# Small mammal (Insectivora, Rodentia) and amphibian communities in the drainage area of Lake Balaton

By

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**Abstract.** The aim of the present study was to observe the structure of small mammal and amphibian communities in different habitats of the drainage area of Lake Balaton, to compile a species list and to describe the demographic parameters of Insectivora and Rodentia. Large areas were divided into smaller study areas, which differed from each other in vegetation and microclimatic conditions. In total, 336 small mammal specimens of 12 species were sampled. In the large investigated areas, the rate of the populations, the degree of diversity and the spatial dispersion of the different populations depend mainly on the vegetation and the humidity. Altogether eight amphibian species were listed. *Rana arvalis* was not recorded earlier in the 1996 survey. In spite of repeated efforts, *Triturus dobrogicus* could not be found. No considerable changes were recorded in the breeding pattern of *Rana dalmatina* along the Endrédi Stream.

Lake Balaton is one of the most popular turistic center of Hungary, there are still some natural and semi-natural places there. Natural value of these localities are very high, because a lot of rare, protected animals and plants confined to these habitats. Realize this fact, the goverment leads to organize at Balaton the youngest natural park in Hungary. The ecological conditions of these places can be protected or improved only by the investigation of them, by studying the animal and plant communities.

Though the fauna of the lake is extensively studied, our knowledge of the fauna, mainly the vertebrate one of the drainage area is very poor. Some protected and endangered species live here, like *Microtus oeconomus.*

The amphibian fauna of Lake Balaton and its surroundings has been studied by several authors (e.g. Fejérváryné, 1943; Ilosvay, 1985; Marián, 1988). A gradual decline, including the disappearance of populations were recorded, but no quantitative data were produced on its intensity in the individual populations. This would especially be important in the case of *T. dobrogicus,* which has a distribution greatly restricted to Hungarian lowlands (Griffiths, 1996).

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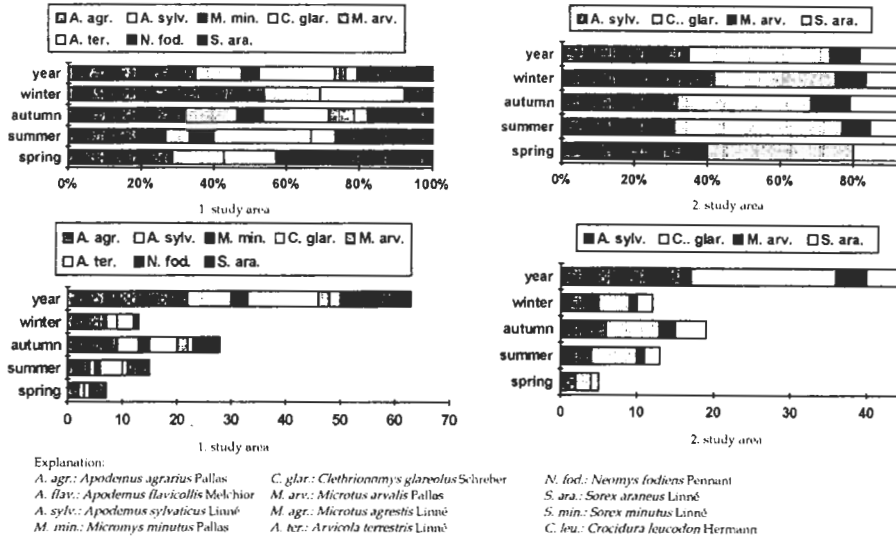


Fig. 1 a. Number of small mammal individuals and rate of the species in study areas 1-2

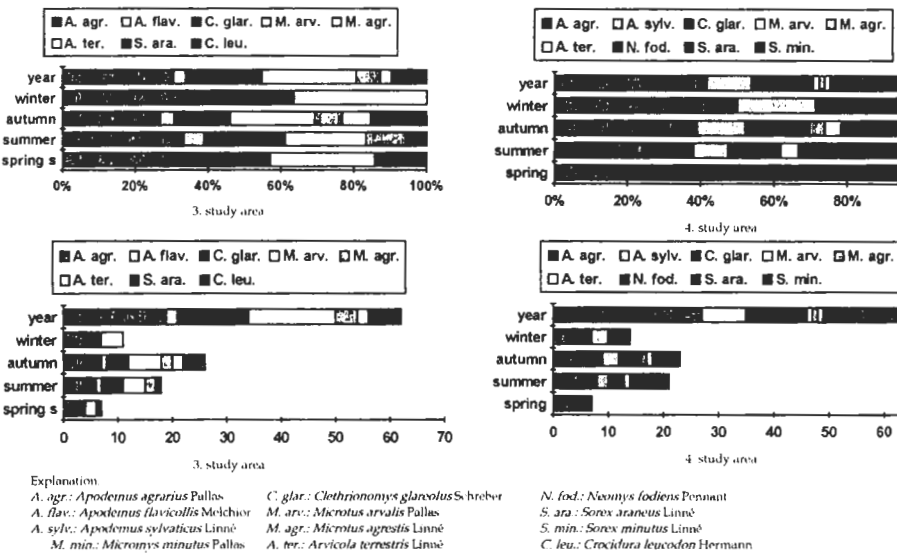


Fig. 1 b. Number of small mammal individuals and rate of the species in study areas 3-4

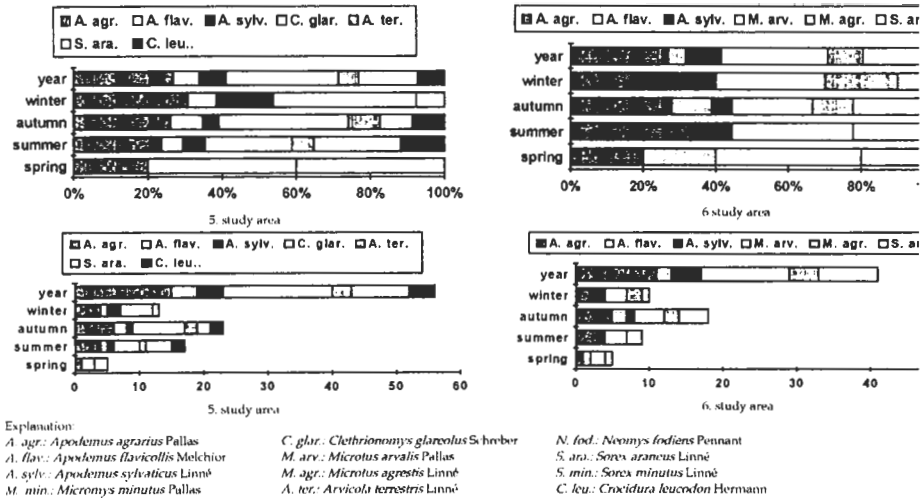


Fig. 1 c. Number of small mammal individuals and rate of the species in study areas 5-6

Investigation of small mammals and amphibians was carried out in mosaic-type places, where we hoped to found the most species. Large investigation areas were divided into smaller study areas; they differed from each other in vegetation and the degree of wetness.

It is well known, that the food preferences of small mammals depend on the species themselves and the food supply (Hjalten, 1996; Bellocq, 1994). Thus, the vegetation of the areas determine the communities of the animals.

The aim of the present study was to monitor the amphibian community along the upper reach of the Endrédi Stream and to compile a species list for the investigated localities with special emphasis on *T. dobrogicus*.

## Sampling sites and methods

We investigated small mammals in two large, mosaic-type areas in the north part of the lake. Each of them were divided into 3 smaller areas. We trapped the small mammals in the following quadrats:

I. Palóznak. - Area of large reeds, a patch of willow trees and a place with sedges and grasses, close to the coast of Lake Balaton. Every study area was in contact with the others. The size of the quadrats were 1.1 ha.

1. Area with reeds, bulrushes and sedges (Caricetum acutiformis-ripariae). - This area is moderately wet and never dry during summer. Dominant plant species are *Phragmites communis, Typha latifolia, Carex.*

2. Patch of willow trees (Salicetum albae-fragilis). - Some parts of this area are covered with water in spring, but it is only moderately wet in other seasons. There are some poplar (*Populus nigra*) and alder trees (*Alnus glutinosa*) among the willow trees and bushes. The grass level is very poor.

3. Area with sedges and grasses (Caricetum alatae). - This open area is usually moderately dry, it is covered with water in spring. Dominant members of the flora are *Carex, Agrostis alba, Calamagrostis neglecta, Poa.*

II. Area close to Szigliget. - Similar to the large investigation area I. It is a mosaic-type area also, but larger than the other one and it shows the certain degree of the degradation in some parts. It was divided into three smaller study areas, which were contact with each other.

4. Large reedy area, with sedges and bulrush (Caricetum acutiformis-ripariae). - This place is moderately wet and dry during a short time of summer. Dominant plant species are *Carex, Typha latifolia, Phragmites communis.*

5. A small forest of willow trees (Salicetum albae-fragilis). - This are is moderately dry, with the exception of spring, when it is wet. Besides of the willow trees (*Salix*), there are poplars (*Populus nigra*), birch trees (*Betula pendula*) and elders (*Sambucus*) in large number in this area. Different sedge species and blackberries are frequent, too.

6. Area with sedges and grasses (Caricetum alatae). - This area is moderately dry during most of the year, covered with water in spring and partly dry in summer. The vegetation were dominated by sedges (*Carex*), *Agrostis alba, Calamagrostis neglecta,* grasses (*Poa*). This open habitat is influenced by human activities, the most frequent weed is *Erygeron canadensis.*

The Endrédi Stream is dammed above Balatonendréd near the source creating a siltated pond. The water flows through a meadow before reaching the village. Upstream from the village two artificial ponds are in the floodplain near the stream. The stream bed has been deepened downstream from the village resulting in a canal-like appearance of the stream. Reservoirs were created in the mid-section of the stream surrounded by arable fields.

In addition, presence of amphibians was checked at the Kétöles- and Tetves Streams, too. The former is a northern inflow with a highly canalised lower section, the latter flows into Lake Balaton from the south, and is in connection with a sophisticated fish pond system. The Kócsi tó at Balatonalmádi, a previous *T. dobrogicus* locality was also sampled.

Data were collected from March, 1998 to November, 1998.

Studying the small mammal fauna we applied the Capture-Mark-Recapture method. We used live-traps to catch the animals. 49 traps were arranged into 7 rows. Every trapping covered a homogeneous habitat. The traps were baited with a piece of toast spiced with onion. Seeds of sunflower and corn were put into the trap to reduce the mortality. Trapped animals were narcotized by diethyl-ether during the treatment. Several parameters of animals, for example length of body, legs and tail, weight, state of sex etc. were recorded. Animals were marked by cut fingers method.

The amphibians of the sampling sites were investigated in different developmental stages. Visual encounter surveys, torching and netting were applied. During the breeding period, both egg clutches and adults were counted. Amphibians were identified according to Dely (1967), Arnold & Burton (1980) and Nöllert & Nöllert (1992). Green frogs (*Rana esculenta, Rana ridibunda, Rana lessonae*) were regarded and described as a „species group".

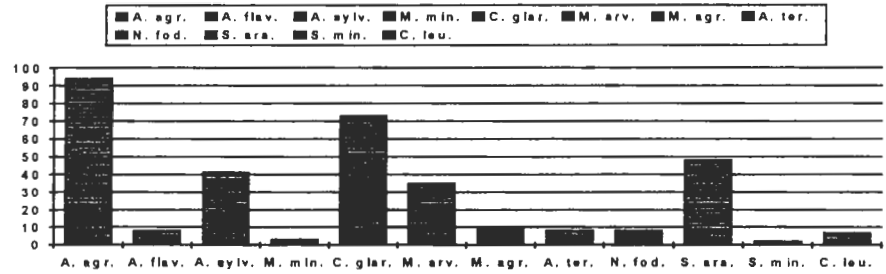


Fig. 2. Number of individuals in total study areas

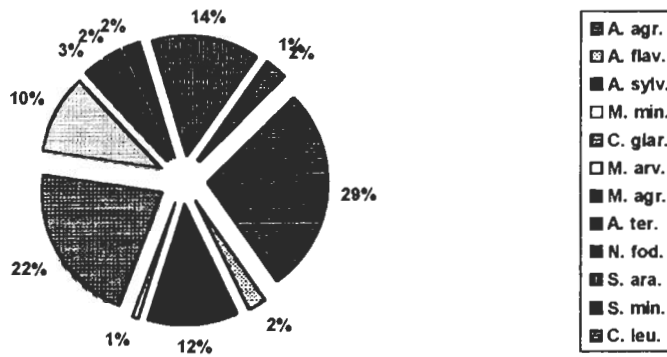


Fig. 3. Rate of individuals in total study areas

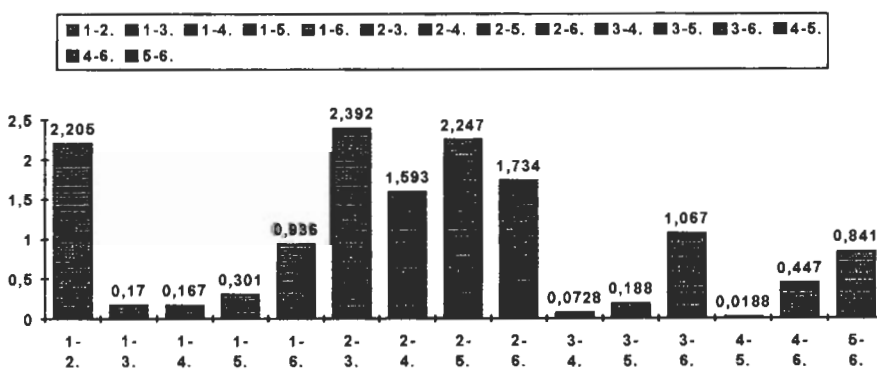


Fig. 4. Differences beetwen the study areas (t-value)

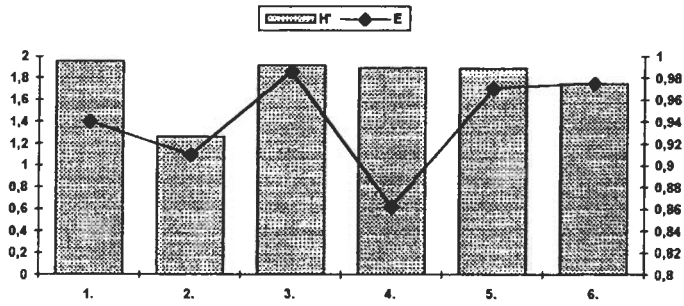


Fig. 5. Shannon-Wiener index and eveness

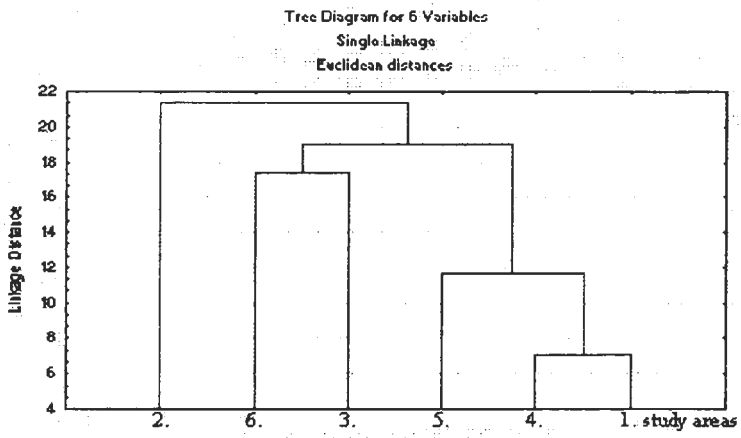


Fig. 6. Result of cluster analysis

## Results and discussion

Altogether, 336 specimens of 12 small mammal species were collected (Table 1). The dominant mouse, vole and srew species were *A. agrarius, C. glareolus* and *S. araneus,* respectively. Most of the specimens were found in autumn (Table 2). The greatest number of species and specimens was detected in the study area 4. The less number of species and the lowest rate of density were found in the areas (study area 2 and 6) most influenced by human. The similarity of the two large investigation areas correlates with the similarity of the small mammal communities of the areas.

The effect is similar of the lack of the grass and bush level (study area 2).

Small mammals prefer the boundaries of the differant habitats. We trapped the largest number of specimens in this type of localities, but we could not detect a high rate of migration. The rate of males and females of the abundant species proved to be roughly equal.

Data were used for cluster analysis (Fig. 6). Large reedy areas (study areas 1, 4) form a common group, and the open, grassy areas (study areas 3, 6) form an other group. The study areas 2 and 5 differ from the other ones. Finally, we conclude that the communities of the large, mosaic-type natural or semi-natural habitats are very similar in the drainage area of Lake Balaton. The human activities result changes in the structure of the small mammal communities.

Table 1 contains the list of amphibian species found at the sampling sites in 1996 and 1998. A new element is the presence of *Rana arvalis*. During the 1996 investigations and also in the previous decades, this frog has not been recorded from the Tetves Stream (pers. obs.), though it was thought to be present along the southern shore of Lake Balaton (Ilosvay, 1985). Three young adults were collected, which might indicate a possible colonisation.

The position of *R. dalmatina* egg clutches at Endrédi Stream can be seen in Fig. 8. The distribution pattern remained relatively constant during the years (Farkas & Puky, 1997) indicating only minor changes in the aquatic environment. The individual number of breeding females of *R. dalmatina* also remained relatively stable.

The search for *T. dobrogicus* proved to be unsuccessful even in areas, where it used to be abundant or breed (pers. obs., Marián, 1988). Its absence is probably due to various human activities (habitat loss, pollution, developed road system, illegal dumping). From a conservation viewpoint, as this species has been ranked internationally as vulnerable (Arntzen et al., 1997), it gives reason for growing concern.

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*Table 1. Presence of amphibian species at the sampling sites around Lake Balaton*

| Species | 1996 | 1998 |
|---|---|---|
| *Triturus vulgaris* Linné | + | + |
| *Bombina bombina* Linné | + | + |
| *Bufo bufo* Linné | + | + |
| *Hyla arborea* Linné | + | + |
| *Pelobates fuscus* Laurenti | + | + |
| *Rana dalmatina* Bonaparte | + | + |
| *Rana arvalis* Fejérváry | - | + |
| *Rana esculenta* complex Linné | + | + |


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