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| SPIXIANA | 16 | 3 | 227-232 | München, 1. November 1993 | ISSN 0341-8391 |
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## Beetles in the food of the tawny owl, *Strix aluco* (L.) in the Kharkov Region (Ukraine)

(Insecta, Coleoptera)

By Zdenek Kletecka & Igor A. Prisada

Kletecka Z. & I. A. Prisada (1993): Beetles in the food of the tawny owl, *Strix aluco* (L.) in the Kharkov Region (Ukraine) (Insecta, Coleoptera). – *Spixiana* 16/3: 227-232.

Pellets were collected under the nests of *Strix aluco* in the Severskij Donec National Park in Kharkov Region in 1979-1982, and they were analysed. Remnants of 81 beetles of 14 species were found in 57 of 675 pellets of *Strix aluco*. Crepuscular beetles (88,9 %) prevailed over nocturnal ones (4,9 %). Large species (over 16 mm) made up 92,6 % of the diet of the tawny owls which prey more upon flying beetles than on running ones. During their outbreaks, the genera *Melolontha* and *Polyphylla* can form a substantial part of the diet of these owls.

Zdenek Kletecka, Department of Natural History, South Bohemian Museum, Dukelská I, 37051 Ceske Budějovice, Czech republic.

Igor Alexejevich Prisada, Ukrainian Scientific Research Institute of Forestry, 310 024 Kharkov, Ukraine.

### Introduction

The tawny owl (*Strix aluco* (L.)) feeds on various animals including nocturnal insects. Pellets regurgitated by the owls mainly consist of sclerotized parts of the bodies of beetles.

Utterndörfer (1952), studying the food of the tawny owls in Germany, analysed their stomach contents and reported 62,14 % mammals, 10,5 % birds, 0,1 % reptiles, 10,7 % amphibians, 0,6 % fishes and 16 % insects. Wendand (1963) state 6,29 % insects in Berlin. Sweenke (1972) reported 12,3 % insects in Netherlands, higher representation of insects is reported by Hendry & Perthis (1986) 36,9 % in food of *Strix aluco* from France. Similar food composition of *Strix aluco* is given by Schnurze (1961) and Haenzel & Walther (1966). Bohác (1963) reported 8 (i.e. 11,6 %) insect specimens - 1 *Melolontha* sp., 2 *Geotrupes* sp., 1 carabid, 2 elaterids and 2 unidentified specimens. Hell (1964) reported 4,26 % insects (3 specimens of *Melolontha melolontha* (L.) and 1 unidentified specimen). Obuch (1983) found 30,8 % insects in food of the tawny owl in the territory of Velká Fatra mountains and in another study (Obuch (1984/85)) he found 340 Coleoptera, which correspond to frequency of 3,43 %. Plesník et Dusík (1986) state 2,33 % frequency, which is 20 specimens of beetles and 1 (0,12 %) specimen of Orthoptera in food of *Strix aluco*. Stanel (1978) stated 16,4 % insects in east Bohemia.

### Material and methods

We studied the food of *Strix aluco* in the Severskij Donec National Park in the Zmijev District of the Kharkov Region, the Ukraine, USSR, in an area along the middle part of the Severskij Donec river near the villages Gaidary, Zadoneckoe, Koropov Khutor, Velyka Homolsha and the town Zmijev. An oak wood with other deciduous trees stands on the right bank of the Severskij Donec and an inundation forest on the left bank where there is also a pine wood higher up on a second sand terrace. The altitude ranges between 83 and 193 m a.s.l.

Tab. 1. Relative biomasses (%) of Mammalia, Aves, Amphibia and Insecta in pellets of *Strix aluco* (L.)

| Species, family                           | year | 1977   | 1978   | 1979   | 1980   | 1981    | 1982    |
|---|------|--------|--------|--------|--------|---------|---------|
| <i>Neomys fodiens</i> (Schreber)          | -    | -      | -      | -      | 1,2    | -       | 1,25    |
| <i>Sorex minutus</i> L.                   | -    | -      | 1,1    | 1,1    | 0,4    | 0,26    | 0,04    |
| <i>Sorex coecutiens</i> Laxm.             | -    | 0,6    | -      | -      | -      | 0,04    | 0,02    |
| <i>Sorex araneus</i> L.                   | -    | 3,3    | -      | 1,8    | -      | 4,0     | 1,32    |
| <i>Sorex</i> sp.                          | -    | -      | -      | -      | -      | -       | 0,5     |
| <i>Mus musculus</i> L.                    | -    | -      | -      | -      | 1,2    | -       | -       |
| <i>Apodemus agrarius</i> (Pall.)          | -    | -      | -      | -      | 2,5    | 0,93    | 0,21    |
| <i>Apodemus sylvaticus</i> (L.)           | -    | 29,0   | 8,6    | 22,5   | 11,7   | 2,86    | 4,37    |
| <i>Apodemus flavicollis</i> (Melchior)    | -    | -      | -      | -      | 6,0    | 14,05   | 4,16    |
| <i>Apodemus</i> sp.                       | -    | -      | -      | -      | -      | 2,2     | 4,41    |
| <i>Micromys minutus</i> (Pall.)           | -    | -      | -      | -      | -      | -       | 0,1     |
| <i>Microtus arvalis</i> (Pall.)           | -    | 55,8   | 66,1   | 37,2   | 46,4   | 53,5    | 53,13   |
| <i>Microtus</i> sp.                       | -    | -      | -      | -      | -      | -       | 0,9     |
| <i>Clethrionomys glareolus</i> (Schreber) | -    | -      | 23,2   | 4,3    | 5,3    | 7,39    | 16,4    |
| <i>Arvicola terrestris</i> (L.)           | -    | -      | -      | 2,0    | 3,0    | -       | 2,8     |
| <i>Cricetulus migratorius</i> (Pall.)     | -    | -      | -      | -      | -      | -       | 7,84    |
| <i>Talpa europea</i> L.                   | -    | -      | -      | 0,7    | 1,1    | -       | -       |
| Mammalia total                            | -    | 88,7 % | 99,0 % | 71,7 % | 78,8 % | 85,23 % | 97,45 % |
| Motacilidae                               | -    | -      | -      | -      | -      | 0,34    | -       |
| <i>Turdus</i> sp.                         | -    | -      | -      | -      | 13,1   | 9,63    | -       |
| Muscicapidae                              | -    | -      | -      | -      | -      | 0,32    | -       |
| Paridae                                   | -    | -      | -      | -      | -      | 0,52    | -       |
| Emberizidae                               | -    | -      | -      | -      | -      | 1,05    | -       |
| Fringillidae                              | -    | 11,3   | -      | -      | -      | 2,46    | -       |
| <i>Fringilla coelebs</i> L.               | -    | -      | -      | -      | -      | 0,34    | -       |
| <i>Chloris chloris</i> (L.)               | -    | -      | -      | 10,1   | -      | -       | 0,22    |
| <i>Sturnus vulgaris</i> L.                | -    | -      | -      | -      | -      | -       | 0,71    |
| <i>Garrulus glandarius</i> (L.)           | -    | -      | -      | 16,2   | -      | -       | 1,45    |
| Aves total                                | -    | 11,3 % | 0,0 %  | 26,3 % | 13,1 % | 14,66 % | 2,38 %  |
| <i>Rana ridibunda</i> Pall.               | -    | -      | -      | 1,3    | 2,7    | -       | -       |
| Amphibia total                            | -    | 0,0 %  | 0,0 %  | 1,3 %  | 2,7 %  | 0,0 %   | 0,0 %   |
| Insecta total                             | -    | 0,0 %  | 1,0 %  | 0,7 %  | 5,4 %  | 0,11 %  | 0,17 %  |

We looked for nests of *S. aluco* in an area of 5000 ha. We installed 40 nest boxes in the oak wood (1650 ha, one box per 41 ha) in March 1979. Balát (1985) mentioned the possibility of using boxes.

Pellets were collected 3-5 times a month under the nests and places where the tawny owls rested at night from 1977 to 1982. The contents of the nests were examined too. We collected 675 pellets and found remnants of insects in 57 of them. The insects were beetles, large, strongly chitinized individuals. We then observed the daily activity of the identified coleopteran species.

The biomass of each preyed species was determined according to its real weight as collected in the examined (Table 1).

## Results

We identified 14 species of Coleoptera from 78 remnants of individuals, the remnants of 3 beetles were not identified (Tab. 2).

The highest biomass 50 g (22,7 %) of insects was found in adult owls during July (1980) when *Polyphylla fullo* (L.) was the most numerous. Within other months (April, May, June) the biomass of beetles varied from 1,5 % to 5,9 %.

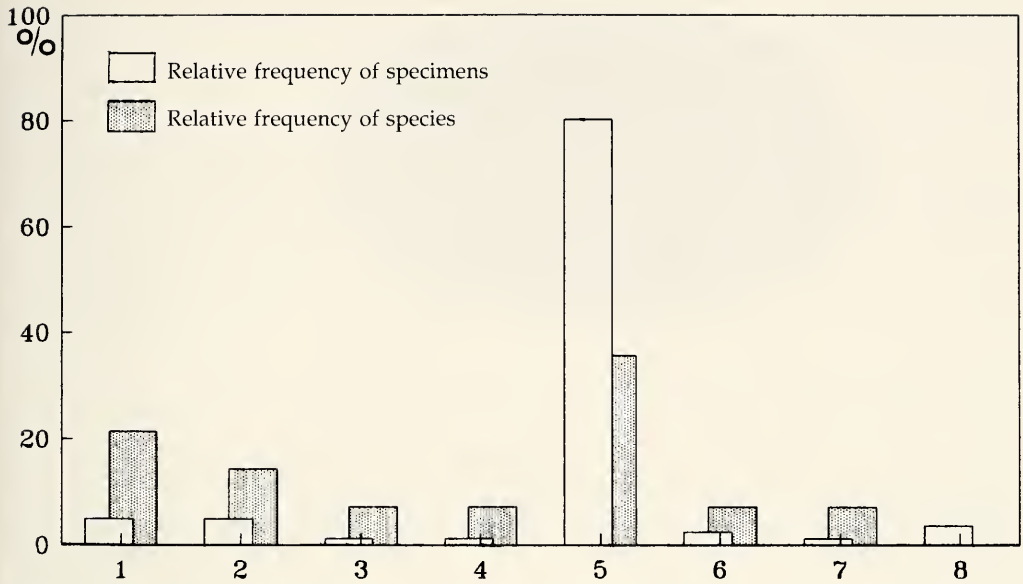


Fig. 1. The occurrence of the family Coleoptera in the food of *Strix aluco* (L.). - Family: 1. Carabidae; 2 Dytiscidae; 3. Silphidae; 4. Lucanidae; 5. Scarabaeidae; 6. Cerambycidae; 7. Curculionidae; 8. unidentified beetles.

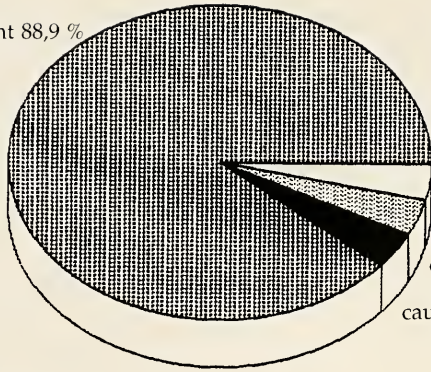
Along with beetles there were also Orthoptera in the food of young owls. The main food of young owls were *Microtus arvalis* (Pall.), *Apodemus flavicollis* (Melchior) and *A. sylvaticus* (L.) forming 1275,7 g (81,8 %), the total insect biomass was 84,7 g (5,43 %) in 1980.

There were 3 species of Carabidae (4 specimens, Fig. 1). Carabids run, exceptionally they fly (*Pterostichus*), some do not (*Carabus*). Carabids are primarily nocturnal predators. They are active at dusk and at the night, mainly on the ground where tawny owls (Fig. 2).

Tab. 2. The occurrence of Coleoptera in pellets of *Strix aluco* (L.) in the spring and summer months of 1980-1982

| Species, family                        | month | IV    | V      | VI    | VII    | VIII  | IX    | Total |
|--|-------|-------|--------|-------|--------|-------|-------|-------|
|  | year  |       |        |       |        |       |       |       |
| 1 Unidentified beetles                 |       |       | 1(82)  |       | 1(82)  | 1(82) |       | 3     |
| 2 Carabidae                            |       |       |        |       | 1(80)  |       |       | 1     |
| 3 <i>Carabus marginalis</i> Fabr.      |       |       |        |       | 2(80)  |       |       | 2     |
| 4 <i>Pterostichus niger</i> (Schaller) |       |       | 1(81)  |       |        |       |       | 1     |
| 5 Dytiscidae                           |       | 1(80) | 1(80)  |       |        |       |       | 2     |
| 6 <i>Dytiscus marginalis</i> (L.)      |       | 2(82) |        |       |        |       |       | 2     |
| 7 <i>Silpha obscura</i> L.             |       |       |        |       |        |       | 1(81) | 1     |
| 8 <i>Lucanus cervus</i> (L.)           |       |       |        | 1(81) |        |       |       | 1     |
| 9 <i>Copris lunaris</i> (L.)           |       |       | 1(80)  | 1(81) | 1(80)  |       |       | 3     |
| 10 <i>Geotrupes stercorarius</i> (L.)  |       |       |        |       |        |       | 1(81) | 1     |
| 11 <i>Potosia cuprea</i> (Fabr.)       |       |       |        | 1(81) |        |       |       | 1     |
| 12 <i>Melolontha melolontha</i> (L.)   |       |       | 25(80) | 1(80) |        |       |       | 35    |
|  |       |       | 8(82)  | 1(82) |        |       |       | 25    |
| 13 <i>Polyphylla fullo</i> (L.)        |       |       |        |       | 25(80) |       |       | 2     |
| 14 <i>Prionus coriarius</i> (L.)       |       |       | 1(81)  | 1(82) |        |       |       | 1     |
| 15 Curculionidae                       |       |       |        |       |        |       | 1(81) | 1     |
| Total                                  |       | 3     | 38     | 6     | 30     | 1     | 3     | 81    |

caught in flight 88,9 %



unidentified beetles 3,7 %

caught running on the ground 3,7 %

caught flying or running on the ground 3,7 %

Fig. 2. Locomotor activity of the coleopteran prey.

Diving beetles (Dytiscidae) were the first insects appearing in spring in the food of tawny owls. Dytiscids live in water and at dusk, they migrate from one water body to another. The tawny owls prefer the largest species, such as *Dytiscus marginalis* (L.) (Fig. 1, Tab. 3).

*Silpha obscura* L. (Silphidae) is a predator running on the ground, which can also fly. It is a diurnal species, but in summer and autumn when it appears in the food of *Strix aluco*, it is active later in the day, in the afternoon and at dusk (Tab. 2).

*Lucanus cervus* (L.) (Lucanidae), flying at dusk, is one of the largest insects in the area (Tab. 3).

Scarabaeidae are represented by *Copris lunaris* (L.) and *Geotrupes stercorarius* (L.) which fly at dusk, looking for excrements to breed in them. Cockchafers (*Melolontha melolontha*) are the most numerous scarabaeids in the food of *S. aluco*, mainly in May. We found in total 35 individuals (Tabs 2 and 3). Many *Polyphylla fullo* appeared in the food of the tawny owls in July (Tab. 2). *Melolontha* and *Polyphylla* are active at dusk, later in the night they stop flying. Another scarabaeid was *Potosia cuprea* (Fabr.) a diurnal species (Tabs 2 and 3, Figs 1 and 3).

Cerambycidae were represented by *Prionus coriarius* (L.) (Tabs 2 and 3), flying at dusk (Fig. 3).

We found only one specimen of Curculionidae, largely a diurnal family (Tabs 2 and 3).

Tab. 3. The taxonomic identity of coleopterans whose fragments were present in the pellets of *Strix aluco* (L.). (A: abundance of the fragments of specimens; D: dominance among all fragments examined; Di: dominance among identified fragments).

| Species, family                        | Abundance (A) | Dominance (D)<br>% | Dominance (Di)<br>% | Body length<br>in mm |
|--|---------------|--------------------|---------------------|----------------------|
| 1 Carabidae                            | 1             | 1,23               | 1,28                | 5-15                 |
| 2 <i>Carabus marginalis</i> Fabr.      | 2             | 2,47               | 2,57                | 18-26                |
| 3 <i>Pterostichus niger</i> (Schaller) | 1             | 1,23               | 1,28                | 16-21                |
| 4 Dytiscidae                           | 2             | 2,47               | 2,57                | 15-20                |
| 5 <i>Dytiscus marginalis</i> (L.)      | 2             | 2,47               | 2,57                | 30-35                |
| 6 <i>Silpha obscura</i> L.             | 1             | 1,23               | 1,28                | 13-17                |
| 7 <i>Lucanus cervus</i> (L.)           | 1             | 1,23               | 1,28                | 25-75                |
| 8 <i>Copris lunaris</i> (L.)           | 3             | 3,71               | 3,84                | 17-23                |
| 9 <i>Geotrupes stercorarius</i> (L.)   | 1             | 1,23               | 1,28                | 16-24                |
| 10 <i>Potosia cuprea</i> (Fabr.)       | 1             | 1,23               | 1,28                | 14-33                |
| 11 <i>Melolontha melolontha</i> (L.)   | 35            | 43,22              | 44,87               | 20-25                |
| 12 <i>Polyphylla fullo</i> (L.)        | 25            | 30,87              | 32,05               | 24-34                |
| 13 <i>Prionus coriarius</i> (L.)       | 2             | 2,47               | 2,57                | 24-40                |
| 14 Curculionidae                       | 1             | 1,23               | 1,28                | 5-15                 |
| 15 Unidentified beetles                | 3             | 1,23               | -                   | -                    |
| Total                                  | 81            | 100                | 100                 |                      |

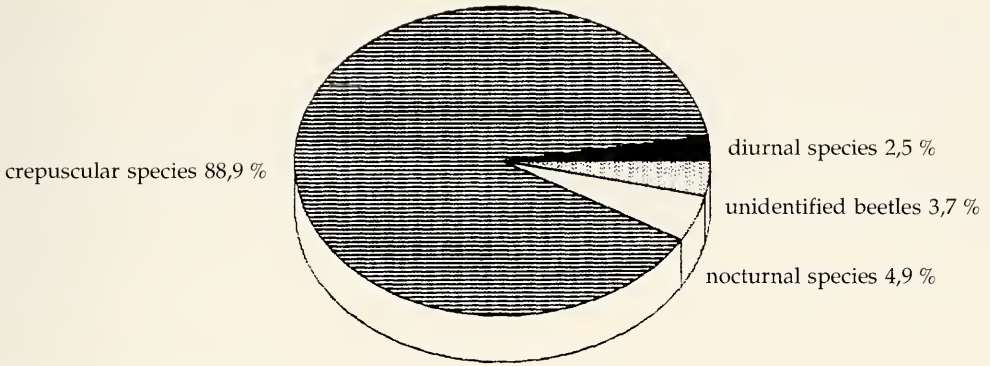


Fig. 3. Frequency of coleopteran prey in relation to its activity.

### Discussion

Scarabaeidae were the most numerous among the insect prey of *Strix aluco* (35,7 % of the identified species, 80,3 % of specimens). Carabidae and Dytiscidae were represented less, and there were single beetles of the families in the samples (Fig. 1).

Tawny owls prefer flying insects to those running on the ground (Fig. 2), apparently because the flying insects are more easily seen and the whirring sounds they make can be heard. Of the insects eaten, 3,7 % could be caught flying as well as running, and 3,7 % could only be running when they were taken. Balát (1956) reported in paper on *Tyto alba* (Scopoli) that it also catches beetles running on the ground. The rest, 88,9 %, were caught in flight (Fig. 2).

Crepuscular beetles (88,9 %) prevailed over nocturnal species (4,9 %) in the prey of *S. aluco*, diurnal species occurred accidentally (2,5 %), and 3,7 % were unidentified beetles (Fig. 3). The prevalence of crepuscular species over nocturnal ones may be due to their size, as most of the large beetles are active at dusk. The diurnal curculionids and *Potosia cuprea* were probably accidentally caught by the owls.

A comparison of sizes of the prey has shown that owls catch mostly large beetles. There were 3,7 % of beetles under 15 mm in the pellets of *S. aluco*; most beetles in the area are of this size. Beetles sized 15-25 mm made up 55,6 % and 33,3 % were in the 26-35mm category. Beetles over 36mm, the largest species living in the area, made up 3,7 % and 3,7 % were unidentified coleopterans (Fig. 4, Tab. 3).

*Melolontha melolontha* and *Polyphylla fullo* can become the main prey of *S. aluco* during their outbreaks (Tabs 2 and 3). Balát (1956) reported that *M. melolontha* and *Amphimallon solstitialis* (L.) frequently occurred in the food of the owl *Tyto alba* during their overpopulation. Bohác (1963) mentioned 2 specimens of *Melolontha* sp. and Hell (1964) found 3 specimens of *M. melolontha* in the food of *S. aluco*. The high representation (40 %) of beetles in pellets of *Athene noctua* (Scopoli) was also found by Obuch (1982).

Although large chafers of the genera *Amphimallon* and *Miltotrogus* and scavenger beetles of the genus *Hydrous* are common in the area and fly at dusk we have never found their remnants. Bohác (1963) reported two specimens of Elateridae in addition to the species mentioned above; they are abundant in the area but we have not found them in the food of *S. aluco*.

### Conclusions

We found the remnants of 78 beetles of 14 species and three unidentified individuals in the food of *Strix aluco*. In the prey of these owls prevail

- 1 flying species over running ones
- 2 crepuscular species over nocturnal ones
- 3 large sized species
- 4 the chafers *Melolontha melolontha* and *Polyphylla fullo* in the times of overpopulation, when they can become a substantial part (21,3 %) of the diet of *S. aluco*.

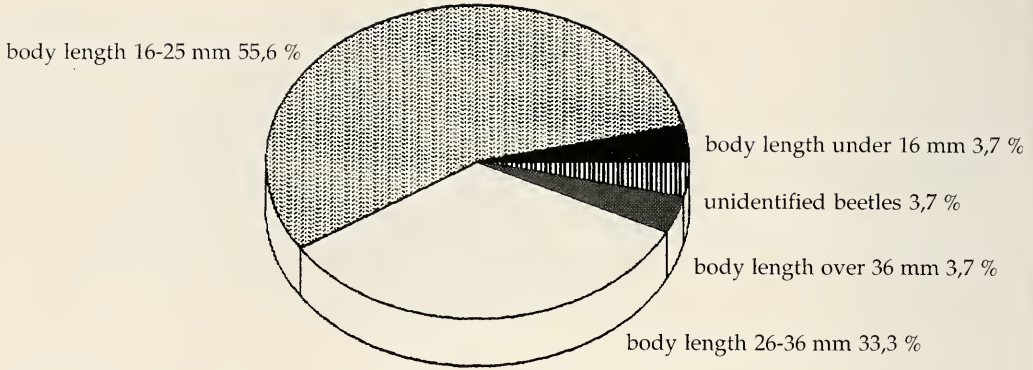


Fig. 4. Sizes of the coleopteran species preyed upon by *Strix aluco* (L.)

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Autor(en)/Author(s): Kletecka Zdenek, Prisada Igor A.

Artikel/Article: [Beetles in the food of the tawny owl, \*Strix aluco\* \(L.\) in the Kharkov Region \(Ukraine\) \(Insecta, Coleoptera\) 227-232](#)