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Numerical comparison of *Vespertilionidae* and *Rhinolophidae (Chiroptera: Mammalia)* in the owl pellets

(Pp. 133—140)

Ilościowe porównanie *Vespertilionidae* i *Rhinolophidae (Chiroptera: Mammalia)* w zrzutkach sów

Количественное сравнение *Vespertilionidae* и *Rhinolophidae (Chiroptera: Mammalia)* в погадках сов

Abstract: The present study is based totally on the literature. It covers the part of Europe within the range of *Rhinolophidae*. Among 707 bats consumed by the owls 692 were *Vespertilionidae* and only 15 belonged to *Rhinolophidae*. The cause for such a great disproportion may be the much faster escape reaction in *Rhinolophidae*, their echolocation, which reaches several times as far as that of *Vespertilionidae*, and the fact that their smell may be repellent to the owls.

I. INTRODUCTION

The study of both the books by UTTENDÖRFER (1939, 1952) reveals the absence of *Rhinolophidae* in the owl pellets. Indeed, the area under investigation lies only partly in the geographical range of that family. However, their complete absence in the pellets is striking because these species have a more open way of life (considering retreats) and their flight speed is much lower than that of *Vespertilionidae*. So it could be expected that they would be more easily caught by the owls. However, the opposite is the case. The above disproportion prompted me to do this investigation.

I wish to thank Dr G. TOPAL (Budapest, Hungary) for translating the Hungarian texts into English, and for expressing his opinion about the problem.

II. MATERIAL AND METHOD

Results are based totally on literature in the European geographical range of *Rhinolophidae*. I have changed the original notation "*M. mystacinus*" to "*M. mystacinus* or *M. brandtii*". The notation "*P. auritus*" as used in the papers published before the year 1961 has been changed to "*Plecotus* sp.".

III. RESULTS

ABELENTSEV, PIDOPLICHKO & POPOV (1956): 3 *Rhinolophus ferrumequinum* (*Asio otus*), 1 *R. hipposideros* (*Bubo bubo*), 57 *Myotis myotis*, 42 *M. blythi*, 1 *M. nattereri*, 5 *Miniopterus schreibersi*, 7 *Plecotus* sp., 23 *Nyctalus noctula*, 5 *Pipistrellus pipistrellus*, 10 *P. nathusii*, 11 *Eptesicus serotinus* (*Tyto alba*).

ALTUM (1863): 4 *Plecotus* sp., 1 *E. serotinus*, 11 *P. pipistrellus* (*Tyto alba*).

BALAT (1956): 4 *M. myotis*, 1 *Myotis* sp. (*Tyto alba*).

BAUER (1956): 49 *M. myotis*, 2 *M. blythi*, 1 *M. schreibersi* (*Tyto alba*).

BAUER (1960): 9 *Vespertilio murinus*, 4 *E. serotinus*, 1 *P. nathusii*, 1 *Nyctalus leisleri*, 2 *N. noctula* (*Tyto alba*) (?).

BOVET (1963): 2 *M. myotis* (*Tyto alba*).

FESTETICS (1959): 1 *N. leisleri* (*Tyto alba*).

GUERIN (1928): 10 *N. noctula* (*Tyto alba*).

JÄCKEL (1866, 1867, 1871): 2 *Plecotus* sp., 5 *N. noctula*, 1 *P. pipistrellus*, 1 *E. serotinus*, 4 *M. myotis* (*Tyto alba*).

KAHMANN & BROTZLER (1956): 1 *R. ferrumequinum*, 2 *R. hipposideros*, 37 *M. myotis*, 1 *Barbastella barbastella*, 1 *Plecotus* sp., 14 *Pipistrellus kuhli*, 1 *P. pipistrellus* (*Tyto alba*).

KINSKY (1942): 1 *M. myotis*, 1 *Myotis* sp. (*Tyto alba*).

KÖNIG (1961): 2 *Myotis emarginatus*, 5 *P. nathusii*, 1 *P. auritus*, 5 *M. blythi* (*Tyto alba*).

KÖVES & SCHMIDT (1964): 1 *P. austriacus* (*Athene noctua*), 1 *E. serotinus* (*Tyto alba*).

KULCZYCKI (1964): 13 *M. myotis*, 1 *M. mystacinus* or *M. brandtii*, 1 *P. pipistrellus* (*Tyto alba*); 2 *R. hipposideros*, 7 *M. myotis*, 1 *V. murinus* (*Strix aluco*), 1 *M. myotis* (*Athene noctua*).

LINTIA (1954): 2 *N. noctula* (*Athene noctua*).

MÄRZ (1954): 1 *M. myotis*, 1 *M. nattereri*, 1 *Myotis daubentoni* (*Strix aluco*).

NADAL & PALAUS (1967): 2 *Rhinolophus* sp. (*Tyto alba*).

NIETHAMMER (1962): 3 *R. ferrumequinum*, 1 *M. mystacinus* or *brandtii*, 1 *M. nattereri* or *emarginatus*, 3 *M. blythi*, 2 *M. myotis*, 1 *E. serotinus*, 1 *M. schreibersi* (*Tyto alba*).

RYBAR (1969): 2 *Myotis* sp., 1 *V. murinus* (*Tyto alba*).

SCHMIDT (1962—3): 1 *P. pipistrellus* (*Tyto alba*).

Schmidt (1966—7): 1 *M. emarginatus*, 1 *M. myotis*, 6 *M. blythi*, 4 *P. austriacus*, 1 *P. nathusii*, 6 *E. serotinus* (*Tyto alba*).

Schmidt & Topal (1971—2): 1 *M. emarginatus*, 31 *E. serotinus*, 10 *P. austriacus*, 9 *M. myotis*, 18 *M. blythi*, 2 *V. murinus*, 19 *N. noctula*, 1 *N. leisleri*, 2 *P. pipistrellus*, 3 *P. nathusii* (*Tyto alba*), 3 *M. bechsteini*, 1 *M. nattereri*, 2 *M. blythi*, 1 *M. myotis* (*Strix aluco*), 2 *P. austriacus* (*Asio otus*).

Schober (1960): 1 *E. serotinus* (*Tyto alba*).

Skuratowicz & Warchalewski (1954): 1 *R. hipposideros*, 1 *Plecotus* sp., 1 *V. murinus*, 1 *Eptesicus nilssoni*, 1 *P. pipistrellus*, 4 *M. myotis*. (Owl species unknown).

Steinfatt & Uttendörfer (1940): 9 *M. myotis*, 2 *M. nattereri*, 1 *Plecotus* sp., 1 *M. bechsteini*, 1 *B. barbastella* (*Tyto alba*).

Tatarinov (1960): 2 *M. schreibersi* (*Tyto alba*).

Uttendörfer (1939): 1 *M. myotis*, 1 *M. mystacinus* or *brandtii* (*Asio otus*); 4 *Plecotus* sp., 3 *Myotis myotis*, 2 *P. pipistrellus*, 1 *M. nattereri* (*Strix aluco*); 7 *M. myotis*, 5 *E. serotinus*, 3 *P. pipistrellus*, 1 *V. murinus*, 1 *M. mystacinus* or *brandtii* (*Tyto alba*).

Uttendörfer (1952): 3 *M. blythi* (*Bubo bubo*), 1 *Plecotus* sp., 2 *M. myotis*, 1 *M. mystacinus* or *brandtii* (*Strix aluco*), 8 *Plecotus* sp., 6 *E. serotinus*, 12 *P. pipistrellus*, 70 *M. myotis*, 5 *N. noctula*, 2 *M. bechsteini*, 1 *B. barbastella*, 1 *M. nattereri*, 1 *V. murinus*, 4 *M. blythi* (*Tyto alba*).

Vries (1960): 5 *Myotis dasycneme*, 2 *M. myotis* (*Tyto alba*).

The numbers of the bats eaten are as follows:

M. myotis	287	specimens
M. blythi	85	„
E. serotinus	68	„
N. noctula	66	„
P. pipistrellus	40	„
Plecotus sp.	29	„
P. nathusii	20	„
P. austriacus	17	„
V. murinus	16	„
P. kuhli	14	„
M. schreibersi	9	„
M. nattereri	7	„
R. ferrumequinum	7	„
R. hipposideros	6	„
M. bechsteini	6	„
M. mystacinus + *M. brandtii*	5	„
M. dasycneme	5	„
Myotis sp.	4	„
M. emarginatus	4	„
N. leisleri	3	„
B. barbastella	3	„

Rhinolophus sp.	2	„
P. auritus	1	„
M. nattereri or *M. emarginatus*	1	„
M. daubentoni	1	„
E. nilssoni	1	„
sum total:	707	„

From the above table it may be concluded that 692 bats belong to *Vespertilionidae* and only 15 to *Rhinolophidae*.

IV. DISCUSSION

The present paper depends on the analysis of the owl pellets as made chiefly by the Germans, Ukrainians, and Hungarians. It is a pity that the Mediterranean nations show little interest in this subject although that area is of special value for such investigations. For example, I have never come across any paper on this subject made by the Italians. This definitely affects the results of the present paper.

From the preceding table it is seen that in the family of *Vespertilionidae* the most common species appear in the pellets more frequently than the less common ones do. *M. myotis*, perhaps the most common European bat, amounts to 40·7% of all the bats eaten that total to ca. 23 species. It is difficult to ascertain whether fast and/or maneuverable flight helps to avoid being caught by the owls. If it is true, then the fact that owls also catch resting bats or that they surely make prey on sick individuals tends to obscure the picture. Moreover, the easier escape from being caught due to speed of flight may be "compensated" for by the great numbers of the given species, *e. g. N. noctula*. Whereas another species which is also a strong flier and at the same time exists in great numbers — *M. schreibersi* (though appearing in a lesser range in the areas concerned) have been found to occur in owl pellets several times more rarely than *N. noctula*, an explanation may be that their flight is not only fast but also more maneuverable, which can help them more than mere speed in escaping from owls. As is known *N. noctula* flies in straight lines, and the speeds of flight of both these species are practically the same (KOLB 1955, CONSTANT and CANNONGE 1957). The efficiency with which different vespertilionids escape from being caught by man is of varying degree. For example, *E. serotinus* are in this respect decidedly slower and clumsier as compared to *M. dasycneme* (KRZANOWSKI 1956). KUZYAKIN (1950) described the lightning speed of movements of *P. kuhli*. These facts certainly bear upon the frequency with which the different species are caught by owls.

Only *R. ferrumequinum*, *R. hipposideros*, *M. mystacinus*+*M. brandtii*, *M. myotis*, *P. pipistrellus*, *E. serotinus*, *P. austriacus* and *P. auritus* appear in most of the area under investigation in this paper. The smallest range is that

of *R. blasii*, *R. mehelyi*, *M. capaccinii*, *M. dasycneme*, *E. nilssoni*, *N. lasiopterus* and *N. leisleri* (BRINK 1967). Limited range may be the reason for rarer appearance of bats in the pellets. If some species appears mainly in the countries where the investigations of the owl pellets have been neglected, then the result may be a total absence in the pellets (*M. capaccinii*, *P. savii*). The appearance of *M. daubentoni* only once may be considered as accidental because in the results of UTTENDÖRFER they are found more frequently but outside the range of *Rhinolophidae*. Similarly, JASKOWSKI (1956) who collected the owl pellets in the analogous zone, found 26 specimens of this species during a single year from only one pair of *Strix aluco*.

Let's deal with the main problem of the present paper, *i. e.* the numerical ratio of *Rhinolophidae* and *Vespertilionidae* in the owl pellets. The number of vespertilionid species in the part of Europe under consideration is taken as 24, *i. e.* ommitting *Myotis ikonnikovi* (HANAK 1965) and *Eptesicus sodalis* (HANAK and GAISLER 1971). Besides, for the closer investigation *Myotis przewalski* is ommitted (KRAUS and GAUCKLER 1972).

Attention is attracted by the great numerical disproportion between *Rhinolophidae* and *Vespertilionidae* eaten by the owls. However, it should not be forgotten that only 5 species of the first family appear in the area under consideration whereas the second family appears in 24 species, *i. e.* 4·8 times as many as the first one. If it is assumed that populations of all the species concerned are equally numerous and that every species is equally susceptible to be caught by the owls, then it should be considered that for every one rhinolophid caught there will be 4·8 vespertilionids. However, dividing the number 692 as found belonging to that family by the number 15 as found for rhinolophids, we get 46·1 which means that for every one rhinolophid caught we will have as many as 46·1 vespertilionids. That is 9·6 times more (46·1 : 4·8) then expected from the above assumption. Indeed, it is obvious that such an assumption has been greatly oversimplified. On the other hand, it is felt that such a great disproportion is not due only to this false assumption. There must some other factor playing a major role. KAHMANN and BROTZLER (1955, 1956) and KAHMANN and GOERNER (1956) put forward arguments for that. They stress that in the Island of Corsica *Vespertilionidae* are much fewer in numbers that *Rhinolophidae* and, that independent of this fact, they are more difficult to find. However, in the owl pellets the authors found 54 vespertilionids and only 3 rhinolophids.

The only paper known to me which shows exception, as it were, to these facts, is that by KÖNIG (1961), but the facts were second hand information to him. Namely, *Strix aluco* nearly exterminated the great colony of *R. ferrumequinum*.

Due to the fact that rhinolophids have a more open way of life and lower and slower flight it could be thought that they should be the prey of owls more often if compared to vespertilionids, but the opposite is the case.

On the other hand rhinolophids exhibit a faster escape reaction from danger,

which every one admits who has tried to catch a hanging *R. hipposideros*: at the last moment it manages to fly off. The escape of vespertilionids from such a small distance is impossible. ABELENTSEV *et al.* (1956) and KUZYAKIN (1950) mention the alertness of rhinolophids and the difficulty of catching them in their day retreats.

It is also possible that the difference in echolocation between these two families results in the low percentage of rhinolophids caught by the owls. Rhinolophids can detect their prey at a distance several times greater than is the case with the other family (KOLB 1970, MÖHRES 1966).

The possible role of taste and smell should not be excluded. Because the owls considered here (except *Athene noctua*) swallow a whole bat without tearing it to pieces, the role of taste seems to be doubtful. The acuity of the sense of smell in birds is under dispute. Its development seems to vary with different species (PORTMANN 1961, KARE 1965). I have not gone through any publication on the sense of smell in owls. With the exception of *Tyto alba*, the owls' inclination to *Soricidae* as a prey is small when compared to *Rodentia*. The cause of this difference in habit is rather obscure. Perhaps the difference in smell between these two mammals' groups has a decisive role.

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STRESZCZENIE

Badania oparto wyłącznie na literaturze. Pokrywają one część Europy objętą zasięgiem podkowców. Wykazały one, że wśród 707 nietoperzy znalezionych w zrzutkach sów było 692 *Vespertilonidae* i tylko 15 podkowców. Przyczyną tej dysproporcji może być znacznie większa szybkość reakcji ucieczki, jaką wykazują podkowce, kilkakrotnie większy zasięg ich echolokacji oraz fakt, że zapach ich może być dla sów niemiły.

РЕЗЮМЕ

Исследования опираются исключительно на литературе. Они охватывают часть Европы с границей распределения подковоносов. Доказано, что среди 707 летучих мышей, найденных в погадках сов было 692 *Vespertilonidae* и лишь 15 подковоносов. Причиной этой диспропорции может быть значительно большая скорость реакции бегства, которую проявляют подковоносы, несколько раз больший диапазон их эхолокации, а также факт, что их запах для сов может быть неприятный.

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