



Original Contribution

**FACTORS INFLUENCING THE MORTALITY OF
STONE MARTEN (*Martes foina*) IN ROAD ACCIDENTS**

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ABSTRACT

Studies on road mortality in Mustelidae family in Bulgaria have not been conducted. Data have been collected on a monthly basis on some parts of the national road network. The location of each road accident has been determined as distance from the settlement, type of vegetation around it and according to the road class. Seasonality is observed in the number of road accidents with martens, in summer during the mating period they are the most frequent. In addition to the season factors such as type of vegetation along the road and speed of the road vehicles affect the frequency of road accidents. It is recommended to lay tubes in the embankment facilities along natural pathways of the marten in order to protect it.

Key words: Mustelidae, Bulgaria, road network, vegetation, seasonality

INTRODUCTION

Among the numerous forms of transforming the natural environment the construction and maintenance of roads has been a major one in the past century. The road network affects the living organisms both directly and indirectly by increasing the mortality in road accidents. This form of mortality may have a significant effect on the population demography of many species (1). The number of badges in the Netherlands has decreased with the increase of the number of roads (2).

In Bulgaria the marten dwells in rocky places, outskirts of deciduous forests, ravines, creeks, river slopes, unused irrigation canals, old quarries and arable lands. Its range of occurrence is very wide, in the mountains it reaches up to the upper boundary of the forest (3, 4). It is in the list of species that are subject of hunting in our country (5). Its large-scale occurrence, the rambling lifestyle and its nocturnal activity are a

prerequisite for the numerous road accidents. Studies on that type of mortality in Mustelidae family in our country have not been conducted except for the otter (6)

MATERIAL AND METHODS

Data have been collected on a monthly basis on some parts of the national road network (**Figure 1**). The studied lot comprises 244 km highway, 530 km first-class road and 180 km second-class roads in the mountainous, semi-mountainous and lowland part of the country. The route has been toured twice a month by specialists employed in dermoplastic laboratories at the natural science museums in Varna, Plovdiv and at Trakia University, Stara Zagora. Additional information was used from specialists at the State Forestry in Stara Zagora and regular hunters. The location of each road accident has been determined as distance from the settlement (within its borders, up to 300 m from it, from 300 to 1000 meters and over 1000 m), type of vegetation around it (forest, bushes or open space) and according to the road class (highway, first and second class). The sex of 64 of the killed animals has been determined.

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RESULTS AND DISCUSSION

A total of 89 cases of road accidents with martens on part of the national road network have been registered (**Figure 1**) (**Table 1**). Their monthly distribution shows a clearly defined peak in June, July and August – 55.1% (49 cases). The reproductive period of the marten is in mid-summer – June and July. The increased

locomotory activity is the possible reason for the more frequent road accidents during that period. Determining the sex of all summer samples was not possible due to the poor state of some of them, but in 39 of the cases male specimens (74% or 29 pcs.) were considerably predominant than female ones (26% or 9 pcs.).

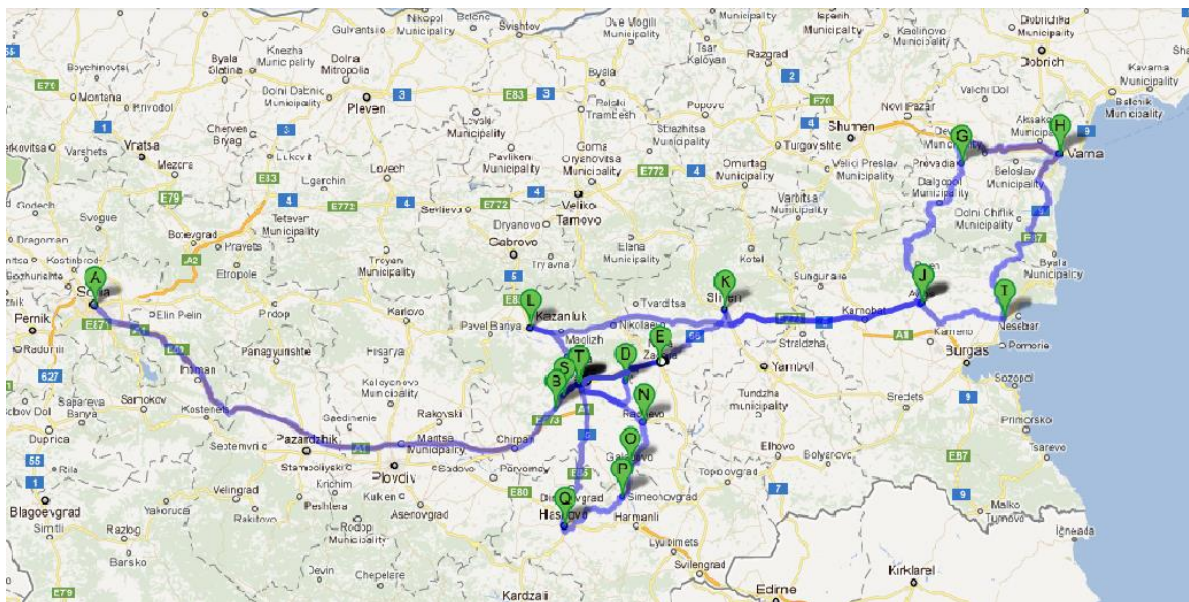


Figure 1. Part of the national road network – study area.

In September, October and November road accidents with martens stayed at relatively permanent but lower level (**Figure 2**). Due to understandable reasons determining the age by the development or abrasion of teeth was not always possible. Judging by the overall state and proportions of the body, great numbers of the carcasses from August to November were of young animals. The possible reason about that is

that young specimens start relocating in search of their own individual areas as early as the end of summer. They are less experienced, enter new territories and it is difficult for them to perceive vehicle traffic as a threat. In Portugal the fox and marten give the greatest number of victims among small predators and these are basically young animals (7).

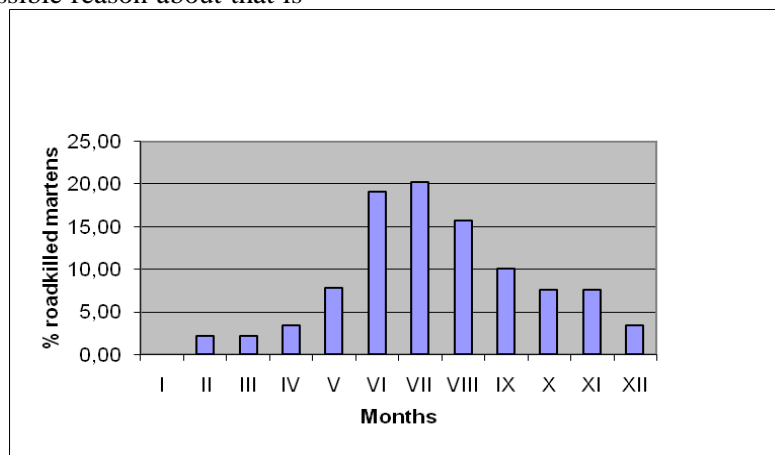


Figure 2. Distribution of marten casualties by months.

The cases of run over martens in winter were the least in number – a total of 5,6% (5 pcs.), in January not a single one was recorded. In April they were 3, 37% (3 pcs.), in May –7, 86% (7 pcs.) (**Figure 2**) Of all 89 cases it was possible to determine the sex of 63 carcasses. Of these 77.8% (49 pcs.) were of male and 22.2% (14 pcs.) – of female animals. There could be two reasons accounting for that correlation, more than 3, 5 to 1 in favour of the male ones: predominance of male animals in the population or their greater activity (8). The present study is not sufficient to give an answer to that question.

In order to establish the effect of roadside vegetation on the probability of road accidents, we excluded from the entire number of samples those in settlements – 8 pcs. (**Table 1**). We used 81 cases as basis for the percentage allocation of road accidents to the adjoining vegetation. Amongst them 24,7% (20 pcs.) were in forest areas, 23,4% (19 pcs.) in bushy area. The more frequent accidents are in open space – 51,8 % (42 pcs.) are probably related to the preferences of the marten to that type of habitats. It avoids dense forests and the inside of forests and it is more commonly found on their brim and in the open landscape. (9, 4).

Table 1. Distribution of the number of road accidents in marten according to: season, adjacent roadside vegetation, distance from the settlement and road class

Factor of influence		Number of road accidents	% of road accidents
<i>season</i>	spring	12	13,5
	summer	49	55,1
	autumn	23	25,8
	winter	5	5,6
<i>roadside vegetation</i>	settlement	8	excluded from the excerpt
	forest	20	2,47
	bushes	19	23,4
	open space habitat	42	51,9
<i>distance from settlement</i>	within settlement	8	9,0
	up to 300 m	15	16,8
	from 300 to 1000 m	18	20,2
	over 1000 m	48	54,0
<i>road class</i>	highway	23	25,8
	first class	56	63,0
	second class	10	11,2

A great number of road accidents with martens happen at a distance not more than 1 km from settlements and within the settlements – 53,9% (48 pcs.) (**Table 1**). An interesting fact is that in cities and villages martens that are victims of the road traffic can also be seen. This takes place close to abandoned buildings, parks and farm yards. It is known that the marten takes advantage of the shelters and the food provided by human activity. It settles in European cities and villages (10, 11, 12, 13). Three of the cases described in the present study are at the same place in the town of Stara Zagora, on a bridge

over the railway line to the industrial area. It is often crossed by martens. Three run over animals have been found at a specific place. Taking into consideration the location of the road compared to the terrain characteristics outside settlements it has been established that accidents take place in proximity to bridges. The paths along which martens move are on both sides along rivers and creeks (own observations). Carcasses of martens are found mostly where the road crosses similar barriers. These are the places where tubes should be planned and laid under the asphalt pavement for martens and other animals to cross (**Figure 3**).

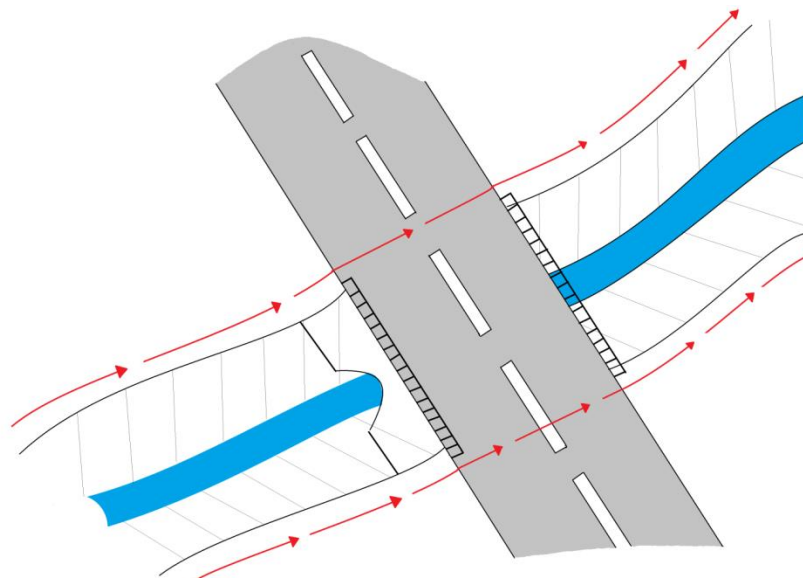


Figure 3. Areas with highest frequency of road accidents.
(Red arrows indicate the path of the martens.)

The frequency of road accidents is a function of vehicle speed. It is normal to think that it is related to the respective road class. Samples collected from highway and first-class roads comprise a total of 88,8% (79 pcs.) of all. Only 11,2 % (10 pcs.) have been recorded on the second-class road network (**Table 1**). A marten has the size of a small cat. From the height of its eyesight it is difficult for it to assess the speed at which vehicles rush. Speed plays a significant role in the mortality of that animal (1).

In mountainous areas where the road meanders and vehicles move slowly accidents are almost non-existent. This is typical of some Balkan passes, for example the Aytos pass – part of the study region. In regard to that, the report on the density of the marten population by counting the animals killed on the road could give erroneous results. Taking the example of the fox, (14) found that counting wild predators by the road accidents is an inaccurate method that needs improvement (verification). Only the ones lying on the road lane are recorded and those thrown off it or that were wounded and died later are not noticed (15,16).

CONCLUSIONS AND RECOMMENDATIONS

Seasonality is observed in the number of road accidents with martens, in summer during the mating period they are the most frequent. In addition to the season factors such as type of

vegetation along the road and speed of the road vehicles affect the frequency of road accidents.

The greatest number of accidents takes place on locations where the road passes over rivers and creeks. It is recommended to lay tubes in the embankment facilities along natural pathways of the marten in order to protect it.

The mechanical counting of killed martens on the roads cannot be a criterion about the number and density of the population in a given areas.

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