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*Araştırma Makalesi / Research Article*

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## **Investigation on Diet of Long-Eared Owl (*Asio Otus*) Inhabiting Fatih Natural Park (Turkey)**

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### **Abstract**

Pellet analyses were used to identify small mammal species in the diet of this owl species in order to reveal its ecological role. In this study, 706 pellets of *Asio otus* were collected from 3 different localities in Fatih Natural Park between February and March 2014. Pellets were dissolved by using 3% NaOH solution and then bones were dehydrated and identified. The aim of this study was to determine mammal composition in the diet of *Asio otus* inhabiting Fatih Natural Park of Yozgat Province, Turkey. Residues of bone from 1293 individuals/preys corresponding to 42377.41 g biomass in total were detected as the result of analysis. These individuals were identified to belonging to 12 mammal species (*Crocidura suaveolens*, *Suncus etruscus*, *Microtus hartingi/lydius*, *Microtus levis*, *Microtus* sp., *Cricetulus migratorius*, *Mesocricetus brandti*, *Apodemus* sp., *Apodemus sylvaticus*, *Apodemus witherbyi*, *Mus macedonicus*, and *Meriones tristrami*) from 3 families and 8 genera. *Microtus hartingi/lydius*, which is known as agricultural pest, was dominant in the diet of *Asio otus*. When diversity of mammal species within the food composition was examined, *Asio otus* nesting in forest was found to primarily prefer agricultural and steppe areas, and was also found in woody and bushy areas. The use of *Asio otus* can be taken into consideration when dealing with rodent species known as agricultural pests.

**Keywords:** *Asio otus*, Diet, pellets, small mammals, Yozgat, Turkey.

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## **Fatih Tabiat Parkı'ndaki Uzun Kulaklı Orman Baykuşu (*Asio otus*)'nun Diyetinin İncelenmesi**

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### **Öz**

Pellet analizleri belli bir alanda yaşayan küçük memeli türlerinin tespitinde ve baykuşun o alandaki ekolojik rolünün ortaya konmasında kullanılmaktadır. Bu çalışma Yozgat Fatih Tabiat Parkından Şubat ve Mart 2014 tarihlerinde *Asio otus* bireyine ait 3 farklı lokaliteden toplanan 706 pellet üzerinde yapılmıştır. Pelletler %3'lük NaOH solüsyonu kullanılarak çözülmüş ve daha sonra kemikler kurutulup teşhis edilmiştir. Bu çalışma ile Yozgat Fatih Tabiat Parkında yaşadığı tespit edilen *Asio otus* bireylerinin diyetindeki memeli kompozisyonunu belirlemek amaçlanmıştır. Yapılan analizler sonucunda toplam 42377,41 gr biomasa karşılık gelen 1293 bireye/ava ait kemik kalıntısı tespit edilmiştir. Bu bireylerin 3 familya ve 8 cins ait toplam 12 memeli türüne (*Crocidura suaveolens*, *Suncus etruscus*, *Microtus hartingi/lydius*, *Microtus levis*, *Microtus* sp., *Cricetulus migratorius*, *Mesocricetus brandti*, *Apodemus* sp., *Apodemus sylvaticus*, *Apodemus witherbyi*, *Mus macedonicus* ve *Meriones tristrami*) ait olduğu saptanmıştır. Tarım zararlısı olarak bilinen *Microtus hartingi/lydius* türünün *Asio otus*' un diyetinde ilk sırayı aldığı tespit edilmiştir. Besin kompozisyonundaki memeli türlerinin çeşitliliğine bakıldığında orman içinde yuvalanan *Asio otus*' un beslenme amacı ile öncelikli olarak tarım ve step alanları tercih ettiği, bununla birlikte ormanlık ve çalılık alanlarda da beslendiği saptanmıştır.

**Anahtar kelimeler:** *Asio otus*, diet, pellet, Küçük memeliler, Yozgat, Turkey.

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## 1. Introduction

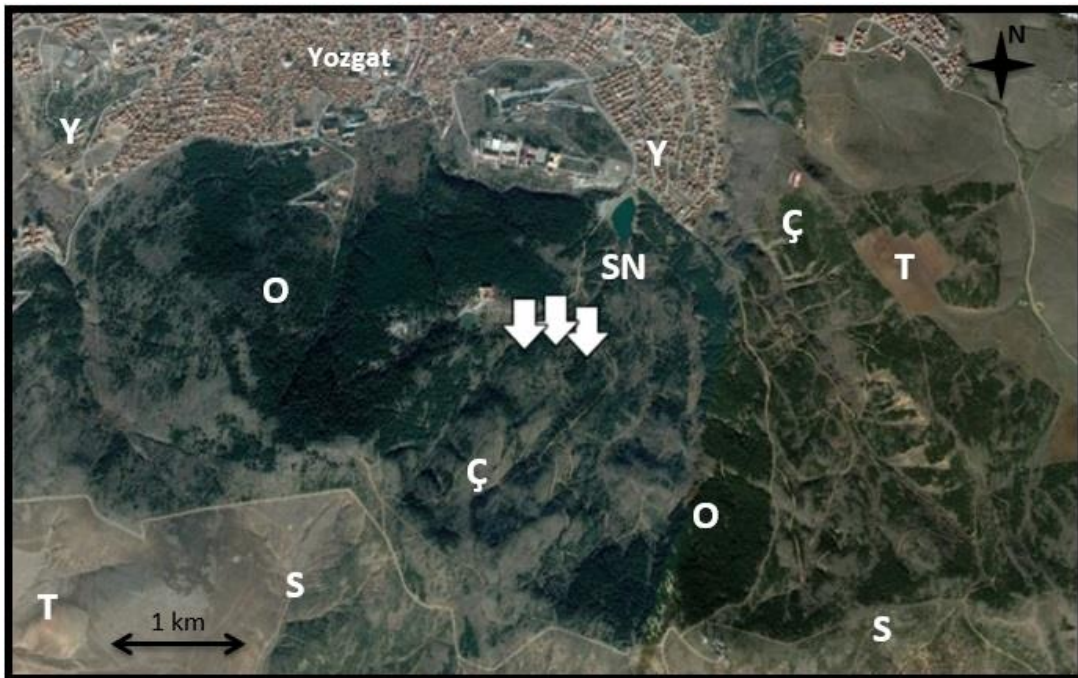
Owls, a member of order strigiformes, are known as myofagus bird species. Pellet structures formed by owls are used to identify mammal species in a certain area and the habitats where they are active [1-3]. Obuch [4] gave new records of several bat species for bat fauna in Turkey depending on pellets collected from in front of a cave in Kahta district of Adıyaman Province. In the same study, the researcher also determined existence of bird and rodent species in the pellets. Studies on food composition through analysis of pellets of owls from various locations in Anatolia have been conducted [2, 5-16].

The aim of this study was to determine species' food preference by analyzing 706 pellets of *Asio otus* which were detected to live in Fatih Natural Park of Yozgat Province. Information regarding the mammal habitats where *Asio otus* is active was also tried to obtain.

## 2. Material and Method

### 2.1. Study Area

Field studies were conducted in three different localities that were close to each other (UTM-36S 655788 E 4407843 N; 655917 E 4407905 N; 656066 E 4407900 N) in Fatih Natural Park of Yozgat Province between 14 February 2014 and 14 March 2014. The study area is a woody zone consisting of dense pine trees and there are sporadic glades and seasonal streams in some places. The city center of Yozgat is located at approximately 1 km north of the study field, agricultural lands and steppe areas are at about 1.2 km east (Figure 1).



**Figure 1.** Localities where the pellets were collected (white arrows) and diverse habitats found around (Habitat Types: T-Agricultural, O-Forest, SN- Marshy and Damp, S-Steppe, Y-Settlements)

### 2.2. Pellet Analysis

In total, 706 pellets were collected from the study area. Analyses were carried out according to Schueler [17] and Yalden [18]. Hairs included in pellets were ensured to lyse by dissolving pellets in 3% NaOH solution. Pellets were kept in hot water bath at 65 °C for 45 minutes. Pellets, then, were dehydrated in petri dishes. Weight of each pellet, number of bone pieces, number of individuals, number of species,

and biomass were identified. Biomass values were determined considering average of weights in studies conducted about species around close areas [19-23].

### 2.3. Prey Identification

Internal character measurements of skulls from mammal species identified were recorded by measuring via caliper with 10 mm precision. Pieces of skull and teeth belonging to each species were photographed by using Leica M125 stereo-microscope. Pamukoğlu and Albayrak [24], Osborn [25], Tez [26], Kefelioğlu and Krystufek [27], Yiğit and Çolak [19], Krystufek and Vohlarik [20], Demirbaş and Pamukoğlu [21], Gözütok and Albayrak [22], Yorulmaz and Albayrak [23], Coşkun [28] and Yiğit [29] were followed for identification of species. Materials were conserved in Zoology Laboratory of Biology Department, Faculty of Science, Çankırı Karatekin University.

### 3. Results

As a result of examining 706 collected pellets, a total of 12 species were identified including *Crocidura suaveolens*, *Suncus etruscus*, *Microtus hartingi/lydius*, *Microtus levis*, *Microtus* sp., *Cricetulus migratorius*, *Mesocricetus brandti*, *Apodemus sylvaticus*, *Apodemus witherbyi*, *Apodemus* sp., *Mus macedonicus* and *Meriones tristrami* from *Crocidura*, *Suncus*, *Microtus*, *Cricetulus*, *Mesocricetus*, *Apodemus*, *Meriones*, and *Mus* species from Soricidae, Cricetidae, and Muridae families in Eulipotyphla and Rodentia orders (Table 1).

Mean pellet weight was 2.69 g, mean bone weight in each pellet was 1.32 g, average number of bones was 94.4 in each pellet, and mean number of individuals per pellet was 1.8. 801 individuals (61.95%) from 5 species of Cricetidae family and 686 individuals (53%) from 3 species of genus *Microtus* were identified in diet of long-eared owl. The species *Microtus hartingi/lydius* among them was placed at the top with 490 (37.90%) individuals. Long-eared owl was determined to consume 42377.41 g biomass in 706 pellets. Among the consumed mass, the species *Microtus hartingi/lydius* with 22589 g (53.3%) was detected to take the first place again.

Among the identified species, *Microtus hartingi/lydius*, *Meriones tristrami*, *Cricetulus migratorius*, *Mesocricetus brandti* *Mus macedonicus* were mainly found in steppes, agricultural areas, and glades; *Crocidura suaveolens*, *Suncus etruscus*, *Microtus levis*, *Mus macedonicus*, *Apodemus witherbyi* were in areas close to human settlements, riparian areas, and shrubbery zones; *Apodemus witherbyi*, *Apodemus sylvaticus* in underbrush under trees within woodlands.

When diet of long-eared owl was considered in terms of habitat distributions, it was determined as follows; agricultural areas (7 species), shrubbery zones (6 species), steppes (6 species), marshy and damp areas (5 species), forests (3 species) and settlements (1 species) (Table 1).

**Table 1.** Overall frequency and proportions of various prey items in the diet of Long eared owl

Species	Number of Individuals	Percent (%)	Body Weight (gr)	Total Biomass (gr)	Percent (%)	Habitat Type
<i>Microtus hartingi/lydius</i>	490	37.9	46.1	22589	53.3	S, T
<i>Mus macedonicus</i>	340	26.3	15	5100	12.03	S, SN, Ç, Y
<i>Microtus</i> sp.	137	10.6	32.5	4452.5	10.51	S, T
<i>Cricetulus migratorius</i>	110	8.5	26	2860	6.75	T, S
<i>Microtus levis</i>	59	4.56	30.2	1781.8	4.206	SN, T
<i>Apodemus</i> sp.	57	4.41	23.45	1336.65	3.15	O, S, T, Ç
<i>Apodemus sylvaticus</i>	28	2.16	22.99	643.72	1.52	O, SN, Ç
<i>Meriones tristrami</i>	24	1.85	99.8	2395.2	5.65	T, S, Ç
<i>Apodemus witherbyi</i>	17	1.31	23.62	401.54	0.95	O, SN, Ç
<i>Crocidura suaveolens</i>	9	0.73	8.5	76.5	0.18	SN, Ç
<i>Mesocricetus brandti</i>	5	0.39	83.7	418.5	0.99	S, T
<i>Suncus etruscus</i>	1	0.08	2	2	0.004	SN, Ç
<b>Total</b>	1293	100	413.86	42377.41	100	

\*Not calculated governorate (Habitat Types: T-Agricultural, O-Forest, SN- Marshy and Damp, S-Steppe, Ç-Brush wood, Y-Settlement)

In this study, long-eared owl was recorded to intensively feed on small mammals inhabiting agricultural areas in the surrounding of Fatih Natural Park. Additionally, it was also observed to create a prey pressure also on rodents inhabiting in border of forests and open lands around them. Despite the fact that there is suitable ponds, agricultural areas and bushes in the forests in the study field where insectivore mammals can live, they were determined to have pellets at minimum rate. In this study, *Suncus etruscus* species was recorded for the first time from Yozgat and Central Anatolia.

#### 4. Discussion

In numerous studies conducted with owl pellets, more than 65% of its diet consisted of species from the genus *Microtus* (Figure 2, Figure 3). Species from the genus *Mus* were recorded to be less than 20%. In this study, while species of the genus *Microtus* took the first place with the rate of 53%, the species *Mus macodenicus* from the genus *Mus* was determined to have a rate of 26%. The species *Mus macodenicus* was recorded to constitute the second most significant element of the diet, following the species *Microtus hartingi/lydius*.

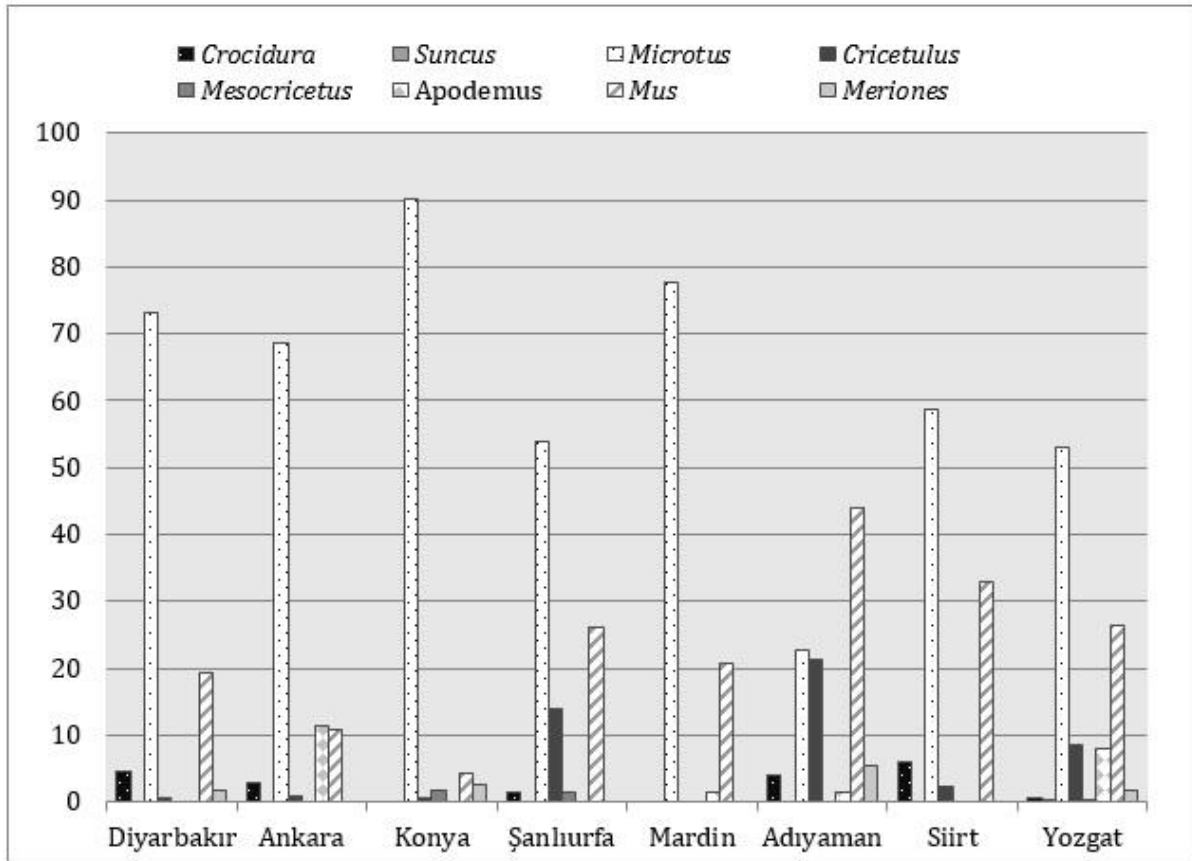
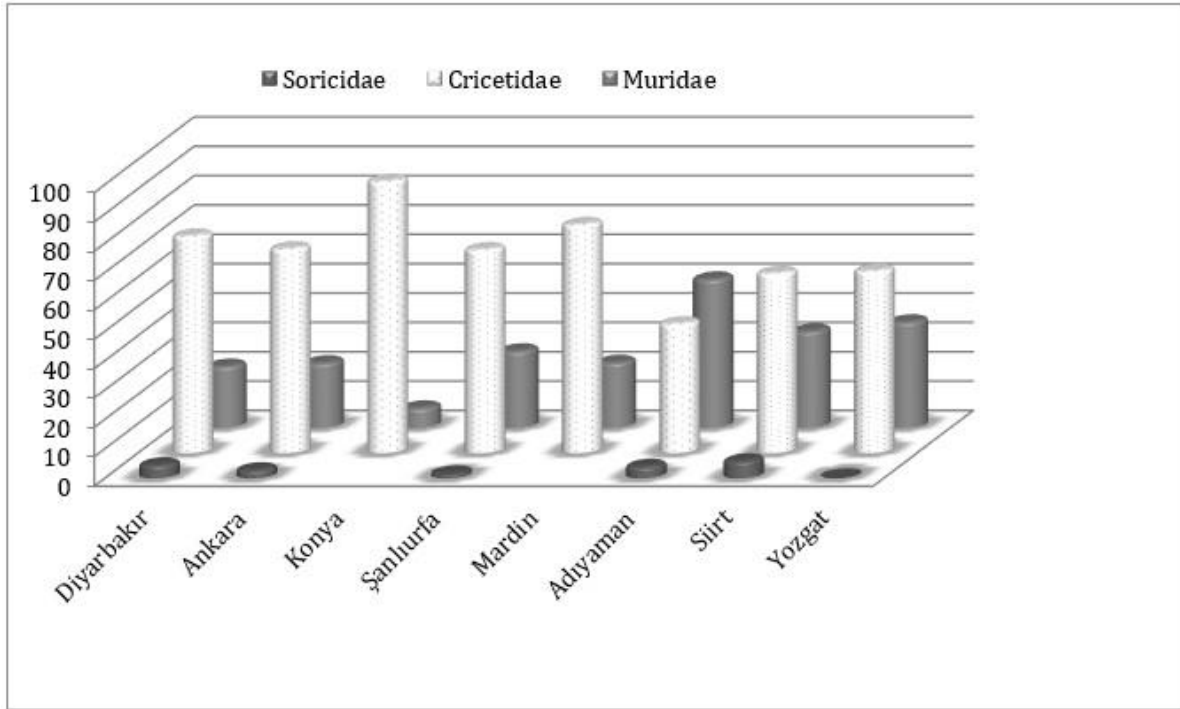


Figure 2. Comparison of percentages belonging to rodent genera with certain literature data



**Figure 3.** Comparison of percentages belonging to rodent families with some literature data

*Microtus hartingi/lydius* is a systematically contradictive species. *Microtus guentheri* was widely used in previous pellet analysis studies, however, in the recent studies conducted on systematical status of the genus *Microtus*, it was found that the species in Central Anatolia was not *Microtus guentheri*. It is still a matter of debate if this species was *M. hartingi* or *M. lydius*? [19, 30-32]. The species *Microtus hartingi/lydius* in Central Anatolia, which is considerably larger than the species *Microtus guentheri* in terms of general morphological body measurements, has the greatest biomass in diet of owl.

According to Kaya and Coşkun [33], six species, *Microtus guentheri*, *Microtus sp.*, *Cricetulus migratorius*, *Meriones sp.*, *Apodemus sp* and *Mesocricetus brandti* species were found in 134 pellet of long-eared owl (*Asio otus*) collected from Erzurum. *Microtus guentheri* in these pellets were the most common small mammal species with a rate of 68.5%. In this study, the remains of 12 mammal species were found in 1293 pellets. *Microtus hartingi/lydius* was the most common species.

Göçer [34] reported that the diet of the nesting Long-eared Owls consisted entirely of birds. In our study the diet of the Long-eared Owls consisted entirely of mammals.

Bulut et al. [13] reported that they found mainly pieces of skull in 138 pellets of the species *Asio otus* collected from Ankara province. However, 7265 (10.9%) of 66647 pieces of bones within 706 pellets were pieces from skull in this study. The species *Suncus etruscus* was identified mostly in pellet analysis studies in Turkey [35]. So far, in studies based on pellet analysis, *Suncus etruscus* species is only recorded from southeastern Turkey. In this study, the record of the species *Suncus etruscus* was given from Central Anatolia for the first time.

Wheat with zinc-phosphide has been used for the control of *Microtus* in Yozgat province, 3616 kg is the amount used in 266281 decares in 2016 [36]. In this study, the effect of the species *Asio otus* alone on *Microtus* was determined. Mixtures used for chemical control purposes negatively influence organisms like particularly *Asio otus* which mainly feed on rodent species and are placed at top of food chain. Eradication of these species as the result of chemical poisoning would cause elimination of natural biological control on rodent species that are considered agricultural pests. Therefore, it has great importance in terms of protecting natural balance to warn relevant people about control of agricultural pests.

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