



## The presence of deer ked (*Lipoptena cervi*, Linnaeus, 1758) in Balkan chamois from the National Park Sutjeska, Bosnia and Herzegovina

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### ABSTRACT

This case study describes the presence of a deer ked (*Lipoptena cervi*, Linnaeus, 1758) in the Balkan chamois (*Rupicapra rupicapra balcanica*) from the area of the National Park „Sutjeska“, Bosnia and Herzegovina (B&H). This is the first finding of this ectoparasite in this animal species in B&H, which indicates that deer ked has significant adaptive abilities to different animal hosts.

### 1. Introduction

Deer ked or *Lipoptena cervi* (Linnaeus, 1758) represents an obligate haematophagous ectoparasite of mainly cervides including but not limited to: roe deer (*Capreolus capreolus*), red deer (*Cervus elaphus*) and white-tailed deer (*Odocoileus virginianus*) (Hodžić et al., 2012). This haematophagous insect is widespread throughout Europe, China, North Africa and North America, but it can also infect horses and cattle which has been recorded in America (Dehio et al., 2004). Deer ked has so far been registered in several cases in the territory of Bosnia and Herzegovina, and for the first time it was found in 1965 in a roe deer from the area of central Bosnia (Delić et al., 1965). The second case was the finding of this parasite in roe deer from the territory of the municipality of Bihać (Hodžić et al., 2012). There are no literature data on this parasite in Balkan chamois (*Rupicapra rupicapra balcanica*) from the territory of B&H. In addition, the occurrence of deer ked on chamois is a rare finding and has been recorded in several cases in the world. A study in Northern Italy noted that this parasite may be present in the Alpine chamois (Bianchi et al., 2016). The species *Melophagus ovinus* (Linnaeus, 1758) and *Melophagus rupicaprinus* (Rondani, 1879), from the Hippoboscidae family, were common finding in chamois (Bianchi et al., 2016). Furthermore, examination of ectoparasites in the Alpine chamois from the territory of Germany confirmed the presence of deer keds - *Lipoptena cervi* (Schlegel, 2013). Also, there is a report of *Lipoptena cervi* presence in *Rupicapra pyrenaica parva* from Leon province - Northern Spain

(Diez-Baños, 1999). Mentioned surveys noted that deer ked is low prevalent in chamois across Europe. The genetic diversity of the *L. cervi* population in Central Europe suggests the presence of common ancestors and continuous migrations (gene flows) across countries (Galecki et al., 2021).

It is believed that deer ked possesses remarkable adaptive capacity for new, non-specific hosts, such as mouflons and chamois (Bianchi et al., 2016). This parasite can accidentally infect humans, in most cases there is only a sting which causes dermatitis, but it does not have the ability to reproduce on humans (Dehio et al., 2004; Hodžić et al., 2012). In addition to the mechanical effect (nuisance) on the host, it has been shown that deer keds may be vectors for gram negative and intracellular bacteria of the genus *Bartonella* (Hodžić et al., 2012).

Balkan chamois is a subspecies that inhabit primeval habitats in our mountainous areas, as well as steep canyons of mountain rivers in Bosnia and Herzegovina. They are very unpretentious in nutrition, but very demanding when it comes to their habitat as they need quiet areas. The number of this very noble species has been declining in B&H since the end of the 19th century, but the alarming fact is that the number of chamois in the territory of B&H from 1992, when the population amounted to about 5700 individuals, reduced to less than 2.000 chamois throughout the country. A drastic fall in the number of chamois is not caused by the predators, nor by some disease. This decline in the number is caused mostly by anthropogenic impacts, that is by destroying the specific habitats of chamois.

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This paper describes the finding of *Lipoptena cervi* (Linnaeus, 1758) on the Balkan chamois in the area of the National Park Sutjeska, B&H.

## 2. Case description and discussion

The National Park “Sutjeska” extends over an area of about 17. 500 ha with chamois present all year long in the park, and the population located in NP “Sutjeska” makes the largest part of the entire population of chamois in the territory of B&H. Depending on the weather and the season and because of the life needs and influences of seasonal changes, chamois stay only in certain areas of the park. The highest concentration of chamois in the area of NP “Sutjeska” is also a reflection of more frequent disturbance in surrounding areas, caused by anthropogenic factors. These disturbances are mainly caused by nomadic farming, exploitation of forest, hunting, intrusions and disturbances by poachers, the presence of too many mushrooms foragers. Some of the most significant habitats of chamois in NP “Sutjeska” are the localities of Bregoca, Kozja strana, Orufa, Treskavac, Boška glava, Uglješin vrh, Ardov, Planinica, Jabučke stijene, Vilinjak, Siljevica, Sutjeska river and Hrčavka canyons, Maglič, Perućica, Sniježnica and others. The area of “Sutjeska” NP has a centuries-old tradition of special protection, since in 1893 the Austro-Hungarian occupation authorities established a special protection regime which is still in force. Currently, there are about 800 chamois in the area of NP “Sutjeska” and special hunting ground “Zelengora”, managed by the National Park “Sutjeska” and the population in this area is stable. It is of particular importance that this number increases constantly and moves towards the limit of the optimal number of chamois for this area. Possible hunting of individual animals in the NP “Sutjeska” area is allowed only in terms of sanitary or breeding justification, in accordance with applicable hunting laws.

Since 2017, a certain number of hunted chamois have been monitored for the presence of endo and ectoparasites in the territory of Republika Srpska. During 2017 and 2018, nine hunted chamois were tested for the presence of the most important parasitic diseases. Out of a total of nine chamois, eight chamois originated from the area of the National Park “Sutjeska”, while one of them originated from the hunting area in Višegrad. By examining the skin of the hunted animal, a diptera (one specimen) was found and it was sampled and delivered in 70% alcohol to the PI Veterinary Institute “Dr Vaso Butozan” Banja Luka for parasitological examination. Ectoparasite was collected on carcass of the male chamois, which was seven years old from the location Kozije strane - Zelengora (43.358517, 18.580779).

The specimen was observed under a stereo microscope and morphological determination of ectoparasite was performed according to the basic keys (Maa, 1965) and recent descriptions of Hippoboscidae in deer (Andreani et al., 2018) and chamois (Bianchi et al., 2016).

On the basis of the morphological traits, the presence of female *Lipoptena cervi* (Linnaeus, 1758) was recorded - Figs. 1–2. Adult female deer fly was 5 mm long, brown with a dorso-ventrally flattened body and three pairs of legs. The legs end with stong claws. It has segmented body with three main parts: head, thorax, and abdomen with visible stripes. The body is covered with hair and so-called “setae” which along with other morphological characteristics (head and sternite shape, shape and size of the mouthpart, differentiation of the dorsal part of the thorax, etc.) serve to distinguish this species in the genus *Lipoptena* (Andreani et al., 2018).

Adult deer keds are bad flyers and gradually lose their wings after landing on the host, but according to the literature, this parasite can spread rapidly in certain geographical areas (Hodžić et al., 2012). This finding suggests that the *Lipoptena cervi* has significant adaptive ability for a variety of ruminant hosts with findings in: fallow deer (*Dama dama*), sika deer (*Cervus nippon*) and elk (*Cervus canadensis*), reindeer (*Rangifer tarandus tarandus*) and moose (*Alces alces*) (Madslie et al., 2011; Kynkaanniemi et al., 2014; Bianchi et al., 2016), therefore this parasite is likely to expand further in the territory of B&H (Hodžić et al., 2012). The presence and distribution of *Lipoptena cervi* in wild



Fig. 1. Ventral side - *Lipoptena cervi*.



Fig. 2. The head of *Lipoptena cervi*.

ruminants is not only a mechanical disturbance but also a risk factor for the possible transmission of, *Borrelia burgdorferi* (Buss et al., 2016) and *Bartonella schoenbuchensis* (Dehio et al., 2004) with questionable vector role for *Anaplasma phagocytophilum* and *Rickettsia* species (de Bruin et al., 2015).

Besides *Lipoptena cervi*, especially in central Europe (Czech Republic, Poland, Slovakia) *Lipoptena fortisetosa* (Bianchi et al., 2016) can be found. According to the basic description by Bianchi et al. (2016), the

typical arrangement of setae on the dorsal thorax is an essential factor in the morphological difference of these two species. A detailed morphological analysis of these two species from the Hippoboscidae family was given by a group of authors from Italy (Andreani et al., 2018). Considering the presence of these ectoparasites on chamois population in the National Park “Sutjeska”, it is necessary to pay attention to unusual changes in health status of this noble wildlife as these changes can potentially be associated with vector-borne diseases.

This finding confirms the need for a detailed epidemiological investigation in order to establish prevalence, distribution and species diversity of Hippoboscidae in B&H. Poor health status of chamois can endanger still insufficiently stable number of this species in the territory of Bosnia and Herzegovina.

#### Declaration of competing interest

The authors declare no conflict of interest.

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