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INVESTIGATION OF REPRESENTATIVE HABITAT COMPLEXES ALONG THE MAROS (MURES) RIVER

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1. ACTUALITY OF INVESTIGATIONS

East and Central European rivers and related habitats play an important role in maintaining the biological diversity of the biogeographical regions, not only because of their corridor function, but being rich core areas of ecological networks [1,2]

European policy toward flood control is being revised, and provides major opportunities toward nature development or restoration [3].

Detailed identification and description of still existing natural or semi natural habitat complexes is necessary to planning conservation strategies, or restoration programs of deteriorated riverside habitats.

Since 1991 Hungarian and Rumanian non-governmental organisations has started interdisciplinary research to assess the common river's environmental condition [4]. On the base of this pilot research representative, and highly natural areas has been selected for more detailed scientific investigations. This presentation gives a short description of investigated habitats, and the main conclusions of the study.

2. DESCRIPTION OF STUDY AREAS

2.1. PEAT BOG AT VASLÁB/VOSLOBEN IN GIURGEU (GYERGYÓI) BASIN

The vegetation of studied area is very rich and divers. The composition and pattern of plant associations seems to be rather undisturbed. The present human use of the grasslands, that is moderate grazing and mowing, do not endanger considerably the natural values, but the nature protection and detailed mapping of this very important natural habitat is necessary and urgent! A similar peat bog basin has been drainaged 50 years ago near to Vasláb/Vosloben bog. The agricultural use of the area is not very successful, but the unical natural values have been disappeared.

Investigated habitats: wetland area (mainly *Carici stellulatae and rostratae-Sphagnetum*, *Caricetum rostratae*, *Caricetum flavae juncosum subnodulosi*, and *Filipendulo-Geranietum palustris*), wet meadows (*Molinietum coeruleae* and *Agrostio - Deschampsietum caespitosae*), and a dry pasture *(Agrostio - Festucetum rubrae.)*

2.2. LOWER MURES/MAROS PASS BETWEEN ILIA AND DEVA

The river valley is very narrow, a main road and a railway line are driven here. Most of the area is under agriculture; the rate of natural habitats is very low. Several plant species of mountain habitats occurs occasionally in the river valley

Investigated habitats: riverside, species rich willow forest *(Salicetum albae-fragilis)*, a wet meadow with furze willow *(Salix cinerea, Lythrum salicaria, Inula helenium)* an abandoned arable land, revegetated mainly with non-weed, native species, a rather degraded pasture, and a mountain pasture.

2.3. PECSKA/PECICA-BEZDIN FOREST

The river is only slightly channelled; it builds and destroys shoals and banks. Different successional stages of natural habitat types are well developed. Most of the forests grow up in natural way after cutting, the forest management is not intensive.

Investigated habitats: The oak-ash-elm forests *(Fraxino pannonicae-Ulmetum)* have high natural value, with species rich, natural undergrowth. The willow and poplar forests *(Salicetum albae-fragilis)* are valuable as well. The sodic oak forest and its glade *(Peucedano officinalis-Asteretum sedifolii)* is such a habitat, which is highly protected in Hungary.

2.4. MAROS SECTION IN HUNGARY

The river is artificially channelled, the dikes separate the inundation area. There are no forests outside the dikes. The planted forests in the inundation area are intensively managed, the natural undergrowth is eliminated at plantation of the forests. The rate of hybrid poplar plantation is rather high. The rate of really old oak, white poplar and willow forest s rather low. The invasive tree species are abundant. Some native and protected plant species occurs sporadically. Most of the inundation area is under nature protection, and habitat reconstruction is planned.

Investigated habitats: old poplar-willow forests (*Salicetum albae-fragilis)*, several planted forests *(Populus canescens, Populus x hybrida, Quercus robur)*, foxtail meadow *(Alopecuretum pratensis)*, grassland on the dike, forest belt.

3. EVALUATION OF THE DESCRIBED HABITAT COMPLEXES

These 4 study sites do not represents the all habitat types and the whole flora and vegetation of Mures valley, but they give a certain picture about the long and very divers river from the upper section till the estuary.

The peat bog and fen area at Vosloben is a highly natural, rich and divers. Detailed botanical description of occurring habitats is in [5]. The present human use of the grasslands, that is moderate grazing and mowing, do not endanger considerably the natural values, but the nature protection and detailed mapping of this very important natural habitat is necessary and urgent! A similar peat bog basin has been drained 50 years ago near to this place. The agricultural use of the area is not very successful, but the unique natural values have been disappeared.

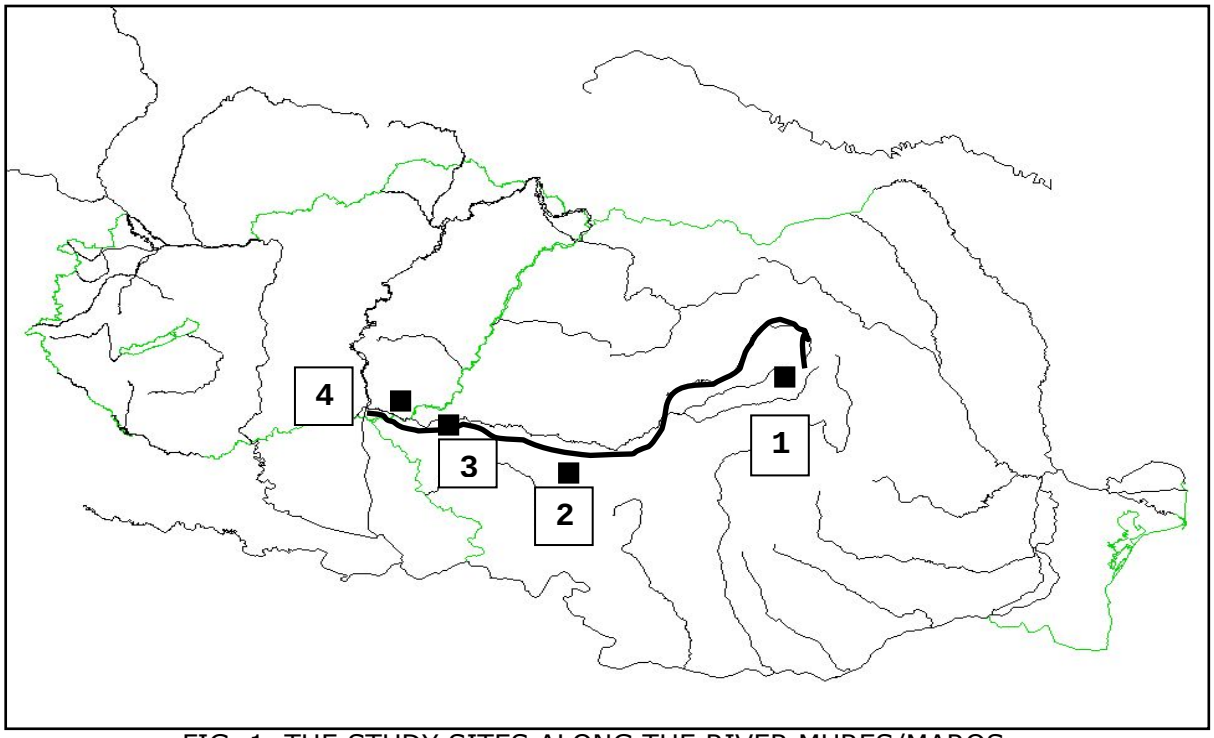

FIG. 1. THE STUDY SITES ALONG THE RIVER MURES/MAROS.
1. PEAT BOG AT VASLÁB/VOSLOBEN IN GIURGEU (GYERGYÓI) BASIN
2. LOWER MURES/MAROS PASS BETWEEN ILIA AND DEVA
3. PECSKA/PECICA-BEZDIN FOREST,
4. MAROS SECTION IN HUNGARY

In the narrow river valley in the lower Mures pass most of the area is under agriculture, or serving the big traffic, so the few semi-natural habitats are very important in maintaining regional biodiversity. The investigated secondary habitats seemed to be rather rich in natural plant species, the mountain species often occurs, the corridor function of the river seems to be working.

Comparison of the two study sites in the Rumanian and Hungarian part of the Murex floodplain clearly demonstrates the effect of human use on reverie habitats. The river is highly channelled in the Hungarian part, flows in a straight, artificial bed, so the natural habitat dynamics of the building and falling banks does not work. In the Romanian section a lot of different natural, successional stages of riverine habitats develop. The other big difference is in the management of forests. In the Hungarian part the forests are artificially planted and intensively managed. The main tree species is the exotic hybrid poplar. There are native oak, poplar and

willow forests, but their grass layer is very poor. The unnatural inundation regime inside the dikes does not allow the survival of several natural species. In the Rumanian part the forests regrowth in natural way after cutting, and the hydrological situation is much more natural. The species rich, and highly natural forests in the Rumanian part could be the reference sites of habitat restoration experiments in Hungary.

4. ECOLOGICAL INVESTIGATIONS AT DIFFERENT SPATIAL SCALES

The studies, scoping different spatial scales from the microcosms to the regions, have revealed the specificities of plant communities in very small patches (ant mounds), the role of an ant supercolony in structuring spatial pattern of the whole ant community, the differential effect of exogenous factors on the habitat selection of plant and different invertebrate assemblages, the restricted potential corridor function of the terrestrial habitats along River Mures/Maros, and the scale-dependence of the faunal and community similarities.

At regional scale, our main aim has been to compare the above-mentioned four complexes of sites and to carry out faunistical "scanning" studies between. these regions. At this level, we hoped to obtain results on the ecological corridor function of the River Mures/Maros valley, too.

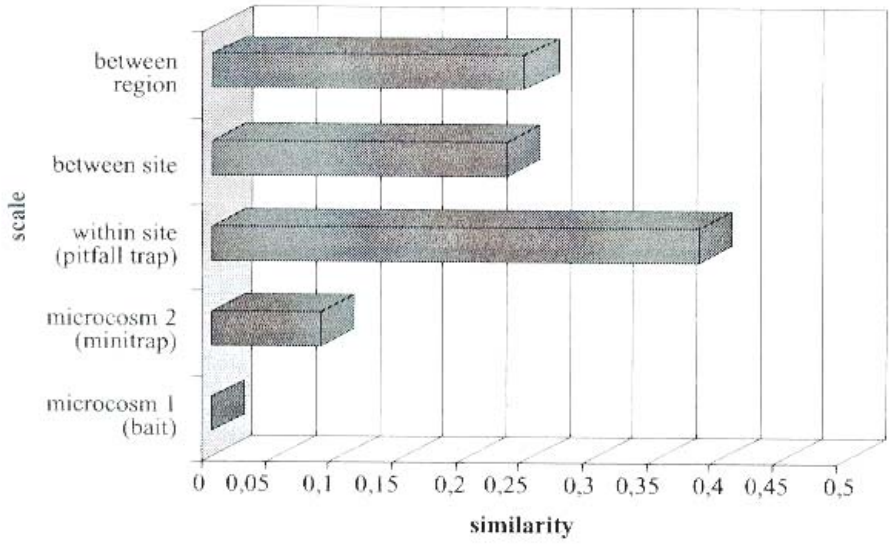

FIG. 2. SIMILARITY VALUES OF ANT ASSEMBLAGES AND FAUNAS AS A FUNCTION OF TWO SMALL, WITHIN SUPERCOLONY (MICROCOSM 1 AND MICROCOSM 2) SCALES; AT HABITAT (WITHIN SITE) SCALE; AT LANDSCAPE (BETWEEN SITE) SCALE AND AT REGIONAL (BETWEEN REGION) SCALE, RESPECTIVELY.

For the regional level comparison, the first question by an ecologist could be that whether an ecological pattern or mechanism is scale dependent. As an example, we demonstrate here the comparison of similarities of the ant (Formicoidea) assemblages/faunas at microcosm, within site (habitat), between habitat and regional scales, respectively (Fig. 2). The data originated from the following field samplings:

- microcosm 1: bait experiments were conducted to follow the circadial rhythms of ants at very small spatial scale;

- microcosm 2: data from mini pitfall traps arranged in 50x50 cm grids and employed to reveal the small spatial scale differences in the penetrated foraging territories of different species;
- within site (habitat) scale: the data are from pitfall traps arranged in 5x5 m grids in the sampled sites and the catches of the individual, traps is compared with similarity measurement;
- between site level.comparison::of the data from different sites within a landscape complex (e.g. within Vaslobin or Maroslele district) and
- between region level: a comparison of the ant fauna of the different regions.

As it is seen on Fig. 2, no linear scale-dependent trend is observed, but there is a similarity maximum at within site scale. The low similarity values experienced at microcosm level are resulted in by the segregation in the territories of the different species and also by the circadian activity differences (in the case of baits) in the presence of a supercolonial species. The high average similarity at within site shows that the sampled habitats are more or less homogeneous. The between site difference indicates the differences of sampled sites (the design of sampling involving different habitat types was our original intention in this study). One could expect even greater dissimilarities at the larger, between-region level, brought about by the geographical scale differences. The results, however, do not meet this expectation, probably because there are similar habitat types of the different studied regions, where the populations of the same, mostly widely distributed species were found. The alternative hypothesis could be that the habitat stripes along the river act as "ecological corridors", resulted in similar withis-stripe faunas.

5. ABOUT ECOLOGOICAL CORRIDORS

The ecological corridor and the ecological network are among the recent and fashionable buzzwords both in ecology and conservation biology. Rivers, both their water bodies, and the terrestrial habitat complexes of the flood plains are a priori regarded to be ecological corridors, as a rule. If we define ecological corridors as such stripe-like habitat, which promote the migration, the dispersion, and the distribution of plant and animal species, it is clear that no any habitat strip is ecological corridor per se. It depends on the studied ecological objects i.e. populations or communities, if a habitat strip is used as corridor or not. Therefore, the term ecological corridor is plural, similarly to the ecological environment. The corridor function of the flood plain of River Tisa has been demonstrated on plants, grasshoppers, ants, snails, birds and ground beetles [see 6. and 1 and the citations therein]. Since the flood plain is a complex of different habitat zones and ecological communities along River Tisa, there is a composed system of potential corridors, differently promoting the migration and distribution of different species either to the North or to the South. Besides these functions, the terrestrial habitats by the River, Tisa flood plain also acts as core areas for several populations and communities and. promote the recolonization of these

ecological units in. habitats island outside the flood plain. In the case of River Mures/Maros, the corridor role is not unequivocal, although the very first paper dealing with role of flood plains and especially floods themselves, as the promoters of insect migration and distribution was published on the beetles by the River Mures/Maros [7]. As one side we cannot dispute the results concerning the faunal (and probably also the floral) distribution by the flood by direct drive, the great differences of the fauna at the upper and lower streams of the river, the different geographical character of the different regions and especially, the interruptedness of the stripe-like habitats at the middle parts of the flood area, where the cultivated fields are adjacent to the riverbanks.

The ecological communities in the inundated part of the flood plain are regularly exposed to the disturbing effects of repeating floods and the processes of recovery result in a complicated dynamics, which can be described with the catastrophe theory. The recolonization of the formerly flooded sites takes place from the higher refuge, from the trees and from the unflooded areas outside. Both the longitudinal migration and distribution along the river ("corridor function") and the transversal migration from to the flooded area (core area function and recolonization) form a complex, rather complicated dynamics of the riversides' biota. As our preliminary results have shown, however, in the case of River Maros, the corridor function is much more restricted.

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