International Association for Danube Research

of the International Association for Theoretical
and Applied Limnology

LIMNOLOGICAL REPORTS

VOLUME 35

Proceedings

**of the 35th IAD Conference, Novi Sad,
Serbia and Montenegro, 2004**

Editors

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visio mundi
academic press

National Committee of IAD Serbia and Montenegro

Internat. Assoc. Danube Res.	35	613–618	Novi Sad, April 2004

Zoological mapping along the Hungarian lower Danube: Importance, aims and necessity discussed with the example of three unrelated groups, Decapoda, Amphibia and Reptilia

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Abstract: The necessity of zoological mapping to support the protection of biodiversity in freshwater ecosystems is demonstrated using the available information on three unrelated groups bound to lotic systems to a different degree, Decapoda, Amphibia and Reptilia. Data collected along the Hungarian Lower Danube show that least information is available on the most aquatic group, Decapoda, while there has been considerable improvement on Reptilia and especially on Amphibia due to mapping carried out in 2001–2003. Based on the experience gained from studying the herpetofauna of the Danubian floodplain, intensive mapping on different animal groups is proposed for the whole river as an increase in up-to-date information is vital for conservation-minded decision making and to help the maintenance of biodiversity.

Zusammenfassung: Die Notwendigkeit der zoologischen Kartierung im Interesse der Aufrechterhaltung der limnischen Biodiversität erörterten wir am Beispiel von drei, auch voneinander sowohl im Verwandtschaftsgrad, wie auch in der Lebensführung und in ihrer Gebundenheit an das Wasser fernstehenden, stark gefährdeten Gruppen. Die aus der unteren Teil der ungarischen Donaustrecke eingeholten Decapoden-, Amphibien- und Reptiliendaten haben eindeutig erwiesen, dass es sich um eine mit dem Wasser engverbundene Gruppe der Decapoden handelt, über die wir heute noch schwache Kenntnisse besitzen. Dank einer zwischen 2001 und 2003 stattgefundenen Ermessung sind uns über die Reptilien, insbesondere über die Amphibien bereits bedeutend mehr Kenntnisse bekannt. Aufgrund der Untersuchung der Herpetofauna des Überschwemmungsgebietes der Donau kann festgestellt werden, dass, um eine entsprechende, aktuelle Information zur Förderung der umweltbedingten Entscheidung und zur Bewahrung der Biodiversität gewinnen zu können, die grundlegende – eine sich auf die Gesamtlänge der Donau beziehende – intensive Kartierung der zur Zeit noch mangelhaft klassierten verschiedenen Tiergruppen nötig ist.

Keywords: Decapoda, Amphibia, Reptilia, Danube, mapping, conservation

Introduction

At present, mankind is experiencing the sixth great extinction era on Earth (CHAPIN et al., 2000). Rapid changes in biodiversity and the functioning of many ecosystems makes gathering of information on the distribution of species,

contraction or expansion of their ranges, stability of (meta)populations and habitat requirements especially important as it is badly needed to slow down and halt loss of species and habitats and maintain existing ecosystems. In this task, distribution mapping is a basic tool to understand large-scale processes and the requirements of species. Freshwater ecosystems are especially endangered, both at the system and the individual species level (ABRAMOVITZ, 1996). However, basic data are missing even on the most endangered groups.

Three groups were selected for comparative evaluation, Decapoda, which are fully aquatic and threatened mostly by competition, hybridisation and disease (PERRY et al., 2001), Amphibia, which need water at least for breeding and larval development, and Reptilia, which, on the contrary, need dry land for egg laying and development but include species which spend most of their life in water, such as *Natrix natrix* and *Emys orbicularis*. The highly threatened status of these groups is well-demonstrated. Decapoda are present in national and regional red lists in high numbers. The newest edition of the International Red Data Book (IUCN, 2003), for example, contains 176 Decapoda species, which is the tenth highest among any classes and orders. If the species number of different groups is also taken into consideration the threat to Decapoda is even more obvious, as the species number of Lepidoptera, for example, is much. On the other hand, however, Decapoda also contain highly successful invasive species colonising new areas, even in other continents and their spreading has also been recorded during the general biodiversity crisis (in Hungary *Orconectes limosus* and *Pacifastacus leinisculus* are such species.). Amphibian decline is a phenomenon occurring globally (see e.g. BLAUSTEIN & KIESECKER 2002, GARDNER, 2002) and Reptilia also include a high ratio of threatened species (ABRAMOVITZ, 1996). Their conservation status also seems to be the same along the Danube as these groups had the highest proportion of endangered species in the Alluvial National Park in Austria in comparison with several other groups such as Odonates (TOCKNER et al., 1998).

Material and Methods

The Hungarian Lower Danube from 1555 to 1433 rkm (km from river mouth) and its surroundings has been selected as the geographical area of the study. The collected information is presented and discussed at the level of 50 km × 50 km UTM square units, which is routinely used on the European scale. Most information given is focussed on two of these squares, is indicated as CSA and CSB in Figure 1. Their hydrology, landscape and biological processes are greatly determined by the Danube, with its 2,200 m^3 discharge and intensive floodplain areas along this stretch. The Danube–Dráva National Park has protected areas both along the river and in the surrounding areas.

All discussed animal groups are present in Danubian ecosystems but their aquatic habitat dependency is greatly different, which basically determined their sampling methodology. Decapoda was collected by hand, trapping or electrofishing. As well as occasional observations or smaller-scale studies, amphibians were systemati-

cally investigated since 1997 in the Gemenc Region of the Danube–Dráva National Park, a 180 km² floodplain area between 1500 and 1470 rkm of the Danube (PUKY, 2000a). Altogether six internationally accepted and widely used methods (HEYER et al., 1994, OLSON et al., 1997) were applied to prove their presence in the area (visual encounter, call counts, road transect, torching, netting, transect method). Reptiles were also studied intensively in the same area, using visual encounter surveys and road transects as the principal methods. In 2001 intensive herpetofauna mapping started in Hungary including both literature survey and site visits.

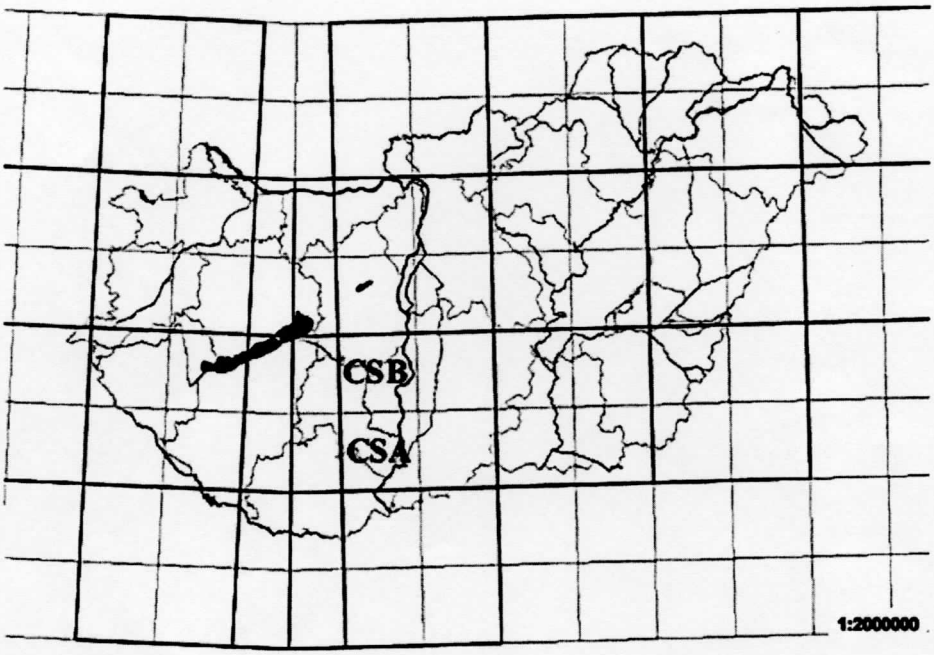

Figure 1. 50 km × 50 km UTM map of Hungary

Results and Discussion

Though historically *Astacus astacus* is the typical Decapoda species of the area, the investigation of the Danubian floodplain at Gemenc revealed the presence of *Orconectes limosus* there (PUKY, 2000b). The spread of the species along the Sió-canal, which connects the River Danube with Lake Balaton, was also recorded at Szekszárd in summer, 2003. As *A. astacus* is still common in neigbouring areas in the west in mountain streams (SALLAI & PUKY 1998) this faunal change is a cause of concern, but there is a lack of information to evaluate the ongoing processes. Further upstream, *O. limosus* is known to inhabit lowland

streams flowing into the Danube, but not mountain streams in the Danube Bend (1720–1658 rkm), so it is not clear what might act as barriers, if they exist at all under the given conditions for this disease-spreading alien species.

At present, altogether twelve amphibian species (*Triturus vulgaris, T. dobrogicus, Bombina bombina, Bufo bufo, B. viridis, Pelobates fuscus, Hyla arborea, Rana arvalis, R. dalmatina, R. lessonae, R. esculenta, R. ridibunda*) are known from the CSA square and ten (*T. dobrogicus, B. bombina, B. viridis, P. fuscus, H. arborea, R. arvalis, R. dalmatina, R. lessonae, R. esculenta, R. ridibunda* from CSB (Figure 1). In comparison with the appropriate numbers (one and two species, respectively) given by the European Atlas of Amphibians and Reptiles (GASC et al., 1997) it is a remarkable improvement. The previous lack or rather neglect of available information is especially surprising in the case of CSA, as it contains Gemenc, an inner delta of the Danube of 180 km^2 floodplain area, which has received international attention (see e.g. ZINKE, 1996) due to its conservation importance. This example stresses the importance of proper data collection and processing and also consultation with relevant local experts.

The three year national mapping project resulted in similar increases in reptiles in the region. Instead of three species in each square, the presence of eight in CSA (*E. orbicularis, Lacerta agilis, L. viridis, Anguis fragilis, N. natrix, N. tessellata, Coronella austriaca, Elaphe longissima*) and seven species in CSB (*E. orbicularis, L. agilis, L. viridis, N. natrix, N. tessellata, C. austriaca, Coluber caspius*) has been demonstrated.

The general knowledge about the distribution of the three groups along the Lower Hungarian Danube was similar at the end of the 1990s unrelated to what degree they are bound to lotic environments. However, due to the mapping of the herpetofauna in the 2001–03 period, much more information is available on amphibians and reptiles today. Though labour-intensive in the first step, when all major mapping units had to be visited and data collected, mapping could be made relatively fast and the processed information can be used effectively when setting up conservation priorities. It is a process which should be done continuously to record changes even after the baseline data base was set up but it needs less effort to keep it up-to-date after that phase. There are always new, surprising findings with conservation consequences, too, e.g. the finding of a third locality for *C. caspius* in Hungary by a university student in the CSB square as detailed by KORSÓS et al. (2002), but at least equally important is the overview these data provide on larger-scale processes.

Based on the experience from herpetofauna mapping in the Hungarian Lower Danube region and the more limited information available on Decapoda there, the launching of intensive mapping on different animal groups is proposed, as it is necessary to understand ongoing biological changes along the River Danube. Such mapping programmes at different scales can only be successful if they are made through international co-operation. An increase in the up-to-date information gained from this approach would be vital for conservation-minded decision

making and would also help to reach the conservation goal described by the Kiev Convention as to halt the loss of biodiversity in Europe by 2010.

Acknowledgements: This article could not be written without the determined help of many conservation volunteers, whose work is greatly acknowledged. I am also thankful to András Révész for making the base map of Figure 1. and to Dr. Julian Reynolds (Trinity College, Dublin) for his revision of the English text. Certain parts of the surveys were financed by the Hungarian Ministry for the Environment.

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