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CORRELATION BETWEEN DIET AND BREEDING OF *TYTO ALBA* (SCOPOLI, 1769) (AVES: TYTONIDAE)

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Abstract. The analyzed *Tyto alba* pellets from Craidolorț and Nadișu Hododului (Crișana Region) revealed a high diversity of its diet. There were identified skeletal remains from one bird specimen and 12 small mammal's species (5 insectivores and 7 rodents), insectivores being dominant. The specific structure of the diet illustrates both the structure of small mammals community in the two areas, revealing a low abundance of rodent populations (especially at Nadișu Hododului), and the breeding status of *Tyto alba* specimens.

Résumé. L'analyse des pelotes de *Tyto alba* de Craidolorț et de Nadișu Hododului (région de Crișana) a relevé une diversité élevée de sa diète. On a identifié une espèce d'oiseau et 12 de petits mammifères (5 insectivores et 7 rongeurs), les insectivores étant dominants en nombre d'individus. La structure spécifique de la diète reflète la structure des communautés de petits mammifères dans les deux régions, relevant le déclin numérique des populations de rongeurs (surtout à Nadișu Hododului), mais aussi le statut reproductif de *Tyto alba.*

Key words: Barn Owl, trophic niche, insectivores, rodents, breeding status, Crișana, Romania.

INTRODUCTION

The Barn Owl (*Tyto alba*) is a cosmopolite species. Due to its wide distribution range and high popularity the species was the subject of many studies carried out in different areas, thus its diet being well known. However, in Romania, only a few data were published, most of the studies on the trophic niche of owls dealing with *Asio otus,* one of the most common night prey birds in Romania. The first mention on *Tyto alba*'s diet belongs to Linția (1954). Later, some other studies were published by Kohl & Schmidt (1977) and Sándor & Sike (2003-2004).

STUDY AREA AND MATERIALS

The material used for this study was represented by two sets of pellets collected at the beginning of May 2004, from Nadișu Hododului and Craidolorț (Crișana) by Sike Tamás, the biologist from the Department of Natural Sciences of Satu Mare County Museum.

At Nadișu Hododului 50 old pellets were collected from the Reformat Church tower, used as resting place by one specimen. The locality is situated at 277 m altitude, in a hilly area of the upper sector of Crasna Valley, dominated by cultivated fields, with some afforested surfaces.

At Craidolorț from the Orthodox Church tower, 50 fresh pellets belonging to a *Tyto alba* pair were collected, before nesting. The locality is situated in the middle sector of Crasna Valley, at 120 m altitude, in an open area dominated by agricultural terrains.

Prey species were identified based on the skull remains, according to Pucek (1981), Murariu (2000) and Popescu & Murariu (2001). Mean body masses are considered according to Murariu (op. cit.), Popescu & Murariu (op. cit.) and original data.

The diet's quantitative structure was described in terms of relative abundance (ratio of individuals number) and relative dominance (mass ratio), in accordance with the measures used by Sîrbu & Benedek (2004).

The trophic dimensions of the ecological niches were studied by means of niche width and similarity, using different measures, namely Levins B and standardized Levins BA width measures, and the Pianka niche overlapping index, as they were used by Sîrbu & Benedek (op. cit.).

RESULTS AND DISCUSSIONS

Although the number of analyzed pellets was very low, the prey diversity was high. There were identified skeletal remains from one bird specimen (that could not be identified) at Craidolorț, and 12 small mammals species (5 insectivores and 7 rodents), presented below:

Ordo Insectivora Bowdich, 1821
Family Soricide Gray, 1821
1. Sorex araneus Linnaeus, 1758
2. Sorex minutus Linnaeus, 1766
3. Neomys fodiens (Pennant, 1771)
4. Crocidura leucodon (Hermann, 1780)
5. Crocidura suaveolens (Pallas, 1780)

Ordo Rodentia Bowdich, 1821
Family Arvicolidae Gray, 1821
6. Microtus arvalis (Pallas, 1778)
Family Muridae Gray, 1821
7. Micromys minutus (Pallas, 1771)
8. Apodemus agrarius (Pallas, 1771)
9. Apodemus sylvaticus (Linnaeus, 1758)
10. Apodemus uralensis (Pallas, 1811)
11. Rattus norvegicus (Berkenhout, 1769)
12. Mus musculus Linnaeus, 1766

Crocidura leucodon represented the dominant species in the owl's diet, with a quarter of the identified specimens, followed by *Microtus arvalis* (21.5%), considered as the main prey of this species (Bezzel, 1996) and of most owls. Among the other rodents, *M. musculus* (7.6%) and *A. uralensis* (6%) are more important. Higher abundances were recorded for the insectivore species: *S. araneus* (18.8%), *C. suaveolens* (11.8%) and *S. minutus* (5.8%). Considered together, the insectivores count more than 60% of the prey animals (Fig. 1).

Tyto alba exploits the same number of food resources (12) in Nadișu Hododului and Craidolorț. Among them, 10 were identified in both pellet sets, while *M. minutus* and *N. fodiens* were found only at Nadișu Hododului and *R. norvegicus* and the bird species only at Craidolorț, all these species being only accidentally prey

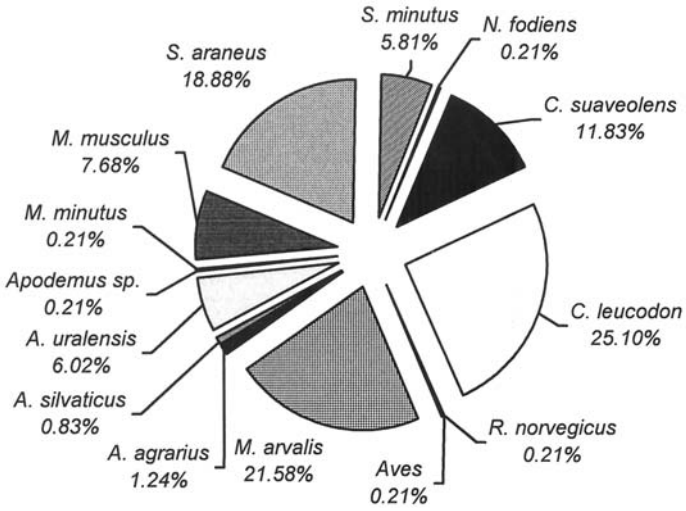

Fig. 1 – Relative abundance of prey species in *Tyto alba*'s diet.

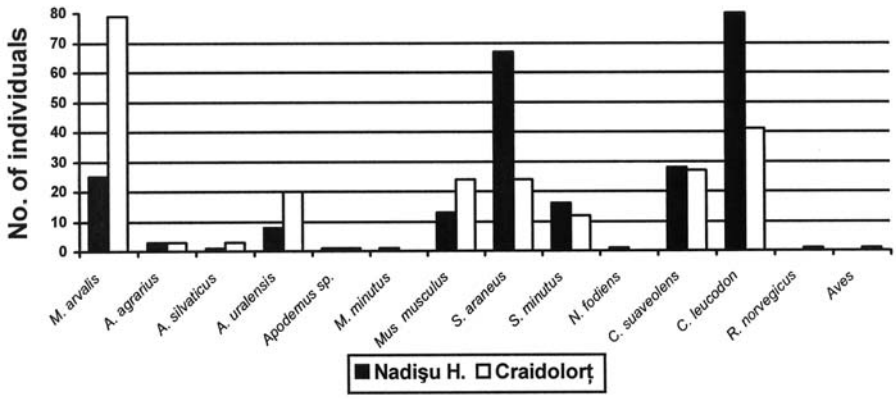

Fig. 2 – Trophic spectrum of *Tyto alba* at Nadişu Hododului and Craidolorţ, expressed as number of prey specimens.

items. However, there are significant quantitative differences between the diets in the two localities (Fig. 2).

The niche width indices record similar values in the two localities. At Craidolorţ the Levins niche breadth index is B = 5.172 and the standardized Levins index BA = 0.348, slightly higher than at Nadişu Hododului - B = 4.737 and BA = 0.311. The value calculated for the Pianka overlapping niche index is 0.712, indicating a relative high resemblance between the two localities, especially from qualitative point of view, due to the high number of common resources. Considering the two pellets sets together, the calculated values are slightly higher than for each

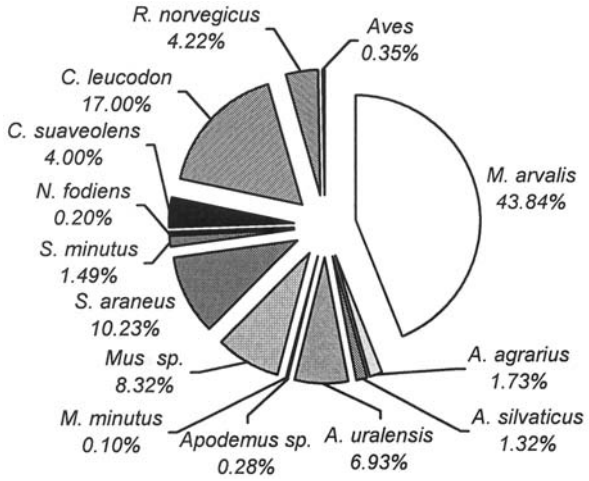

Fig. 3 – Relative dominance of prey species in *Tyto alba*'s diet.

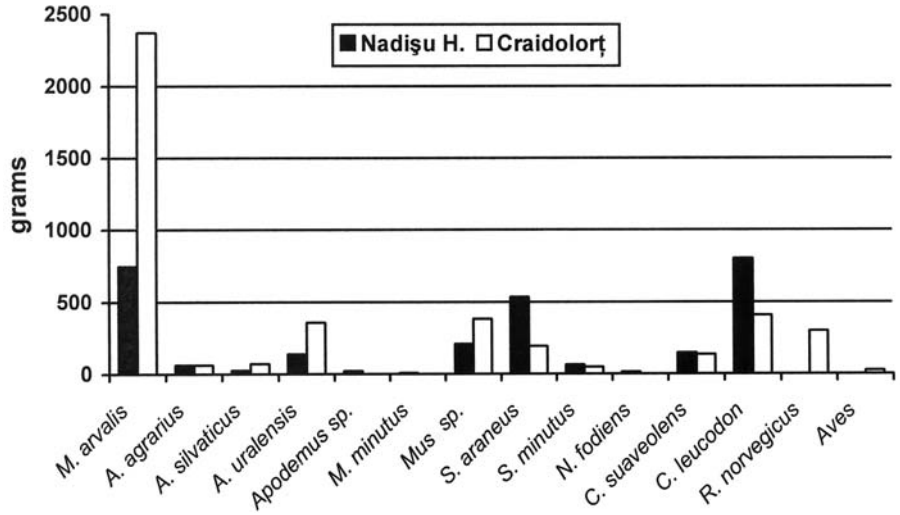

Fig. 4 - Trophic spectrum of *Tyto alba* at Nadişu Hododului and Craidolorţ, expressed as prey biomass.

locality: B = 5.772 and BA = 0.398, due to both the higher number of prey species and their percentage balancing.

The number of prey specimens per pellet is similar in the two localities, varying between two and 11 (Fig. 5). Considering the biomass, the minimum value per pellet is similar in the two sets (20 grams), but the maximum value is 116 grams at Nadişu Hododului, while it reaches 187 grams at Craidolorţ (Fig. 6).

The mean values per pellet of prey specimens' number in the two localities are only slightly different. A Barn Owl eliminates on average two pellets a day, thus

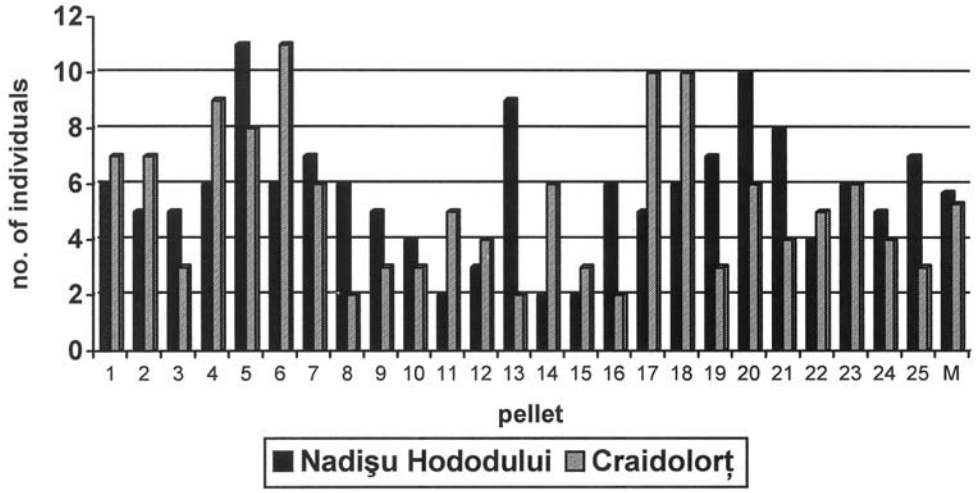

Fig. 5 - The distribution of prey specimens in the pellets from Nadișu Hododului and Craidolorț.

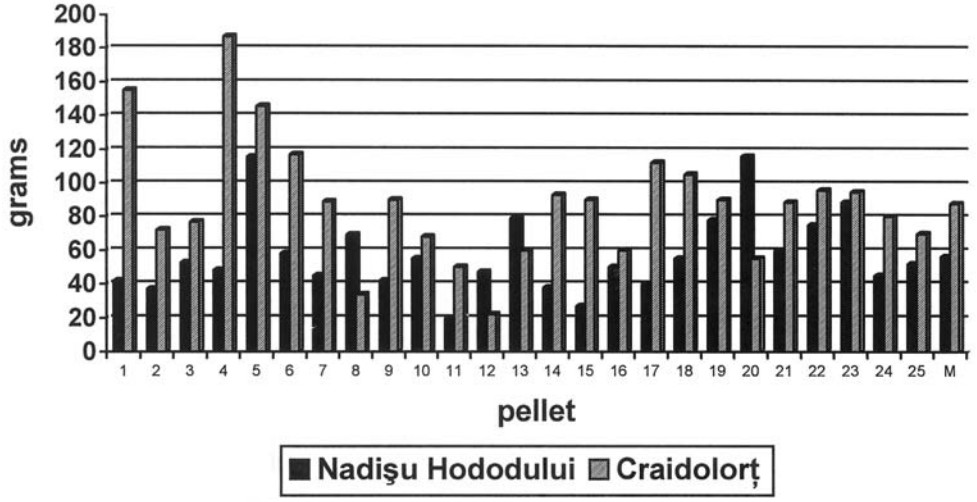

Fig. 6 - The distribution of prey biomass in the pellets from Nadișu Hododului and Craidolorț.

we can conclude that in both localities the birds consumed 11 prey specimens per day (slightly more at Nadișu Hododului). But due to the small mammals' community's structure, the biomass ratios in the two localities are different: at Nadișu Hododului the mean value is only 56.5 g per pellet (that means a daily average of 113 g); while at Craidolorț it is of 88 g (a daily ration of 176 g).

At Craidolorț the diet of *Tyto alba* is similar to the trophic spectrum presented in other studies from Europe: Satu Mare - Romania (Sándor & Sike, 2003-2004), Broye Plain - Switzerland (Roulin, 1996) and even the British Isles (Glue, 1974;

Love et al., 2000), if we consider that here *M. arvalis* is replaced by *M. agrestis* and the *Crocidura* species are lacking, the only non-aquatic shrews inhabiting the Isles being *S. araneus* and *S. minutus*.

The peculiar diet structure of *T. alba* from Nadişu Hododului locality (clearly dominated by insectivores) is probably due to both the numerical decline of the *M. arvalis* (and probably also other rodents) population and the high density of insectivore populations, as other reserve prey items (birds, reptiles, insects) are lacking.

Among the insectivores, *C. leucodon* and *S. araneus* are more abundant, the larger species from the *Crocidura* and *Sorex* genera. Moreover, the abundance of insectivore species in the diet decreases along with their body mass (except for *N. fodiens*, an aquatic species identified only at Nadişu Hododului, one specimen), in both localities. According to Emlen's hypothesis (1966) cited by Bellocq (1998) predators will feed selectively when food is abundant. Besides, Bellocq (idem) notes that breeding Barn Owls selectively fed on large rodents (within the species). In our case, at Craidolorţ, the population density of *M. arvalis* was probably high enough to allow its selective predation, being the main prey. At Nadişu Hododului however, the selective predation was on the insectivores (not within the species as Bellocq notes, but among species), being chosen those species with larger body mass. This indicates a high density of all the four shrew species, in both localities.

The mean values per pellet of prey specimens' number and biomass show that the feeding effort is similar in both localities (on average 11 preys per day), but the obtained energy is much lower (with aprox. 50%) at Nadişu Hododului. This fact is reflected also in the breeding status of the birds. At Craidolorţ the pellets come from a breeding pair, while at Nadişu Hododului they were produced by an individual that did not reproduce.

The amount of food required by chicks to attain a relatively stable body mass of 450 to 500 g in 30 to 35 days (Bellocq & Kravetz 1993, ap. Bellocq, 1998), and the energetic demands of breeding adults, are higher than the energy required to simply maintain body condition under usual environmental conditions. Thus, given the same abundance of small mammals prey consumption by owls is higher during the breeding season. If the required food quantity is not available, owls do not reproduce, which was the case at Nadişu Hododului. These results are in accordance with those obtained during a 14 year study in Thuringia, on the breeding of *Tyto alba* (Bezzel, 1996). This research revealed that during the years of *M. arvalis* numerical decline, up to 60% of the Barn Owl adults do not breed and the chicks' mortality can reach 100%.

Conclusions

The analyzed *Tyto alba* pellets from Craidolorţ and Nadişu Hododului (Crişana Region) revealed a high diversity of the prey. There were identified skeletal remains from one bird specimen and 12 small mammal species (5 insectivores and 7 rodents). The specific structure of the diet was characterized by the high abundance of insectivores. This was especially obvious at Nadişu Hododului, where they were clearly dominant, probably due to both the numerical decline of the *M. arvalis* population and the high density of insectivores. As body mass of insectivores is lower than of rodents, the same hunting effort in the two localities resulted in a reduced input of energy for the individual from Nadişu Hododului compared to those from Craidolorţ, causing their different breeding status (breeding pair at Craidolorţ and non-breeding specimen at Nadişu).

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CORELAȚIA ÎNTRE DIETĂ ȘI REPRODUCERE LA *TYTO ALBA* (SCOPOLI, 1769) (AVES: TYTONIDAE)

REZUMAT

Analiza ingluviilor de *Tyto alba* colectate de la Craidolorț și Nadișu Hododului (Crișana) a relevat o diversitate ridicată a dietei acestei specii, fiind identificate în total o specie de pasăre și 12 de mamifere mici (5 insectivore și 7 rozătoare), dominante fiind insectivorele. Structura specifică a hranei ilustrează pe de o parte structura comunităților de mamifere mici din cele două zone, relevând o abundență scăzută a rozătoarelor, mai ales la Nadișu Hododului, iar pe de altă parte, statutul reproductiv al indivizilor de *Tyto alba*.

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