J. Breuste
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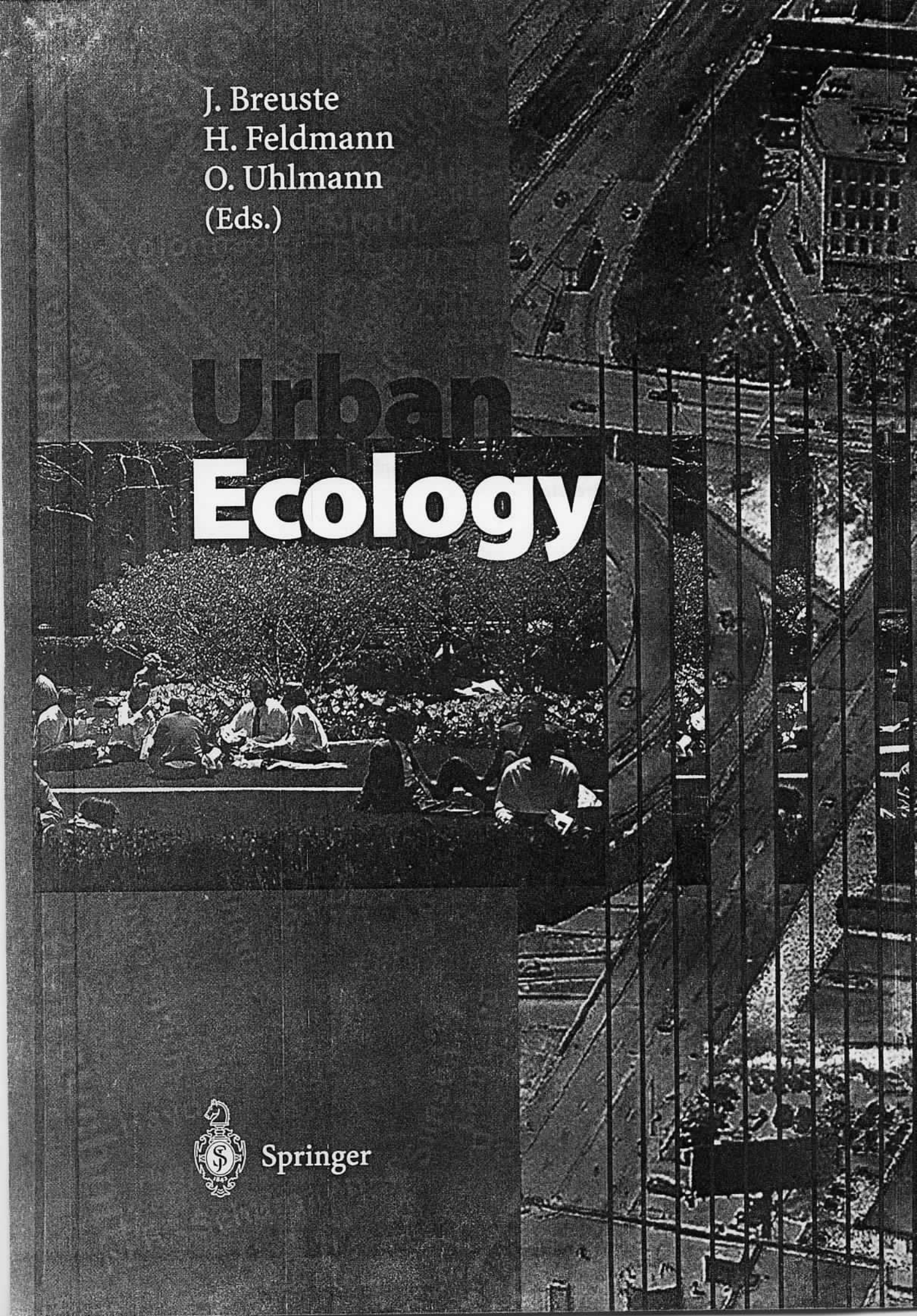
(Eds.)

Urban Ecology



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Effect of Urbanisation on Local Herpetofauna and its Possible Indicator Value, a Decade-Long Experience in Budapest

Miklós Puky

1 Introduction

Settlements have usually been built in areas where water was available in adequate quantities. As a consequence, they often include different water bodies and wetlands, which are, or have frequently been, valuable from a present nature conservation viewpoint, too. In spite of this the disappearance and isolation of these landscape elements is a common trend world-wide. Besides their obvious habitat function, they also serve as key areas in the maintenance of the corridor function of, for example, rivers flowing through cities. Settlements may bear conditions which can provide real (e.g. foraging) advantage (Ballasina 1984) attracting several species in different ways (Baker 1990).

The plant communities and birds of cities are usually quite well-known, while other groups are often neglected. In Hungary only limited information is available on amphibians (Puky, Kecskés 1991) though their bi-phasic life strategy, diverse ecological needs and relative abundance make them ideal organisms for the monitoring of environmental changes. The aim of this study was to investigate the herpetofauna of the Hungarian capital and to record its changes in the medium term.

2 Site and Methods

Budapest has 2.3 million inhabitants and covers 525.3 km^2. The altitude change is nearly 400 metres between the forest covered hills on the right bank and the lowland on the left side of the Danube. Diverse water bodies can be found within the border of the city. Mountain streams enter the Danube here (usually in a canalised form at their mouth) and the last remnants of the Danubian floodplain can also be found in low lying areas.

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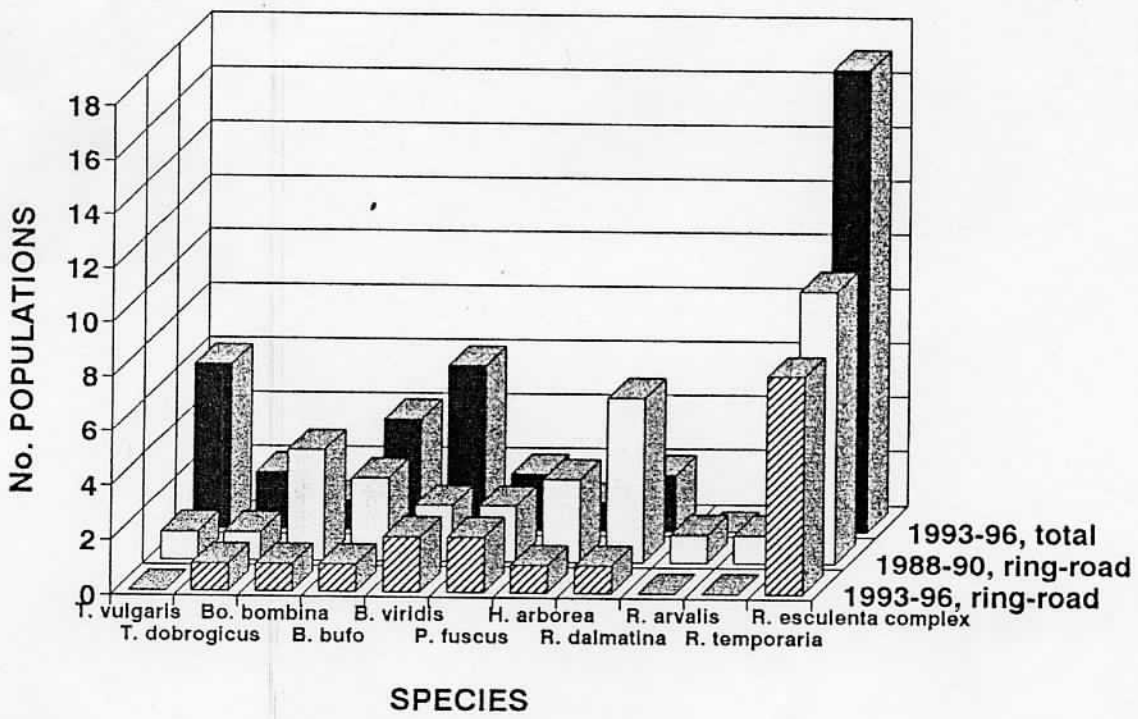

Fig. 1. "Occurrence of amphibian species in Budapest"

The building area of a 87 km ring-road was studied in 1988–90 and re-surveyed for four years between 1993–96 to detect changes due to construction works and natural causes. Amphibians were selected for biomonitoring of water bodies; the chemical composition of the water together with a number of other parameters were also recorded. In the second phase (1993–96) another 21 sites, including all typical water types in the city from lowland streams to forest ponds, were added to the original list to obtain an overview of their general status.

Habitats were visited several times a year under different conditions and in different seasons. Where it was possible the population characteristics of the amphibian communities (species, sex ratios, length-weight distribution) were also described in detail to gain a broad overview of the ongoing processes.

3
Results and Discussion

A relatively high species number, altogether 10 species and a species group (68.7% of the total amphibian fauna of Hungary) were found at the end of the 1980's; this is similar to the situation in other large cities (see Langton 1991, Nabrowsky 1987). Unlike the situation in London, for example, no introduced species were observed (Puky, Kecskés 1991). *Rana esculenta complex* was the

Table 1. Chemical characteristics of small water bodies in Budapest between 1993–96

Locality	Chemical Parameters						
	NO_3^- [mg/l]	SO_4^{2-} [mg/l]	PO_4^{3-} [mg/l]	Cu^+ [mg/l]	Fe^{2+} [mg/l]	Conductivity [mS/cm]	TDS [g/l]
Csepel island	–	33	0,20	0,01	0,07	3,81	1,90
Lake Balázs	0,40	>75	0,02	0,01	0,03	0,9	0,45
Lake Jászberényi	–	38	1,21	0,19	0,16	–	–
Lake Naplás inflow	0,10	>36	0,04	0,08	–	0,90	0,43
	3,50	27	0,75	–	–	–	
Lake Temetõ	3,33	>75	0,29	0,71	–	1,02	0,52
Ördögárok	1,50	>75	2,09	1,54	–	1,19	0,60
Törökbálint, fish pond	–	>1300	0,04	1,38	0,09	–	–
Danubian floodplain	–	36	0,38	0,04	0,13	–	–
Lake Kavicsos	2,10	>75	0,01	–	–	1,80	0,84
Szilas stream	8,20	>75	0,10	–	–	–	–
Lake Istenszeme	0,50	>75	0,21	–	–	1,06	0,53
Lake Libegõ	0,20	7	2,75!	–	–	2,06	1,04

commonest recorded taxon. The only lowland occurrence of *Rana temporaria* in the country was also detected during this survey (Stollmayerné et al. 1991). Several water bodies were inhabited by large and diverse communities (Fig. 1), others only by one or two species. By the mid-1990's two species disappeared and all but two (*Bufo viridis, Pelobates fuscus*) were present at fewer localities than before.

Amphibian decline is a well-known global phenomenon (Wake 1991), in this case the fast extinction rate was mainly in connection with a variety of human activities and drought. Isolation struck the investigated localities in two ways. Standing water bodies suffered the most from construction works. Running waters seemed to have barrier sections for some species. Pollution through dumping resulting in concentrations above the maximal acceptable limits was also shown to cause problems in the functioning of some aquatic systems (Table 1). Despite this, morphological deformities, which were reported in cases when urban pressure was high (Vershinin 1990), have not been recorded in Budapest so far. The most stable habitats were fish ponds, however, they did not contain the rarest species.

Urgent measures are needed to conserve the herpetofauna of the Hungarian capital. Besides regulations, a possible survival strategy has to include negotiations with the local councils and schools and the education of the residents on the value of their local waters in order to reverse some negative effects.

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