

# Examination of the Nasal Botfly (*Cephenemyia stimulator*, Clark, 1815) in the Roe Deer (*Capreolus capreolus*, Linnaeus, 1758), in Hungary

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## Abstract

We examined roe deer in the southern part of Hungary, in different habitats, in the last two hunting seasons. The subject of the examination was the nasal botfly (*Cephenemyia stimulator*) larvae in the roe deer. We examined to what extent the larva influences key parameters of the roe deer. We researched the skulls of roe deer and we found the different developmental instar larvae. We collected all possible data about these roe deer: the age, the body weight, the condition, the sex and the trophy (antler) weight in case of the bucks. We analyzed and classified the collected and calculated data and specified the typical indicators of parasitology, e.g. the number of infected roe deer, the proportion of infected roe deer, the number of larvae, the parasitism, the prevalence, the mean intensity.

**Keywords:** botfly, *Cephenemyia stimulator*, larva, parasitology, roe deer

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## 1. Introduction

Many hunters think that botfly larva has a particularly negative effect on the roe deer population.

Researchers in this topic do not have common standpoint in this respect.

The health status of roe deer depends on many factors, with one of the most important of these being parasitic diseases. There is some information on the occurrence of botflies from the *Cephenemyia stimulator* (CLARK, 1815). These parasites can cause health problems, resulting in the weakening of trophies (skulls), reduced carcass weight or even death; they can also affect the behaviour of the host [1].

It is not unique for people travelling in Hungary to spot the roe deer by roads, as it is the most widespread game species in the country.

The roe deer (*Capreolus capreolus*) is the most typical ungulate species to be found in Hungary.

Its most preferred habitat is the ecotone zone situated between forests and open fields [1].

The roe deer - especially bucks – takes a significant place in our wildlife management. One of the conditions of good quality roe deer populations is proper animal health state. In order to achieve this aim, it is very important to know the diseases that influence the roe deer's general health state the most. We are investigating one of the parasitic diseases, namely the occurrence of a botfly, *Cephenemyia stimulator* larvae, ranged among the Oestridae family.

On the basis of domestic observation we can speak of the occurrence of a significant country-wide parasite infestation. Earlier examinations showed a 71.7% infestation level of roe deer, and the average intensity amount was 12 specimen [2]. According to the most recent Hungarian research, on the contrary, has shown different results. Király and Egri inform us in their works that the prevalence in roe deer was 34.8% in 2002, while

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it was 38.5% in 2003 considering Tolna county. Mean intensity amount was 8.7 in 2002 and 9,8 in 2003 [3-5]. Opinion is split in respect to what degree parasite larvae damage the host organism. According to Minár, in the young age group we can count on significant damage [6]. Sugár in contrast does not consider the presence of larvae significant [2, 7].

## 2. Materials and methods

We collected the samples necessary for research in 2014 and in 2015 from the middle of April till the end of September, in the lands of four wildlife management regions, primarily in the southern parts of the Great Plain.

We examined 111 roe deer bucks altogether, in which we found 239 botfly larvae, in second and third instar form. The samples ready for examination were specimen cut into small skulls, rarely big skulls. The main aspect during larva collection was to find all infected individuals and each and every larvae. At the same time we noted the individual's identification data, the eviscerated body weight, later on the age, the condition, the weight of the trophy. We defined the collected botfly larvae by stereomicroscope, in which the descriptions of Papp and Szappanos[8], as well as Minár [6] oriented us.

From the data such gained we calculated the characteristic botfly larva indices:

- prevalence %: infected/examined specimen
- mean intensity: number of larvae found/number of individuals carrying larvae. Statistics were performed using SPSS for Windows 15.0. and QP3.0 programme package [9].

We created three age groups for further analysis, on the basis of trophy judgement ages:

- young: 1-3 years
- middle-aged: 4-5 years
- old: 6 years and above.

## 3. Results and discussion

All infected animals were found to be *Cephenemyia stimulator* larvae. We could not identify other larvae belonging to the Diptera species. During the research we investigated the occurrence of botfly larvae in roe deer in a two-year period. Some of the results of the study are in line with our own previous results, but we found

differences in other cases. We summarized the detailed figures in Table 1.

We examined 111 pieces roe deer bucks skulls in the 2 years, 63 bucks skulls in 2014 and 48 pieces in 2015. Out of 111 bucks 27 were infected by botfly larvae, 16 individuals in 2014 and 11 in 2015. We collected 239 botfly larvae, 146 pieces in 2014 and 93 pieces in 2015. The prevalence levels did not show any significant difference, there are were 25.4% in 2014 and 22.9% in 2015. There is difference in the main intensity, apparently. Between the 9.1 pieces in 2014 and 8.5 pieces in 2015 there is no significant difference. There is no statistically significant difference in the data of the two examined years either in the standard deviation or in the minimum or maximum values.

Literature data on the prevalence of nasal bots in roe deer range between a maximum of 70.8% , and a minimum of 11.1–25.6 % in Hungary [5].

In Király and Egri's inquiries the prevalence ranged between 11.1% in Komárom county (N = 9) and 76.9% in Bács-Kiskun county (N = 13). Mean intensity was highest in Szolnok county (19.0; N = 14) and lowest in Veszprém county (3.9; N = 55) [5]. As it can be seen, there can be great differences between the infection rate of the roe deer populations living in different habitats, even in one and the same country.

Salaba et al. conducted studies in the Czech Republic during the period 1999–2006. They confirmed the presence of *Cephenemyia stimulator* in 146 out of the 503 roe deer surveyed, with a prevalence of 28.8% and intensity of infection ranging from 6 to 11 larvae per host. The prevalence ranged from 16.1 to 42.9% per year, and the mean intensity from 6 to 11 larvae per animal [10].

According to previous studies in Poland, Dudzinski has found a correlation between the intensity of *Cephenemyia stimulator* larva infection and the sex or age of the host. He concluded that males were more frequently attacked than females, and young individuals were more sensitive to infection with larvae than older animals [11]. In contrast to his findings Slawomir et al. very recent study has confirmed that only older males of roe deer were infected by *Cephenemyia stimulator*[1].

There is a new parasitology research conducted in Spain, where they examine the throat botfly too. They did not publish information about the

prevalence in relation of age and sex. On the contrary, they found the prevalence of this myiasis is very much influenced by weather conditions [12].

We also carried out the age group analysis (Table 2). We examined 21 young, 28 middle aged and 14 old roe deer bucks in 2014. Prevalence % has a similar value in all three age groups: 23.8%, 25.0% and 28.6%. The mean intensity shows serious differences between young and old bucks

( $P < 5\%$ ). The differences between young and middle-aged and middle-aged and old groups do not represent significant differences. Prevalence% indicators show similarity in 2015, in all three age groups: 23.5%, 21.7% and 25.0%. We did not find statistically meaningful differences between the age groups or the years. In 2015 the mean intensity shows serious differences between young and old bucks and middle aged and old bucks have significant differences, too ( $P < 5\%$ ).

**Table 1.** Detailed figures of roe deer nasal bot fly infection (years)

Indicators	2014	2015
Number of examine specimen (n)	63	48
Larva carrier (n)	16	11
Prevalence (%)	25.4	22.9
All larvae (n)	146	93
Mean intensity (n)	9.1	8.5
Spread (n)	8.02	6.9
Variance	64.32	47.61
Minimum (n)	1	1
Maximum (n)	18	16

**Table 2.** Nasal botfly infestation of roe-bucks by age group (years)

Indicators	2014			2015		
	Young	Middle aged	Old	Young	Middle aged	Old
Number of bucks (n)	21	28	14	17	23	8
Larva carrier (n)	5	7	4	4	5	2
Prevalence (%)	23.8	25.0	28.6	23.5	21.7	25.0
All larvae (n)	57	63	26	41	46	6
Mean intensity (n)	11.4	9.0	6.5	10.3	9.2	3.0

In Király and Egri studies the infestation indices were significantly higher in kids than in adult roe deer of both sexes (prevalence:  $P = 0.005$  and median intensity:  $P = 0.000$ ). On the other hand, prevalence ( $P = 0.457$ ) and intensity ( $P = 0.289$ ) did not differ among young, middle-aged and old bucks. Intensity was significantly higher in bucks than in does ( $P = 0.016$ ) [5].

In the above cited study, the authors found that infestation indices were all significantly higher in fawns. They attributed it either to the fawns' less efficient immune response, or – alternatively– to their less efficient defensive behavior against swarming flies. Higher prevalence and intensity of nasal bots in fawns are considered to be consistent with results of a previous study by Király and Egri. Similarly, higher intensity of nasal bots in fawns than in adults had been reported in Red deer in Hungary [5].

According to Király and Egri, on the contrary, nasal bot prevalence was significantly lower in

fawns than in adults of Red and Fallow deer (*Cervus dama*) in Southern Spain. Other age-related differences in the epidemiological indices of Roe deer are not known, with the exception of a study by Vaca ( $P < 5\%$ ) who reported higher prevalence and mean intensity of *Cephenemyia stimulator* in yearlings than in older individuals [13].

#### 4. Conclusions

We have not found any significant differences in relation to either of the parasitological indicators among the 2014 and 2015 years' data. Neither prevalence nor mean intensity differ immensely, statistically displayable form if we compare the two years.

If we take age groups into consideration, we can state that prevalence levels do not show statistically displayable differences. This is true for both 2014 and 2015 data.

On the contrary, if we examine mean intensity in 2014, we find significant differences between young and old bucks. Young and middle-aged bucks and middle-aged and old bucks will show differences which are not significant.

In year 2015, the situation is similar in the case of mean intensity, furthermore young and old, as well as middle-aged and old bucks will have significant differences, too.

In respect of young and middle-aged bucks, we got very close indicators of mean intensity.

It could be seen in both years that prevalence was the highest in old bucks, but on the other hand the mean intensity was the lowest.

The authors offer several explanations for the higher infestation bucks. Briefly, bucks are believed to have a reduced resistance for a longer period of time as a result of condition loss during the mating season. Developing antlers also has high energy requirements acting against resistance. In the case of roe deer, the territorial behaviour of bucks is also to be taken into account, which causes high stress and, as a consequence, energy loss[5].

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