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Helminths of Wild Boars Hunting in the Belgrade Area

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Abstract

There are multiple areas in the vicinity of Belgrade that are inhabited by wild boars. The aim of the current study was to the investigation of biodiversity and prevalence of intestinal and pulmonary helminths of wild swine in the broader Belgrade area. The study was carried out on 47 wild boars (14 males and 33 females), shot by authorized hunters, and collected during the hunting period between 01.12.2018. and 31.01.2020. During the examination, we occurred *Metastrongylus elongatus* (56.25%), *Hyostrongylus rubidus* (21.87%), *Physocephalus sexalatus* (18.75%), *Globocephalus urosubulatus* (15.62%), *Macracanthorhynchus hurudunaceus* (12.50%), *Ascaris suum* (9.37%) and *Trichuris suis* (6.25%).

Keywords: Helminths; Wild Boars; Belgrade; Serbia

Introduction

Wild boars are omnivores with a high variety of diet. They eat roots, fungi, fallen hazelnuts, acorns, chestnuts and fruit. At the same time, they eat rodents, small reptiles, larvae, earthworms, snails and carrion, such as livestock (lambs, kids, calves) and wildlife (deer, pheasants, quail, etc.) carcasses [1]. Diet and lifestyle allow wild boars to have contact with intermediate hosts of parasites (worms, coleopterans, mollusks and arthropods) so that parasitic infections are constantly present in them [2]. The high prevalences and parasite variety detected in feces, combined with successful reproduction and migration tendencies of wild boars help to maintain a broad parasite spectrum. There are many papers about parasites of the wild boar, especially in Europe where hunting represents a significant economic activity and in other parts of the world [3-9]. Accurate knowledge concerning the distribution of certain pathogens in wildlife also contributes to a better understanding of risk factors for the domestic pig population. The presence and biodiversity of helminths in wild boars in Serbia hunting areas have not yet been comprehensively investigated. We have only a limited number of papers published on this topic [10-15]. The study aimed to investigate the prevalence and diversity of helminths of wild swine in the Belgrade area.

Materials and Methods

Belgrade is situated in South-Eastern Europe**,** on the Balkan Peninsula**.** It lies at the point where the river Sava merges into the Danube**,** on the slope between two alluvial planes. Although the city itself lies 116.75 meters above sea level and is located at the confluence of the Danube and Sava rivers, the hunting grounds have mixed profiles varying in hilly such are Torlak hill at 303m, Avala (511 m) and Kosmaj (628 m) to the south of the city, as well as flat plains by the Sava and Danube rivers, consisting of alluvial plains and loessial plateaus. The city has an urban area of 360 square kilometers, while together with its metropolitan area it covers 3 223 km^2.

The study was carried out on 5 hunting grounds in

Belgrade area on 47 wild boars (14 males and 33 females), shot by authorized hunters, and collected during the hunting period from 01.12.2018 to 31.01.2020. Data recorded at sampling time included the site of the shooting and the sex and age of wild boars. Based on tooth eruptions and replacement patterns the wild boars were categorized into age groups: juveniles (< 1 year old) and adults (≥ 1 year old) [16]. In the juveniles group we had 8 males and 10 females and in the adults 4 males and 23 females animals.

During our examination, wild boars were necropsy immediately after death. Thoracic and abdominal viscera were isolated, ligated, removed, placed into plastic bags, labeled, and brought to the laboratory in refrigerated containers. Collected helminths were kept in buffered 10% formalin. Identifications of helminths were based on morphological characteristics [17].

Results and Discussion

The results of the necropsy revealed that 32 (68.08%) animals harbored helminths in intestines and/or lungs. The sex of the animals did not reveal any differences in parasitic fauna between female and male animals, however, males (3 young and 5 adults) seemed to have a higher parasitic burden than females (9 young and 15 adults). There was no significant age-related difference in the prevalence of parasite species. At the same time, it was found that in younger animals the intensity of infection was lower than in older animals. The extent of the infection was greater in younger than in adult wild boars, which is explained by the development of the immune response to certain parasitic species. Infection with only one nematode species was found in 9 wild boars – 3 young and 6 adult animals. Mixed infection was observed in 23 animals. Infection with two helminth species was determined in 11 animals (4 young and 7 adults), with three species found in 9 animals (3 young and 6 adults) with four species found in 3 adult animals. Adult animals were infected with more parasite species than the young and as such presented a potential source of infection and contaminants of hunting grounds. During examination *Metastrongylus elongatus* (56.25%), *Hyostrongylus rubidus* (21.87%), *Physocephalus sexalatus* (18.75%), *Globocephalus urosubulatus* (15.62%), *Macracanthorhynchus hurudunaceus* (12.50%), *Ascaris suum* (9.37%) and *Trichuris suis* (6.25%) were found.

In our study, the most abundant parasite species was *Metastongylus elongatus.* Research performed in several regions of Serbia demonstrated a high prevalence of *Metastrongylus* infection in wild boars [10,11,14,15]. *Metastrongylus elongatus* was dominated species in the south and southwest and *M. pudendotectus* dominant species in the northern areas of Serbia. Similar findings were recorded in domestic pigs in organic production in Serbia [18,19]. Based on existing data Metastongilus species have been reported as the most abundant helminth species in wild boars in numerous European countries especially in Poland, Germany, France, Spain and Italy [5,6,20-23]. Lungworms are found in a high percentage of wild boars outside of Europe too, in Turkey, Iran, Russia and China [24-28]. This can be explained by the wide distribution and a large number of species of their transitional hosts, earthworms from the genera E*isenia, Dandreobena, Allopbophora, Lubricus, Octolasium, Bimastus* and *Heledrillus* [29]. During the autopsy, the preferred place was the back parts of the diaphragmatic lobe - margo acutus and margo obtusus. Bronchiolitis, bronchitis, diffuse pneumonia, alveolar emphysema, and connective tissue proliferation and cellular infiltration were observed. The changes were wedge-shaped, at the base of which there weres bronchia filled with parasites in various developmental stages, either free in mucous exudates or surrounded by cellular infiltrate.

Hyostrongylus rubidus and *Physocephalus sexalatus* are the most important stomach worms of swine. *Hyostrongylus* is relatively common in wild and domestic swine worldwide, but *Physocephalus sexalatus* are less common or geographically limited in warmer parts of the world. Both species are present in wild boars and free-range pigs throughout Europe [3,4,20,21,30-33]. In Serbia, these parasites are highly prevalent in the North-West and North Parts of the country, which is mostly lowland. In that areas, domestic pigs are often kept in semi-intensive breeding and we have a large number of hunting grounds with wild boars so there is constant contact between them [13,34]. During the autopsy, we found Hyostrongylus burrows into the stomach wall causing ulceration and gastric nodules with increased mucus production. Pathological changes in infection with Physocephalus are noted pathological changes in the form of ulceration on the gastric mucosa as well as bloody suffusion.

Globocephalus urosubulatus is a hookworm that affects swine and wild boars worldwide [1,35-37]. These worms we found attach to the gut's mucosa to suck blood and change frequently the attachment site. This causes numerous small bleeding and lesions in the mucosa.

Macracanthorhynchus hirudinaceus was most usually Acanthocephalans parasite of wild boars in Europe and the Middle East [21,22,38-42]. Development continues through transitional hosts Coleoptera from the genus Scarabidae (*Melontha vulgaris, Cetonia aurata, Polyphylla fullo, Anomalia vitis*, etc.) [43-45]. Usually, this parasite infection is happening to pigs in habitats where we meet skarabids - fields and pastures [25,47-48]. At autopsy, we observed dark yellow in them and sometimes reddish-brown bumps on the outside of the intestinal wall, which indicated the place

of fixation of parasites. Around each of the nodules were observed bright red hyperemic areas causing the bowel wall at these locations were callous. In the interior of the tubes observed sometimes hemorrhagic catarrhal enteritis, and parasites that were attached to the mucous membrane of the intestines. *Ascaris suum* is a large ascarid nematode found in the small intestine of pigs. Ascariasis is the most frequent and widespread parasitic infection of domestic and wild pigs, with a global distribution [6,7,10,12,21,42]. It represents the most significant parasite in farm pigs, while their percentage is much lower in wild boars [45,49]. From the eggs introduced into the digestive tract, developed larvae emerge, which begin the hepatopulmonary migratory phase, which ends with maturation in the intestines [2]. During necropsy sectional findings and the macroscopic picture of infected animals related to the phase of larval migration. The most characteristic picture is provided by the liver, which acquires a continuous or discontinuous silver-gray color after several infections. In young piglets, the liver is enlarged, congested and with more or less bleeding under the capsule [50,51]. Due to degenerative-necrotic changes, whitish, vaguely limited spots can be observed on the surface of the liver, which can converge so that such a liver looks like it is sprinkled with milky white spots. On the surface of the lungs, they were visible numerous spot bleeding, especially on the tops of the lobes. The lungs are partially collapsed and filled with bloody foamy contents containing a large number of larvae. The small intestine was the primary site of parasitism and the adult forms of the parasite are found in it. The intestinal mucosa is catarrhal inflamed and with necrotic fields.

Trichuris suis was the least abundant parasite species we found. This type of parasite is also of global distribution and is found in both wild and domestic swine. During the autopsy, we found parasites in the large intestine. There, they pierce the mucous membrane and their rear end protrudes into the lumen of the intestine. No significant pathological changes were observed in the intestinal mucosa.

Conclusion

The presence of parasites and their impact on the health of wild boars has not yet been comprehensively investigated. Previous studies have shown that their helminth fauna is similar to that of domestic pigs. Since contact between wild and domestic pigs is possible and recognized as a major risk factor for African swine fever free-range keeping and organic farming are potential contact points for a mutual parasitic infection transfer between them. The obtained results from this study indicated that wild boars should be regarded as the potential reservoir for a variety of endoparasites. For these reasons, this research must be continued on a larger scale and even more hunting grounds on the territory of Serbia.

Conflicts of Interest

The author states that there is no conflict of interest.

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