

UDC: 599.323(477)

Features of badger (*Meles meles* L., 1758) nutrition in the Kharkiv Region V.A.Tokarsky

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During the autumn season of 2001–2010 badger nutrition in Kharkiv region was studied. Studies were based on analysis of badgers' excrements. Composition of badger nutrition in Kharkiv region was described. Results of this study were compared with results of other authors. The results show that at the studied area in the autumn plant components were 72.7% of the total diet, 24.5% were rodents and 2.6% of the diet were birds in this period. Remains of animals mainly belonged to rodents (fragments of jaws with teeth, hair, bones and parts of the spine). Quite rarely small amount of undigested birds remains were found (feathers and bone fragments). As part of the diet in this period the presence of components such as amphibians, reptiles and insects was not detected, due to its unavailability at this time of year. That small amount of excrements which were collected at two other areas, can only provide a preliminary characterization of the badger nutrition in this period of the year. We can only say that in these cases the prevalence of herbal ingredients over animals was even more significant.

Key words: *badger, food components, scatological analysis.*

Особенности питания барсука (*Meles meles* L., 1758) в Харьковской области В.А.Токарський

В течение осеннего сезона 2001–2010 гг. на территории Харьковской области изучали питание барсука. Исследования были основаны на анализе их экскрементов. Приведена композиция питания барсука в регионе. Результаты этого исследования были сравнены с результатами исследований зарубежных авторов. Результаты анализа показывают, что на исследуемом участке в осенний период растительные компоненты составляют 72,7% от общего рациона, 24,5% принадлежат мышевидным грызунам и 2,6% в рационе в этот период составляют птицы. Остатки животного происхождения принадлежали в основном мышевидным грызунам (фрагменты челюстей с зубами, шерсть, части костей конечностей и позвоночника). В незначительном количестве присутствовали непереваренные остатки птиц (перья и фрагменты костей). В составе рациона в этот период не было обнаружено присутствия амфибий, рептилий, насекомых, что связано с их недоступностью в данное время года. Результаты обработки экскрементов, которые были собраны на двух других участках, могут дать лишь предварительную характеристику питания барсука в данный период года. В этих случаях преобладание растительных компонентов над животными еще более значительно.

Ключевые слова: *барсук, пищевые компоненты, анализ экскрементов.*

Особливості харчування борсука (*Meles meles* L., 1758) у Харківській області В.А.Токарський

Протягом осіннього сезону 2001–2010 рр. на території Харківської області вивчали харчування борсука. Дослідження були засновані на аналізі їх екскрементів. Наведена композиція харчування борсука в регіоні. Результати цього дослідження були порівняні з результатами досліджень зарубіжних авторів. Результати аналізу показують, що на досліджуваній ділянці в осінній період рослинні компоненти складають 72,7% від загального раціону, 24,5% належать мишоподібним гризунам і 2,6% в раціоні в цей період становлять птахи. Залишки тваринного походження належали в основному мишоподібним гризунам (фрагменти щелеп із зубами, шерсть, частини кісток кінцівок та хребта). У незначній кількості були присутні неперетравлені залишки птахів (пір'я і фрагменти кісток). У складі раціону в цей період не було виявлено присутності амфібій, рептилій, комах, що пов'язане з їх недоступністю в даний час року. Результати обробки екскрементів, які були зібрані на двох інших ділянках, можуть дати лише попередню характеристику харчування борсука в даний період року. У цих випадках переважання рослинних компонентів над тваринами ще більш значно.

Ключові слова: *борсук, харчові компоненти, аналіз екскрементів.*

Introduction

Badger population on the territory of Ukraine in the end of 60's of the XX century wasn't more than 11000 individuals, and continued to decline until the end of 80's. The reason of conferment of badger status as the species that need protection was its uncontrollable extraction by poachers and transformation of its habitats. Due to enhancement of protection in hunting lands from poachers and extension of territories of the natural reserve fund, badger population in Ukraine began to rise, but the species still needs protection.

To improve efficiency of conservation measures it is necessary to know about the biology features and behavior of the species. One aspect of the biological characteristics of the species is the nutrition features, which directly influence the behaviour and the distribution of species in a given area. Similar studies were carried out for a long time ago and not in all regions of Ukraine. Data on qualitative composition of the badger ration known only for the Western regions of Ukraine and for the territory of Crimean reserved area.

Materials and methods

The aim of this research was study of qualitative composition of the badger nutrition on the territory of Eastern Ukraine. To explore badger nutrition scatological method has been used.

Badgers excrements were gathered on their three forage area (on the territory of the National Park "Gomilshansky Lisy" (surroundings of the village Gaidary, Zmiyiv district), on the territory of the regional landscape park "Velikoburlukskaya Step" (surroundings of the village Nesterivka, Velykyi Burluk area) and on the territory of the National Park in the Dvorichna district (surroundings of the village Krasnoe)).

The main part of analyzed material was gathered on the territory of the National Park "Gomilshansky Lisy" in October and November of 2001–2010 in amount of 105 specimens. The search of excrements was based on the studies of the badger settlement organization "badger towns" and coming from them "badger pathways". Based on our own observations and the literature data (Korneyev, 1967; Flint et al., 1970) it has been clarified that badgers make "public toilets" on the way from feeding areas to the settlement place. This fact facilitates search for the required material.

Collected excrements were dried at room temperature, then soaked in water and washed through the sieve (with a cell size of 1 mm). All recognizable undigested feed remains were separated and identified using the key (Kuznetsov, 1975).

For the each excrement type a number of species presented in the remains of different types of plants and animals has been calculated.

Then the frequency of occurrence (in %) of different types of feed has been calculated from all analyzed material. The results are presented in the table 1. The results have been compared with Poland group data (Kowalczyk et al., 2000).

Table 1.
Structure of food of badgers (the territory of the National Park "Gomilshansky Lisy", surroundings of the village Gaidary, Zmiyiv district) during the autumn period

Component of nutrition	Frequency of occurrence in % from total
Plum	28,0
Blackthorn	10,0
Pear	14,0
Apple	12,0
Cherry	5,0
Mouse rodents	24,5
Birds	2,6
Green parts of the herbaceous plants	1,7
Walnut	1,0
Corn	1,0

Results and discussion

During the analysis of excrements it has been found, that in autumn badger diet consists of different components of the plant and animal origin. Predominant components among them were of the plant origin, such as the fruit of plum (*Prunus domestica*), blackthorn (*Prunus spinosa*), pear (*Pirus sp.*), apple (*Malus*

domestica) and cherry (*Cerasus* sp.). Also smaller quantities of corn, walnuts and green parts of herbaceous plants were found.

Remains of animals mainly belonged to rodents (fragments of jaws with teeth, hair, bones and parts of the spine). Quite rarely small amount of undigested birds remains were found (feathers and bone fragments). As part of the diet in this period the presence of components such as amphibians, reptiles and insects was not detected, due to its unavailability at this time of year.

The analysis of results shows that at the test area in the autumn plant components are 72.7% of the total diet, 24.5% belongs to rodents and 2.6% of the diet belongs to birds in this period.

That small amount of excrements which were collected at two other areas, can only give a preliminary characterization of the badger nutrition in this period of the year. We can only say that in these cases the prevalence of herbal ingredients over animals was even more significant.

Comparing the results from the main studied territory with the analysis of the diet of badger in similar regions of Poland (Goszczyński et al., 2000; Kowalczyk et al., 2000), it can be concluded that in Poland badger diet in autumn is characterized by a large variety of food and a lot of components of animal origin. That fully confirms the opinion of J.Goszczyński (Goszczyński et al., 2000) that the badger diet changes towards the predominance of plant nutrition components with moving badger settlements closer to human settlements and agricultural lands.

With a lack of food near the settlement animals can travel long distances to search for food, using temporary burrows for that. Moreover, distances overcome in search of food, different for young and adult animals, males move further away from the settlement in search of food than females (Cresswell, Harris, 1988).

Unlike other species of predatory animals, the harm caused by the badger of hunting fauna, is insignificant. There are only a few cases, which suggest that the badger diet includes some commercial species (quail and their eggs, rabbits). Usually they get into the badger ration accidentally due to illness or injuries.

In the badger excrements sometimes can be found the remains of large animals (wild boar, deer) and some pets, but they are likely have been obtained by badger from the dead carcasses.

Different authors give a general characteristic of the badger nutrition, it is mentioned that there are qualitative differences in the diet of these animals, depending on habitat and time of year. Most authors refer badger to animals-euryphages that use several groups of different food origins. In particular this feature plays a decision role in the survival and reproductive success in environments, where highly specialized predators are not able to feed themselves and to feed their offspring (Ternovskiy, 1977; Flint et al., 1970).

The badger diet independently of the season and habitat is characterized by considerable diversity, but in the summer and autumn this diversity is especially high.

The badger diet consists of over 96 species of animals and more than 36 species of plants, but the individual components of the nutrition do not play the same roles. Thus in the annual badger feed balance mammals occupy only 13.3%, but according to the data from the Western regions of Ukraine number of mammals in the diet can achieve 30.7% (mainly due to rodents) (Korneyev, 1967). Birds in the badger diet in Ukraine territory, in contrast to other areas, can be found relatively rare (Flint et al., 1970). Reptiles, due to their daily activities, are very rarely revealed in the badger diet. In the annual balance of badger nutrition it is only 3.5% (mainly in spring and summer), mostly this is sand lizard (*Lacerta agilis*) and less frequently grass snake (*Natrix natrix*).

To the main components of nutrition amphibians should be included (Korneyev, 1967). Their numbers in spring and early summer reaching 44.2% of the total components of nutrition. Amphibians play a great pabular value in this period, as most of the other components of nutrition are not available. Also, a large number of amphibians remains are detected in the badger excrements at the end of July and August, when there is a way out of fry from ponds after metamorphosis. Among amphibians in Ukraine territory in the badger diet are green frogs and toads (green and grey). The total number of amphibians in the badger diet is 22%. Based on these data, we can say that just due to amphibians badgers quickly recover their strength after a winter hunger strike.

Insects and their larvae considered as one of the most common components of badger food. They are most often found in the excrements in the summer and summer-autumn period. Badger prefers insect larvae which it successfully gets through excavating soils and old stumps. Badger eats with pleasure the larvae of wasps and chafers. Most frequently among insects remains of dung beetles and chafers are found in the excrements.

Shellfish (small species of gastropods) are also found in the diet of the badger, but in a small number. Earthworms are one of the most important feed for badgers, especially in wet rainy years.

Plant components form a special group in the badger diet. Especially they play important role in summer and autumn. Most part of the plants consumed by the badger belongs to wild and domestic fruit plants (pear, apple, blackthorn, and dogwood). Also in large numbers can be oak acorns and beech nuts.

Certain role in the badger diet herbaceous plants play, notably strawberries which acquires significant importance in the growing season. In addition, badgers, which have settlements close to the crop fields, regularly visit the fields with ripe crops and willingly eat corns, oats, melons, etc. Badgers attend orchards and gardens, if they are located in the pabular region. Here they eat the fruit of cherry, apple, pear and even walnuts (Ternovskiy, 1977).

For the badger diet variability of qualitative and quantitative components is significant, depending on the season. In spring and summer the most common components are amphibians and insects (72.9%), 16.2% in this period belongs to rodents, and only 10% of the components are of plants origin.

In summer and autumn variety of components is greatly increased. Greatest diversity in this period is due to insects that are found in 97.7% of analyzed excrements. Along with insects, main food group in this period are plants, they are in 60.5% of the analyzed excrements. Rodents, as in the previous season, play a significant role in the diet. Nutritional analysis of badger by scatological method has been carried out also in some Poland regions (Borowski, 2000; Goszczynski et al., 2000). Polish authors confirm that earthworms and vegetable ingredients together form a very stable part (about $\frac{3}{4}$ of food) of badger diet. They also note the latitude and the periodicity of change in the number of consumed by badgers secondary food resources, insects and vertebrates. A significant change in the badger food components along the transition from forest to farmland was also observed. The role of animal ingredients reduced, while that of vegetal components increased.

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Представлено: Й.В.Царик / Presented by: I.V.Tsarik
Рецензент: В.В.Навроцька / Reviewer: V.V.Navrotska
Подано до редакції / Received: 14.10.2014