

COENOTIC RELATIONS OF SMALL MAMMALS ALONG THE RIVER TISZA

M. MIKES and VESNA HABIJAN—MIKES

Institute of Biology, Novi Sad; Institute of Nature Protection of Vojvodina, Novi Sad,
Yugoslavia

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Abstract

The research of coenotic relations of small mammals along the periodically inundated zone of the river Tisa was performed in four diverse habitats. By the method of capture-marked-recapture, in addition to the faunistic list, data on the spatial aspects of individuals and species, as well as on their day-night activities were obtained. The total of 231 animals belong to 5 genera and 7 species. It has been stated that each habitat has its particular faunistic composition, both in quantitative and qualitative respect. Namely, the greatest numerousness of small mammals has been stated in the forest community, *Clethrionomys glareolus* being the dominant one. *Adodemus agrarius* appears in the mesophyllic vegetation on the foot of the dam, while *Microtus agrarius* has been found in the meadow community of the dam. *Apodemus sylvaticus* and *Microtus arvalis* inhabit agrobiocoenoses.

Introduction

Although the Yugoslav section of the river Tisza cuts Vojvodina along the longer side, its fauna of vertebrates, with the exception of fish, has not been elaborated so far. Sporadic works on vertebrates touch other regions of Vojvodina. On the other part, the existing publications on birds and mammals do not represent detailed ecological studies, and they primarily have a faunistic character.

Works on small mammals have also, in the first place, a faunistic character and to a lesser degree an ecological one. MIRIĆ 1961 elaborated the fauna Chiroptera of the fortress of Petrovaradin. In 1975 he gave data on ermine, and in 1976 on the polecat of the steppe from the Pannonian recess. PETROV 1949, and HAM 1980, 1980/81 described the mammals the Deliblato Sand, and TVRTKOVIĆ and DŽUKIĆ 1979 the small mammals of Slano Kopovo. Autecological studies are the works of RUŽIĆ—PETROV 1950, 1979 on European souslik, MIKES 1966, 1971 on *Mus musculus hortulanus*, SAVIĆ 1973 on mole rat. The works of SAVIĆ and MIKES 1966, HABIJAN et al. 1982, MIKES et al. 1982 deal with the density and distribution of the mole rat population. RUŽIĆ 1978 described the diffusion area of the common hamster in Yugoslavia, and KRSMANOVIĆ 1984 its reproductive activity. SAVIĆ 1960 presented the expansion of the muskrat in Yugoslavia. MIKES 1958 and KRSMANOVIĆ 1979, 1980 elaborated the biology of the nutrition of some species of small mammals. The works of SAVIĆ et al. 1976 and MIKES et al., 1977 are studies on the populations of small mammals in the agrobiocoenoses of Vojvodina.

Some data on the wild cat and the small mammals of the river Tisza may be found

in the works of DIMITRIJEVIĆ and HABIJAN 1976, 1977, HABIJAN and DIMITRIJEVIĆ 1977, 1979 and MIKES *et al.* 1983.

It is quite understandable that many questions related to the investigations of the terriofauna of the river Tisza region has still to be answered, in particular, if we start from the results of the numerous investigations in the section of the river Tisza in Hungary, primarily from the ecofaunistic-terriologic aspect (CSIZMAZIA 1980).

Terriological investigations of the region of the river Tisza are of manifold importance as regards the research work on mammals in Vojvodina. Namely, on a relatively narrow area along the river Tisza one may find diverse habitats. The numerousness and the development of the populations of small mammals on these habitats and ecotones, beside biological factors, depends, in the first place, on drastic periodical changes of the physical conditions of habitats. The role of the small mammals on these habitats, in relation to the economical and sanitary importance of the mouselike rodents from the fields under crop, has primarily been manifested in community relations. Through nutrition chains the small mammals have been an important factor in the biology of the nutrition of carnivorous mammals and birds of prey.

Material and Methods

We investigated the small mammals of the periodically inundated territory of the river Tisza in the estuary region at the end of August 1983 (Fig. 2). The capture period lasted four days (25—28 August). It has been worked on four clearly separated habitats (Fig. 4), and that:

1 — in the forest community, about 100m wide, comprizing all typical components between the bank and the protective dam under this habitat (CSIZMAZIA 1980);

2 — on the narrow girdle of the mesophyll component of herbaceous plants on the ecotone alongside the foot of the dam;

3 — in the grass community under mowing on the protected zone out of the dam, and

4 — in agrobiocoenoses which extend immediately alongside the dam.

On the marked habitats the small mammals were captured by live traps of the longworth type the standard linear method being used, and the traps being placed at 10m distance each. The capture was checked every two hours, except from 9 a. m. to 5 p.m. in the daytime and from 9 p.m. to 3 a.m. at night. All together 231 animals were registered, belonging to 5 genera and 7 species (Tab. 1). After having been elaborated (determined according to the species and sex, body length and weight measured, marked) each captured animal was released at the place of capture. In this way, by applying capture and marking, not only the faunistic composition has been stated, but data on spatial aspects inside the habitat and data on day-night activity of the animals have also been obtained.

It should be mentioned that because of the application of this method data on the presence of other members of the terriofauna of the respective communities from the examined territory (Chiroptera, common mole, hedgehog, European polecat, wild cat, fox, wild boar, roe deer) have not been taken into consideration. The analysis of the presence and numerical relations of some of the mentioned mammals, first of all the Chiroptera, Insectivora and small Carnivora, would have presented a more integral picture of the cenotic relations of the given communities.

Results and Discussion

By applying the method of capture-marked-recapture in a four-day period it has been stated that the relatively high number of small mammals is due to rodents in 95,67% (Tab. 1). Among Insectivora the presence of the species *Sorex araneus* has been stated, and among Carnivora two protected species *Mustela nivalis* and *Mustela erminea* have been present. Mice and voles have been represented by two species each: *Apodemus agrarius* and *Apodemus sylvaticus*, respectively *Clethrionomys glareolus* and *Microtus arvalis*. Mice have been present in a greater number — 64,9%.

Tab. 1. The survey of captured animals per habitats

TISZA, 1983

HABITAT		A. agr.	A. syév.	C. glar.	M. arv.	S. aran.	M. niv.	M. erm.	Σ
SYLV.	I	31	29	36	2	6	1	1	106
GLAR.	II	36	8	1	28	-	-	-	73
	III	3	16	-	5	-	-	-	24
AGR.	IV	-	11	-	15	1	1	-	28
Σ		70	64	37	50	7	2	1	231

By the analysis of spatial aspects of the small mammals, the distribution of the dominant species of rodents, members of the communities on the examined habitats, has been stated. Namely, *Apodemus agrarius* lives at the brink of the forest and in the mesophyll community of the herbaceous plants on the ecotone alongside the dam. *Apodemus sylvaticus* is less numerous than the former species, but its presence is characteristic for all four habitats. It is the most numerous in the forest community (Tab. 1).

A similar relation has also been stated among the voles. While *Clethrionomys glareolus* is only a member of the forest community, *Microtus arvalis* lives not only in forest but on other habitats, too, although its presence is characteristic, in the first place, for the steppe-grass community (habitat II and IV, Fig. 3).

By further analysis of cenotic relations, a close connection between the small mammal species and the habitat which they live on has become obvious. Namely, while *Clethrionomys glareolus* appears with *Apodemus agrarius*, *Microtus arvalis* lives together with *Apodemus sylvaticus* in a community (Fig. 4).

Finally, these investigations have proved that the presence of the species *Clethrionomys glareolus*, stated for the first time when the biology of the nutrition of the wild cat from this region was being investigated (HABIJAN and DIMITRIJEVIĆ 1979), as well as by the occasion of control capture (MIKES *et al.* 1983), is not accidental. The presence or the absence of this palearctic species inside an ecological area entirely depends on the degree of drastic changes conditioned by the impact of antropogenous

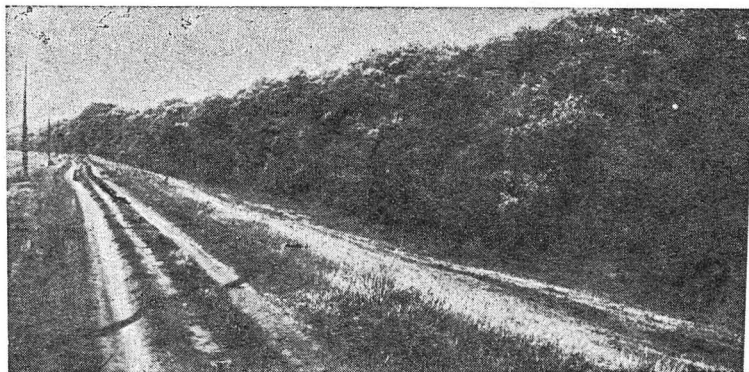


Fig. 1. The habitats alongside the river Tisza

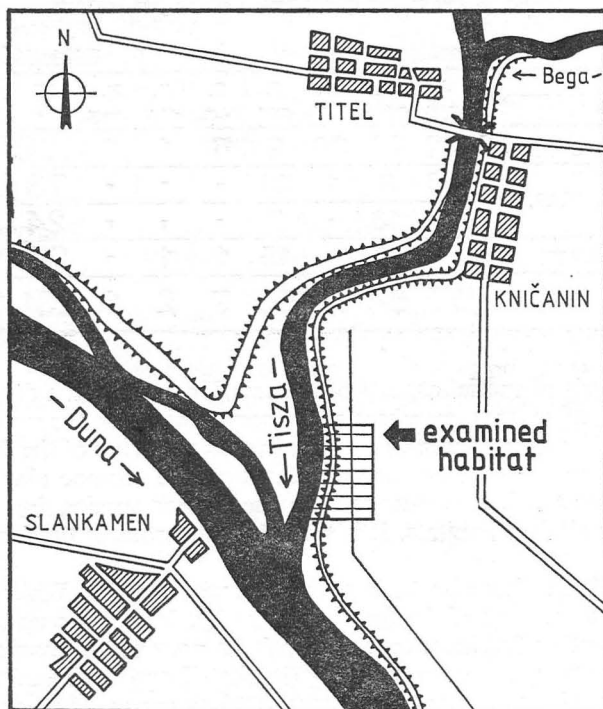


Fig. 2. The research territory at the estuary of the river Tisza

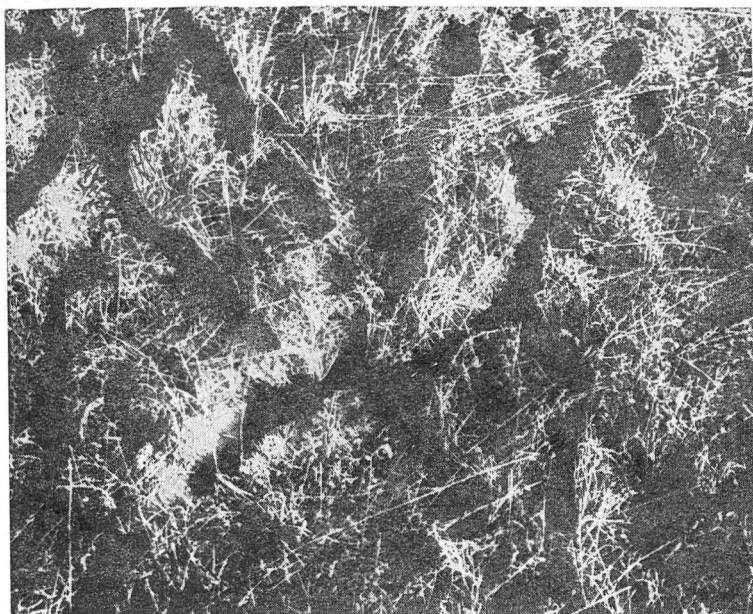


Fig. 3. The colony of *Microtus arvalis* on the dam

factors on the given habitat. Namely, although the examined territory along the river Tisza is not spacious, the structural organisation of the forest community provides for the presence and development of the populations of the species *Clethrionomys glareolus* on this habitat.

Having in mind that on a relatively narrow territory we can find diverse habitats, and that inside the same habitat diverse species may appear, the knowledge of spatial aspects of the small mammals and their activities in function of time is important not only in view of the species which have similar ecological niche but with regard to the other member of the communities too.

The time distribution of the small mammals on the examined habitats has been analysed on the basis of the daynight activities of the animals. The method of capture-marked-recapture has given the opportunity for the analysis of this time distribution. On the basis of the previously presented data we have analysed the time distribution of the animals on two characteristic habitats of the examined region of the river Tisza (habitat I and III, Fig. 4). On these habitats two dominant species of rodents live together: *Clethrionomys glareolus* with *Apodemus agrarius*, respectively *Microtus*

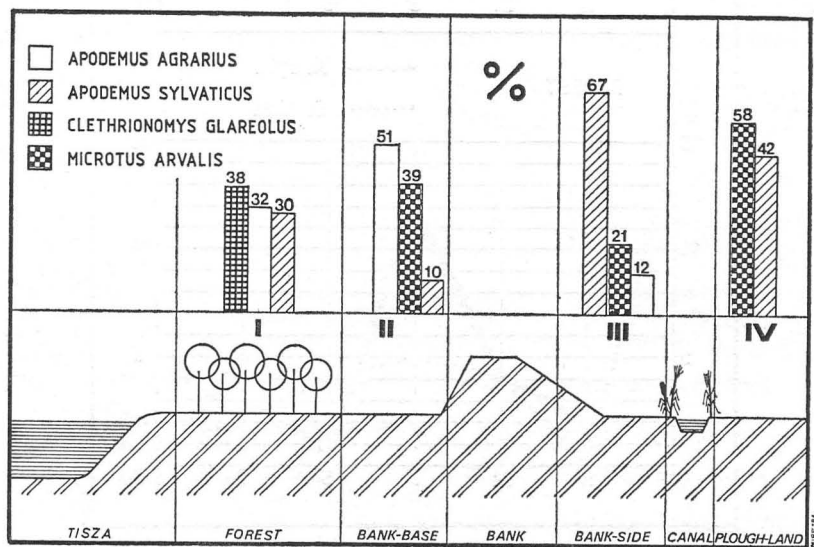


Fig. 4. The dispersion of rodents per habitats

arvalis with *Apodemus sylvaticus*. The time of the release of the animals has been taken as the indicator of the activity rhythm. The results of the time diffusion of the mentioned species in the habitat are presented on graphs (Fig. 5). The numerical values of the dominant species of rodents from the respective habitat are presented on the ordinate, while the activity rhythm in two-hour intervals is noted on the abscissa for the whole capture period.

The analysis of the obtained data clearly shows that in competitive relations the time diffusion of the voles living in the same habitat with mice comprises the morning and evening hours (*Clethrionomys glareolus* in the forest, *Microtus arvalis* in the grass communities), while the members of the genus *Apodemus* appear at typically night animals. The relations we stated are surely conditioned by the morphophy-

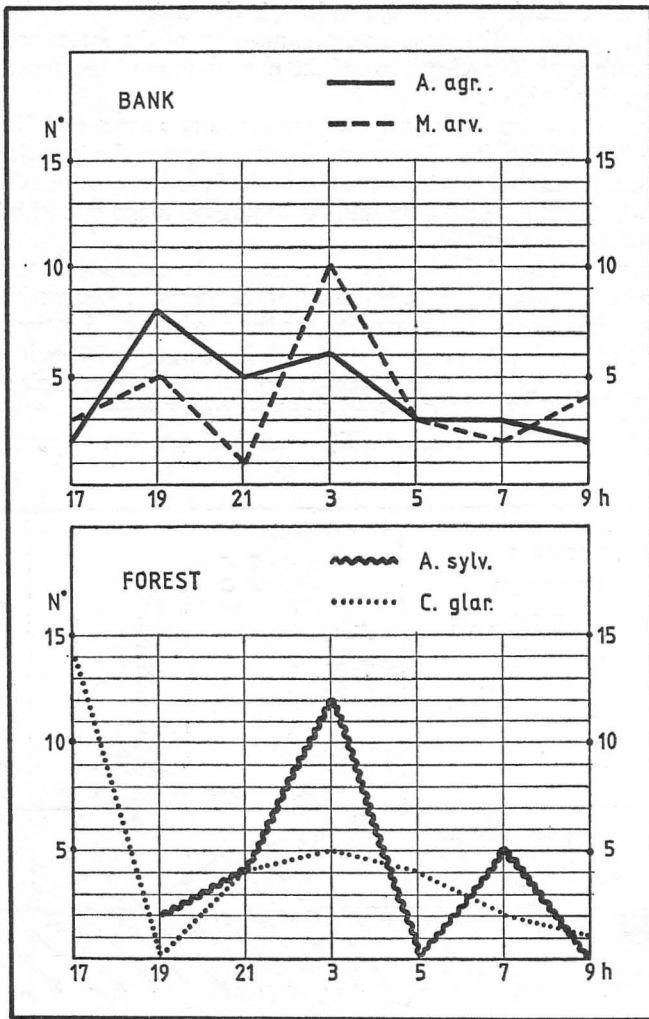


Fig. 5. The activity rhythm of the dominant rodent species

biological organization of the species which have similar ecological niches, first of all, in relation to the behaviour and the mode of nutrition. This statement entirely confirms the findings of TODORVIĆ *et al.* 1966, in relation to the species *Apodemus flavicollis* and *Clethrionomys glareolus*, the dominant rodent species of the forest community *Querceto-Carpinetum petree* in Fruška Gora. Namely, in our case, too it has been stated that the rhythm of the time activity of the two dominant rodent species entirely depends on the density of their populations, the members of the genus *Apodemus* retaining their stable rhythm of night activity and the voles changing it.

The quantitative and qualitative composition of the fauna of small mammals we have stated is the result of the optimal impacts of biotical and abiotical ecological factors in the autumn type of low water level on the examined habitats of the perio-

dically inundated zone (I and II habitat) and the protected zone (III and IV habitat, Fig. 4).

After having analysed the cenotic relations of the small mammals, we may suppose that, due to the regulatory interventions along the whole Yugoslav flow of the river Tisza, the typical habitats we have mentioned in this work appear alongside the river on a narrow territory. On the other hand due to the complex impact of microclimate factors some species of small mammals as well as certain communities have an island character conditioned by the mosaic distribution of their habitats. Having in mind that the small mammals are very plastic representatives of the terriofauna, we may conclude, on the basis of the results of our investigations, that they are very sensitive indicators of the state in some habitats or the changes of the life environment entirely.

References

- CSIZMAZIA, GY., (1980): A Tisza magyarországi hullámerén végzett mammológiai-ökofaunisztika vizsgálatok — I. Juhász Gy. TF Tud. Köz. 19—38.
- DIMITRIJEVIĆ, S., HABJAN, V. (1976): Analiza populacije divlje mačke (*Felis silvestris* SCHREBER 1777) sa područja Vojvodine. — Zbor. za prir. n. MS, 51, 107—113.
- DIMITRIJEVIĆ, S., HABJAN, V. (1977): Rasprostranjenje i brojnost divlje mačke *Felis silvestris* SCHR. 1777 u Vojvodini. — Arh. biol. n. 29, 175—178.
- HABJAN, V., DIMITRIJEVIĆ, S. (1977): Varijabilnost kranioloških obeležja populacije divlje mačke (*Felis silvestris* SCHREBER 1777) sa područja Vojvodine. — Zbor. za prir. n. MS, 52, 59—67.
- HABJAN, V., DIMITRIJEVIĆ S. (1979): Ishrana divlje mačke *Felis silvestris* SCHREBER 1777 u Vojvodini. — Zbor. II Kongr. ekol. Jug., 1447—1456.
- HABJAN, V., MIKES, M., SAVIĆ, I., MIKES, B. (1982): Gustina populacije vrste *Spalax leucodon* NORDM. 1840 (Rodentia) na Deliblatskom pesku. — VI Kongr. biol. Jug. A 3—37.
- HAM, I., TVRTKOVIĆ, N., KATARANOVSKI, D., SOLDATOVIĆ, B. (1980): Novi podaci o stepskom mišolikom skočimišu, *Sicista subtilis* PALL. 1773 (Rodentia, Mammalia) iz Deliblatske peščare. — IV simp. biosimst. Jug.
- HAM, I., DŽUKIĆ, G., TVRTKOVIĆ, N., KATARANOVSKI, D., MIKUSKA, J. (1980): Faunistička i ekološka gradnja za sisare, vodozemce i gmizavce Deliblatskog peska. — Prir. Vojv., God. 6—7, 29—41
- KRSMANOVIĆ, LJ. (1979): Ishrana vrste *Apdoemus flavicollis* (Rodentia, Mammalia). — Zb. II kongr. ekol. Jug. 1549—1564.
- KRSMANOVIĆ, LJ. (1979): Ishrana vrste *Clethrionomys glareolus* (microtinnæ, Rodentia). — MS., br. 56, 98—108.
- KRSMANOVIĆ, LJ. (1984): Dinamika reproduktivne aktivnosti hrčka (*Cricetus cricetus* L. Rodentia). Dokt. disetr., PMF., N. Sad.
- MIKES, M. (1958): Prilog poznavanju ishrane mišolikih glodara na kulturnim poljima i ledinama u okolini Sente. — Rad vojv. muz., sv. 7, 75—85.
- MIKES, M. (1966): O ektoparazitskoj fauni miča-humkaša (*Mus musculus hortulanus* NORDM.). — Arh. biol. n. 18, 3—4.
- MIKES, M. (1971): Ekološka proučavanja na mišu-humkašu (*Mus musculus hortulanus* NORDM.) u Vojvodini. — MS., sv. 40, 52—129.
- MIKES, M., TODOROVIĆ, M., SAVIĆ, I. (1977): Stanje teriofaune u ekosistemima Vojvodine. — Arh. biol. n. 29, 131—140.
- MIKES, M., HABJAN, V., SAVIĆ, I. (1982): Distribution and Dispersion of the species *Spalax leuħshdon* NORDM., 1840. Säuget. — Mitt. 30, 161—167.
- MIKES, M., HABJAN, V., DIMITRIJEVIĆ, S. (1983): Ecological aspects of the wild cat's (*Felis silvestris* SCHR., 1877) feeding behavior. — Tiscia (Szeged) 18, 146.
- MIRIĆ, DJ. (1961): Slepí miševi (Chiroptera) Petrovaradinske tvrđave. — Gl. prir. muz. B 16, 35—175.
- MIRIĆ, DJ. (1975): Hermelin (*Mustela erminea* L. 1758, Mammalia) na južnom obodu Panonskog basena. — (Gl. prir. muz. B 30, 81—101.
- MIRIĆ, DJ. (1976): Stepski tvor, *Mustela eversmanni* LESSON, 1827 (Mammalia, Carnivora) u jugoistočnom delu Panonskog basena. — Gl. prir. muz. B 31, 129—157.
- PETROV, B. (1949): Prilog poznavanju sisara Deliblatskog peska. — Gl. prir. muz. B 1—2.
- RUŽIĆ—PETROV, A. (1950): Prilog poznavanju ekologije tekunice *Citellus citellus* L. — Zb. rad. Inst. za ekol. i biog. 1, 97—140.

- RUŽIĆ, A. (1979): Smanjenje brojnosti populacija tekunice u periodu od 1947 do 1977. godine. — Ekol. Vol. 14, 185—194.
- RUŽIĆ, A. (1978): Rasprostranjenje i brojnost hrčka (*Circetus cricetus* L., Rodentia) u Jugosl. — Bios., Vol. 4, 203—208.
- SAVIĆ, I. (1960): Tok rasprostranjenja ondantre (*O. zibethica* L.) u Jugoslaviji. — Arh. biol. n. 12, 83—88.
- SAVIĆ, I., MIKES, M. (1966): Zur Kenntniss des 24-Stunden-Rhythmus von *Spalax leucodon* NORDM., 1840. — Zeit. f. Säugetk. 32, 233—238.
- SAVIĆ, I. (1973): Ekologija slepog kučeta (*Spalax leucodon* NORDM.) u Jugoslaviji. — MS. 44, 5—70
- SAVIĆ, I., TODOROVIĆ, M., MIKES, M. (1976): Terioločka istraživanja u stacionarima šumskih ekosistema i agrobiocenoza. — Ekol. V. 11, 167—179.
- TODOROVIĆ, M., SAVIĆ, I., MIKES, M. (1966): Ritam aktivnosti vrsta *Apodemus flavicollis* i *Clethrionomys glareolus* u odnosu na brojnost njihovih populacija. — Arh. biol. n. 18, 33—34.
- TODOROVIĆ, M., MIKES, M., SAVIĆ, I. (1968): Untersuchungen zum Aktionsraum der Gelbhalsmaus (*Apodemus flavicollis* MELCH, 1834). — Z. f. Säugetk. 33, 100—106.

A kisemlőfauna cönotikus viszonyai a Tisza árterületén

MIKES, M., HABIJAN—MIKES VESNA

Biológiai Intézet, Újvidék, Tartományi Természetvédelmi Hivatal, Újvidék

Kivonat

A Tisza árterületén jelentkező négy különböző élettéren vizsgáltuk a kisemlőfauna cönotikus viszonyait. A jelölés és újrafogás módszerét alkalmazva a faunalista mellett az egyedek és fajok térbeli megoszlását, valamint éjj-nappali aktivitását is figyelemmel kísérhettük. A 231 befogott egyed 5 nem és 7 faj képviselője. Megállapítást nyert, hogy az eltérő élőhelyek kisemlőfaunája úgy minőségi mint mennyiségi összetételében jellemző. Nevezetesen az erdőtársulás kisemlőfaunája a legnépesebb, a *Clethrionomys glareolus* dominációjával. A töltesláb lágyszárú mezofil vegetációját az *Aphodemus agrarius*, míg a gypszinti részt a *Microtus arvalis* népesíti be. A kultúrtáj szántóira az *Aphodemus sylvaticus* és a *Microtus arvalis* jelenléte jellemző.

Ценотические отношения в фауне мелких млекопитающих, обитающих в пойме Тисы

Микеш, М., Гавияи—Микеш Вешна

Институт Биологии, Новый Сад краевое управление охраны природы, Новый Сад

Резюме

Авторы исследовали ценотические отношения в фауне мелких млекопитающих, обитающих в четырёх разных биотопах поймы Тисы. Применяя методы мечения и нового отлова наряду с переписью фауны, мы могли наблюдать распределение по площади отдельных экземпляров и видов, а также их активность в ночное и дневное время. 231 отловленный экземпляр относится к 5 родам и 7 видам.

Было установлено, какая именно мелких млекопитающих характерна как количественно, так и качественно для различных биотопов. Например, фауна мелких млекопитающих в лесовой артели растений наиболее обширна, с преобладанием *Clethrionomys glareolus*. Мезофилльную вегетацию травянистых растений у подошвы насыпи населяют *Aphodemus agrarius* а в дерновом горизонте *Microtus arvalis*. Для агrobiocenoza характерно присутствие *Aphodemus sylvaticus* и *Microtus arvalis*.

Cenoticki odnosi sitnih sisara duz reke tise

MIKES, M., HABIJAN—MIKES VESNA

Institut za biologiju, Novi Sad Pokrajinski zavod za zaštitu prirode, Novi Sad

Abstrakt

Ispitivanja cenotičkih odnosa sitnih sisara duž plavne zone reke Tise vršena su na četiri različita biotopa. Metodom markiranja i ponovnog ulova dobijeni su, pored utvrđivanja faunističke liste, podaci o prostornim aspektima jedinki i vrsta, kao i o njihovoj niktohederalnoj aktivnosti. Ukupno ulovljenih 231 životinja pripadnici su 5 rodova sa 7 vrsta. Utvrđeno je da svaki ispitivani biotop ima specifični faunistički sastav, kako u kvantitativnom, tako i u kvalitativnom pogledu. Naime, najveća brojnost sitnih sisara konstatovana je u šumskoj zajednici, sa dominacijom *Clethrionomys glareolus*. U mezofilnoj vegetaciji u podnožju nasipa javlja se *Apodemus agrarius*, dok se u livadskoj zajednici samog nasipa susreće *Microtus arvalis*. Agrobiocenoze naseljavaju *Apodemus sylvaticus* i *Microtus arvalis*.