Špilberk artificially 123 years ago and Kalvária spontane-

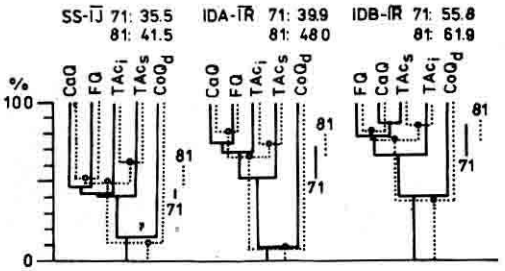

Fig. 3. Group average clustering of five carabid cenoses from Pavlovské kopce hills (Šustek 1983) separately for the years of 1971 and 1981 (SS - species similarity, IDA - identity of activity dominance, IDB - identity of biomass dominance, IJ - Jaccard's index, IR - Renkonen's index, CaQ - Carpini Querceta, TAc - Tiliae Acereta, s - superiora, i - inferiora, FQ - Fagi Querceta, CoQ - Corni Querceta, d - degradation stadium)

ously cca. 150 years ago. Proportionally to the anthropic pressure subjected, they are inhabited recently by typical carabid faunula of destroyed oak or oak-beech forests. In the past, however, thay could be classified quite differently if the typological approaches had been used.

The congruence of zoo- and phytocenoses is strongly influenced also by the ability of species to hold independent populations in a limited area and to resist the penetration of other "foreign" species, if the beta- and delta-diversity is high. This is the case of some carabid communities in the stands of Robinia pseudoaccacia in South Slovakia and Moravia, where, if a suitable immigration source is present in the near neighbourhood, the most tolerant carabids of oak forests can be found. Contrary, in completely isolated, though large stands agricultural landscape the forest faunula is absent and the stand functions as a refuge for the field fauna exhibiting such properities in these conditions as the normal field faunula of carabids 30 years ago.

A few examples of carabid cenoses chosen showed that the composition of a community is subjected to dynamic and deep changes even in the same site (2 FQ '71, '81, 1 FQ, Fig. 2). Such changes lead to seeming convergence of remote cenoses on the one hand, and two identical cenoses can develop divergently under the anthropic pressure and they can be classified typologically into different units on the other. It seems that the cases of seeming congruence of zoo- and phytocenoses is just so frequent as the cases of disgruence. Conformly to more authors (MÜLLER 1975, RABELER 1960, SCHAEFFER 1970 and TIETZE 1974, in KRAUSE 1978) it is not possible to confirm or to negate unambiguously the congruence of zoo- and phytocenoses. On the present methodical level the congruence represent probably a continuum and it is possible to define the precondition, in which it is high or low. Low beta- and delta-diversity, predictability and stability, natural or anthropogenously uninfluenced cenoses, dominance of K-selected species, similar requirements of individual species to abiotical factors, considering the species from more functional levels in an ecosystem, ecologically supported and multidimensional classifications of cenoses lead to high congruence. High beta- and delta-diversity, unpredictability and unstability,

anthropogenously changed or abiotically governed cenoses, dominance or r- or S-selected species large individuals areas and typological classification lead to low congruence.

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