

RESEARCHES REGARDING PECULIARITIES OF THE FECES BELONGING TO SOME CARNIVOROUS AND INSECTIVOROUS MAMMALS

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In this paper there are presented some peculiarities of the feces belonging to some carnivorous and insectivorous mammals. A few of them are unknown in the scientific literature: the presence of the vegetable food in the nutrition of the species *Mustela putorius* Linnaeus, 1758, the existence of insects like source of food for the species *Mustela nivalis* Linnaeus, 1758, the identification of cereals like food for the species *Martes foina* Erxleben, 1777. The researches were performed in the Tinca area (Bihor county, Romania) during 2015–2016.

Key words: mammal feces, carnivorous and insectivorous, species identification, Tinca area, Romania.

INTRODUCTION

A series of mammal species present preponderant crepuscular or nocturnal activity. The knowledge of the traces left of these (trace of paw, apertures in the ground, peculiar odours, excreta, traces of their activity on the bark of the trees, etc.) conduce to the identification of respective species, being often an extraordinary experience.

The present paper wants to bring new contributions regarding the peculiarities of the scats belonging to some carnivorous and insectivorous mammals. The researches were performed in Tinca area (Bihor county), during 2015–2016.

The Tinca area is situated in the western part of Bihor county, part of the historical province Crişana, having a north-western position, referred to the Romanian territory. The hydrographic system is represented by the Crişul Negru river, the relief is hilly, the average altitude is 110 m. The vegetation belongs to the oak forest.

In Romania there were elaborated papers which include the type of food and other peculiarities of the carnivorous and insectivorous mammals (Murariu, 2000; Murariu & Munteanu, 2005).

A faunal monograph of the vertebrates from Tinca area which includes some data regarding the scats of the mammals was elaborated by Ilie (2016). A book, translated into Romanian language, treats exclusively the animals and their traces

insisting on the peculiarities of the excrements belonging to Olsen (2012). Characteristics of the mammals feces are included in the paper of Bang & Dahlstrom (1985).

MATERIAL AND METHODS

The identification of the feces was performed through open observation. The measurement of the feces was realized with the help of slide rule or a measuring tape. The analysis of their composition was performed through their division into fragments with the help of some narrow and hard objects (e.g., a piece of branch). A part of these feces were photographed.

The identification of the mammal species to which belongs the feces was performed using the papers of Bang & Dahlstrom (1985) and Olsen (2012).

RESULTS AND DISCUSSION

The researches performed during 2015–2016 in Tinca area (Bihor county) about the feces of some mammals emphasized the presence of the following species:

Mammalia Class

Insectivora Order

– *Erinaceus europaeus* Linnaeus, 1758

Scat 1: L = 2.5 cm, l = 0.8 cm, contained only elytrons of Carabidae (Coleoptera): *Harpalus* Latreille, 1802 and *Pterostichus* Bonelli, 1810 genera; Tinca, March 4, 2016.

Scat 2: L = 6.2 cm, l = 0.7 cm, contained only seeds of fruits; Tinca, July 12, 2015.

Scat 3: L = 4 cm, l = 1 cm, contained elytrons of carabids (*Harpalus* Latr., *Pterostichus* Bon.); Tinca, June 15, 2016 (Fig. 1).

Scat 4: L = 3.1 cm, l = 1 cm, contained the remains of a specimen of *Gryllotalpa gryllotalpa* Linnaeus, 1758 (Orthoptera: Gryllotalpidae) as well as the remains of carabid coleopterans (elytron, pronotum, antenna); Tinca, June 20, 2016.

Scat 5: L = 4 cm, l = 1.1 cm and excrement 6: L = 4.5 cm, l = 1 cm, contained remains belonging of a beetle from Cerambycidae and Carabidae families (Coleoptera), as well as of two specimens of Chrysomelidae family: *Chrysolina sturmi* Westhoff, 1882 (one male and one female); Tinca, June 24, 2016.

Scat 7: L = 4.5 cm, l = 1.1 cm, contained remains of *Gryllotalpa gryllotalpa* L. as well as remains of Carabidae; Tinca, June 24, 2016.

Scat 8: L = 3.5 cm, l = 0.8 cm, contained remains of *Gryllus campestris* Linnaeus, 1758 (Orthoptera: Gryllidae) as well as remains of little Carabidae.



Fig. 1. Feces of *Erinaceus europaeus* L.

Scat 9: L = 3 cm, l = 0.6 cm, presented same content like anterior feces.

Scat 10: L = 5 cm, l = 1 cm, contained remains of cricket and seeds of spontaneous Graminaceae. The excrements 7, 8, 9 were observed at Tinca, June 25, 2016.

Data regarding the dimensions and the content of these feces correspond to the data mentioned in the scientific literature and point out the importance of this mammal in the biological pest control in agriculture.

Carnivora Order

– *Vulpes vulpes* Linnaeus, 1758

Scat 1: L = 5 cm, l = 1.3 cm, contained seeds of spontaneous Graminaceae as well as pronotum and elytron of female stag beetle, *Lucanus cervus* Linnaeus, 1758 (Coleoptera: Lucanidae); Tinca forest, June 27, 2016.

In this case too, the dimension and the content of excrement correspond to the scientific literature.

– *Mustela putorius* Linnaeus, 1758

Scat 1: L = 5.6 cm, l = 0.7 cm, contained only seeds of dwindling, withered grapes; Tinca, March 3, 2016.

The presence of the grapes's seeds we can explain through the fact that nearness there is an abandoned house, the grapes being not gathered, fallen on the earth. Also, the presence of a vegetable remains in the excrements of this species represent a scientific newness because the scientific literature previously mentioned indicates only animal food.

Scat 2: L = 6.5 cm, l = 0.9 cm, contained remains of some carabid coleopterans and of one cerambicid coleopteran; Tinca, September 1, 2016.

– *Martes foina* Erxleben, 1777

Scat 1, 2, 3: L = 8 cm, l = 1.5 cm. Each scat was broken in two pieces (each piece having L = 4 cm) and there were situated in the nearly points, at a distance of 20 cm compared to others. This positioning could indicate a territory marking. The

feces contained only seeds and skin as well as grains of maize. The observation was performed on a turf land from personal court, Tinca, November 19, 2016 (Fig. 2).



Fig. 2. Feces of *Martes foina* Erx.

Scat 4,5: L = 7.7–8.2 cm, l = 1.3 cm, contained remains of pens (rachis) only pens, numerous grains of wheat, claws of tree sparrow (*Passer montanus* Linnaeus, 1758) and only the scaled skin from her fingers.

Scat 5, 6: L = 4.6 – 5.1 cm, l = 1.2–1.5 cm, contained masticated grains of maize.

Scat 7: L = 4 cm, l = 1.5 cm.

Scat 8: L = 8.1 cm, l = 1.3 cm.

Both feces contained masticated grains of maize and grapes seeds.

The three groups of feces (4.5; 5.6; 7.8) were at distance of 2.20 meters, respectively 2.50 meters, compared to others and probably this is territory marking.

Long masticate of food before deglutition (Murariu & Munteanu, 2005) is attested by the identification of masticated grains of maize, but only partial, while the grains of wheat, having more reduced dimensions, were left unbroken. Also, the presence of cereal grains like food of this species is not indicated in the scientific literature, being mentioned only the seeds of different fruits.

Near these feces another little piece of feces was observed which did not contain vegetable or animal remains, but above of this was a beetle demifrozen belonging to species *Harmonia axyridis* Pallas, 1773 (Coleoptera: Coccinellidae).

There are not data regarding the attraction of Coccinellidae compared to excrements than in very rare cases, because the liquid resulted from the feces in putrefaction. All these excrements were observed in the personal court; Tinca, February 18, 2016.

Scat 9: L = 8 cm, l = 1.4 cm, contained a beak and the scaled skin from the fingers of one juvenile specimen of hen; Tinca, February 25, 2016 (personal yard) (Fig. 3).



Fig. 3. Feces of *Martes foinea* Erx.

Scat 10: L = 8.3 cm, l = 2 cm, contained a grain of maize partially masticated, a claw of hen, the scaled skin from one finger, a rodent hair (probably resulted from a mouse) and an apple drying skin, Tinca, March 3, 2016.

Scat 11: L = 8.1 cm, l = 1.4 cm, contained rodent hair, remains of carabid coleopterans, Tinca, April 15, 2016 (personal yard).

Scat 11: L = 9.5 cm, l = 1.5 cm, contained only remains of one juvenile specimen of hen (pens and rachis of pens, a part of beak, claws); Tinca, September 17, 2016 (personal yard).

We observe a similitude regarding the dimensions of the excrements compared to data from scientific literature.

But there are new data regarding the food (the presence of cereal grains) and the aspect regarding the mastication of her (the food with little dimensions is not masticated or only partial).

– *Mustela erminea* Linnaeus, 1758

Scat 1: L = 4.5 cm, l = 0.5 cm, contained fruit seeds and a stone of cherry, Tinca, July 14, 2016.

Scat 2: L = 2 cm, l = 0.5 cm, contained only remains of carabids (*Pterostichus* Bon.), Tinca, June 27, 2016.

Scat 3: L = 2.2 cm, l = 0.5 cm, contained remains of carabid coleopterans as well as pronotum and elytrons of a beetle belonging to species *Labidostomis longimana* Linnaeus, 1761 (Coleoptera: Chrysomelidae); Tinca, June 27, 2016.

Scat 4: L = 1.5 cm, l = 0.5 cm, and excrement 5: L = 2 cm, l = 0.5 cm, contained remains of carabid coleopterans; Tinca, June 29, 2016.

Scat 5: L = 1.6 cm, l = 0.4 cm, contained remains of some carabid coleopterans pronotum; Tinca, September 9, 2016.

The analysis of the excrements dimensions demonstrates a relative discrepancy between the data registered from land and the data from the paper of Olsen (2012).

In this paper it is specified a length of the excrements comprised between 4–8 cm, fact not found in reality, but the breadth is alike.

The data obtained from land correspond with the idea presented in the book of Bang and Dahlstrom, who affirm that the excrements of ermine could have a variable length, but the breadth is approximately 0.5 cm.

Regarding the composition of excrements, it is noticed the predominance of insects, fact which proves a relative diminution of the number of rodents and a high accessibility at the food formed from insects. I mention that out the feces described in this paper I discover almost every day 4–5 feces, in different locations of Tinca village, having length between 1.5 – 2.5 cm, breadth 0.5 cm, all contained only remains of coleopterans.

Sometimes the presence only of insects remains in the scats could explain their relatively reduced dimensions, compared to the data indicated by Olsen (2012), the food of ermine being formed generally from rodents, more rarely big animals (hares, pheasants, roe deers) sometimes only insects, birds, fruits, eggs of birds.

– *Mustela nivalis* Linnaeus, 1758

Scat 1: L = 2.2 cm, l = 0.2 cm, contained hair of rodents (probably *Microtus arvalis* Pallas, 1779); Tinca, June, 2015.

Scat 2: L = 1.2 cm, l = 0.3 cm, contained only pronotum of some little carabid coleopterans; Tinca, June 12, 2016 (personal yard) (Fig. 4).



Fig. 4. Feces of *Mustela nivalis* L.

Scat 3: L = 2 cm, l = 0.3 cm and scat 4: L = 2 cm, l = 0.3 cm, both contained only the hair of some rodents; Tinca, June 12, 2016 (personal yard).

The analysis of the excrement's dimensions of common marten demonstrates alike results compared to the feces of ermine: the values of the breadth are characteristic, the length being variable depending on the type of food (it is more reduced in the case of the food formed from insects only).

On the other side, the feces of common marten were in the same territory with the excrements of ermine, at a little distance (6 meters), partially contradicting the observations of Olsen (2012). Olsen affirms that the ermine does not tolerate the presence of the common marten on her territory, because she has the same food like the common marten. The presence of both species was more observed by Ilie. The author identified the two types of feces at little distance and traces in snow of both species during the winter.

However, in the same territory, the presence of the feces and the traces of common marten is very rare compared to the number of feces of ermine which were observed almost daily, explaining the intolerance of the ermine compared to common marten in the respective territory.

The presence of insects remains in the feces of common marten represent a scientific newness, literature does not mention insects like food of this species.

A synthesis of the data presented in this paper is represented in Table 1.

Table 1

The characterization of the feces of some insectivorous and carnivorous mammals

| Species | Dimensions | Content |
|----------------------------|----------------------------------|---|
| <i>Erinaceus europaeus</i> | L=2.5–6.2 cm l= 0.6–1.1 cm | Insects, Graminaceae seeds |
| <i>Vulpes vulpes</i> | L= 5 cm l = 1.3 cm | Insects, Graminaceae seeds |
| <i>Mustela putorius</i> | L=5.6–6.5 cm l= 0.7–0.9 cm | Grapes seeds, insects |
| <i>Martes foina</i> | L = 4–9.5 cm l=1.2–2 cm | Seeds, cereal grains, remains of birds (claws, pens, skin), hair of rodents |
| <i>Mustela erminea</i> | L = 1.5–4.5 cm l = 0.4–0.5 cm | Seeds, insects |
| <i>Mustela nivalis</i> | L = 1.2–2.2 cm l = 0.2–0.3 cm | Hair of rodents, insects |

CONCLUSIONS

The analysis of the feces of some insectivorous and carnivorous mammals emphasizes the followings:

The feces presented generally the dimensions indicated in the scientific literature, some reductions of their length are noticed in the case of the feces which contains numerous remains of insects (ermine, common marten). In these cases the

dimensions of the feces breadth are principal, thus it could identify the species which belong to these feces.

The presence of the vegetable food in the feeding of *Mustela putorius* L.

The identification of the cereal grains like food for the species *Martes foina* Erx.

The attraction of some Coccinellidae (Coleoptera) for the feces.

The intolerance in the same territory of the species *Mustela erminea* L. and *Mustela nivalis* L. because of the competition for food.

The existence of insects like source of food for the species *Mustela nivalis* L.

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