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Research Article

Data on the ticks spread in dog's in Albania

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Abstract **–**Ticks were collected and identified from dogs in veterinary clinics across Albania as part of the project "Mapping and assessment of tick habitats in Albania and PCR-based determination of pathogens they carry," funded by AKKSHI. A total of 637 specimens were collected, all of which had the morphological features necessary for taxonomic identification. Ticks were evaluated in the following regions: 148 ticks (84 in summer and 64 in autumn) in the Shkodra region, 214 ticks (133 in summer and 81 in autumn) in the Tirana region, 105 ticks (62 in summer and 43 in autumn) in the Korça region, and 170 ticks (92 in summer and 78 in autumn) in the Vlorë region. Ticks were collected using tweezers from the animals' bodies and placed in tubes with ethanol (or methanol) at 70-96%. Details regarding both the veterinary clinic and animals sampled were recorded. The collection of ticks in all four regions took place between March-June and September-October of 2024. Species identification was carried out in the Laboratory of Parasitology, Faculty of Veterinary Medicine by using a digital stereomicroscopy examination, following a provided key. In total five genera of ticks were identified in Albania: *Ixodes*, *Hyalomma*, *Rhipicephalus*, *Haemaphysalis,* and *Dermacentor*. Of the various ixodid tick species, 10 were found to parasitize dogs with owners.

Keywords –Dog, Region, Ticks, Species.

I. INTRODUCTION

Ticks are hematophagous ectoparasites commonly found on stray dogs and cats, but they have also been observed to infest dogs with owners, particularly during their seasonal peak. Even domestic dogs, despite being kept indoors, come into contact with ticks when they are taken outdoors into fields, parks, and other environments. Local relief and land diversity condition changes in key meteorological factors such as temperature and humidity, creating areas with specific vegetation that influence the spread of animal components of the biocenosis. In this context, ticks, as ectoparasites of animal skin, have special ecological requirements related to the microclimate of the region and the phytocenosis. Certain regions of the phytocenosis correspond to the needs of ticks.

Ticks are significant vectors of various diseases that pose serious health threats and significant economic losses, affecting the health and productivity of animals [9]. They transmit a wide range of infection diseases among vertebrates and humans. The total aria in Albania is calculated to be 28.748 square kilometers. The country is located in the southeastern part of the Adriatic and the northeastern part of the Ionian Sea, both located within the Mediterranean Sea. The diversity of landscape and climatic conditions creates the perfect conditions for ixodid ticks spread. The tick fauna of Albania includes more than 12 species of ixodid ticks, recognized as carriers of a number of dangerous infectious pathogens. All ticks belonging to the category of hard ticks: *I. ricinus, H. inermis, H. punctata, H. sulcata, D. marginatus, R. bursa, R. sanguineus , R. turanicus, R. annulatus , H. Marginatum*. These decades, an increase in both the number of ticks in Albania and the number of cases of tick-borne diseases (TBD) has been recorded [10]. In past few year in Albania are made some effort to detect the prevalence and distribution of ticks in vertebrates and humans [7, 5, 3, 2, 4]. The data are incomplete so the aim of the current study was to detect and identify the ixodide ticks among dogs population of Albania.

II. MATERIALS AND METHOD

Describedplaced in tubes containing 70-96% ethanol or methanol. Details of the sampling area and the animal samples were recorded. The tick collection in all four regions took place between late March–June and September-October 2024. Species identification was based on morphological features and carried out using a digital stereomicroscope (Optica WF 10x22) with an online key provided by Frank L. Ruedisueli & Brigitte Manship from the University of Lincoln, along with keys by cited authors [11],[6][8],[1],[4]. Ticks from the Ixodidae family were classified into metastriata (with anal grooves around the anus from behind) and prostriata (with anal grooves around the anus from the front). Based on this classification, and other morphological features, we describe the key used for differentiating the various genera of ticks from the Ixodidae family.Ticks with a long rostrum.Genus *Ixodes*: Long rostrum, prostriata anal groove, long legs located near the front of the body, no eyes or festoons. The male's ventral surface has scutum divided into pregenital, median, and anal sections. Stigmas are flat and oval in males, round in females. Males measure 1.5–2 mm, females 7–12 mm. Among the approximately 200 species of *Ixodes*, *Ixodes ricinus* (Linnaeus 1758) is of significant importance in Europe, also known as the sheep tick.Genus *Hyalomma*: Characterized by large eyes, metastriata, dull scutum, with the second palpal segment at least twice as long as the third. The first coxa is split into two parts, with scutum visible on males, festoons may or may not be present. Legs are long with white rings at the joints, and peritremes are generally shaped like a comma. Males measure 4–5.5 mm, females 20 mm in length. Important species include *Hyalomma marginatum* Koch, 1844 and *Hyalomma anatolicum* Koch, 1844.Genus Amblyomma: Eyes present, metastriata, scutum highly decorated with excellent color reflections. The second palpal segment is at least twice the length of the third. The first coxa is crescent-shaped, equipped with one or two backward hooks, and males lack a ventral scutum.Ticks with a short rostrum.Genus *Haemaphysalis*: Four-sided capitulum base, metastriata, no ventral scutum, no eyes, with festoons. Palps are short and conical in shape. The first coxa is equipped with a hook, and the trochanter has a triangular protrusion on the dorsal surface. Peritremes are oval in females and comma-shaped in males. Males measure 1–3.5 mm, females 12–14 mm in length.Genus *Dermacento*r: Exophilic ticks with a short rostrum and four-sided capitulum. Eyes and festoons present. The first coxa is split, and the fourth coxa is wider in males. Scutum is decorated with spots, while the ventral scutum is absent in males. Peritremes are oval. Ticks are larger, with males measuring 6–7 mm and females 10–20 mm. This genus develops in a three-phase cycle. Dermacentor marginatus is the only species found on dogs in Albania.

Statistical Evaluation

The Kruskal-Wallis H test, a rank-based non-parametric test, was used to determine if there are statistically significant differences between two or more groups of an independent variable on a continuous variable. Since we have multiple groups in the study, post-hoc testing was used to determine which groups differ from each other. The Kruskal-Wallis test ranks all the data from all groups together, replacing each value with its rank in the combined dataset. The null hypothesis of the Kruskal-Wallis test is that the mean rank of the groups is the same, which is related but not identical to the hypothesis that the medians are equal.

$$H = \frac{N-1}{N} x \sum_{i=1}^{k} \frac{n_i(\overline{R_i} - E_{r_i})^2}{\sigma} \quad (1) \qquad \sigma^2 = \frac{(N^2-1)}{12} \quad (2) \quad E_R = \frac{N+1}{2} \quad (3)$$

N-Total Sample Size; n_i-Number of Cases in Groups; $\overline{R_i}$ -Mean Rank in Group I; E_{r_i} -Expected Value of Ranking; σ^2 -Rank Variance.

If the null hypothesis is true, there is no difference between the independent samples. Then high and low ranks are randomly distributed across the samples and should be equally distributed across the groups. Therefore, the probability that a rank is assigned to a group is the same for all groups. If there is no difference between the groups, the mean value of the ranks should be the same in all groups. Each sample has the same expected value of the ranks, which corresponds to the expected value of the population. The variance of the ranks is calculated with formula (2).In the Kruskal-Wallis test, the test value H is calculated. The H value corresponds to the χ^2 distribution. The critical H value can be read from the calculated critical χ^2 distribution values.To find out which of the pairs differ, the individual groups are compared. To see the coexistence of the results, we also used the Median Test.The median test is a non-parametric test which is used to test whether two (or more) independent groups differ in central tendency - specifically whether the groups have been drawn from a population with the same median. The null hypothesis is that the groups are drawn from populations with the same median. The alternative hypothesis is that the two medians are different (two-tailed test).

III. RESULTS

We have identified and classified the ticks found on the bodies of dogs and cats when they were brought to veterinary clinics. A total of 666 specimens were collected, of which 637 were identifiable parasites on dogs, and only 29 were identifiable ticks on cats.

Figure 1. Ticks collected by region and host

No.	Region	Dog ticks		Total dog ticks	Cat ticks		Total cat ticks	Overall total
		Summer	Autumn		Summer	Autumn		
1	Shkodra	84	64	148	4	0	4	152
2	Tirana	133	81	214	7	1	8	222
3	Vlora	92	78	170	8	5	13	183
4	Korca	62	43	105	3	1	4	109
Sum		371	266	637	22	7	29	666

A total of 637 ticks were collected, which met the conditions for examination and morphological differentiation. Since cats in a domestic setting have a much lower level of infestation compared to dogs (cats live a more family-oriented life and are less exposed to the environment), as reflected in the numbers (29 out of 666 specimens), the differentiation of species was carried out only on dogs, while maintaining the criteria of season and region.

Figure 2. Tick species by region and species

No.	Nomenclature of the species	**Shkodra**		**Tirana**		**Vlora**		**Korça**		Overall total
		Summer	Autumn	Summer	Autumn	Summer	Autumn	Summer	Autumn	
1	*Ixodes ricinus*	20	17	31	15	23	22	16	14	158
2	*Haemaphysalis punctata*	4	1	4	5	5	2	4	2	27
3	*Haemaphysalis sulcata*	8	3	5	2	5	3	4	3	33
4	*Haemaphysalis inermis*	2	5	6	5	4	3	7	4	36
5	*Hyalomma marginatum*	3	2	15	10	5	4	6	3	48
6	*Hyalomma anatolicum*	11	9	13	11	8	9	5	4	70
7	*Rhipicephalus bursa*	7	4	8	7	11	8	4	4	53
8	*Rhipicephalus turanicus*	3	8	10	3	9	7	2	3	45
9	*Rhipicephalus sanguineus*	23	13	29	17	18	17	14	6	137
10	*Dermacentor marginatus*	3	2	12	6	4	3	0	0	30
11	Sum	84	64	133	81	92	78	62	43	637

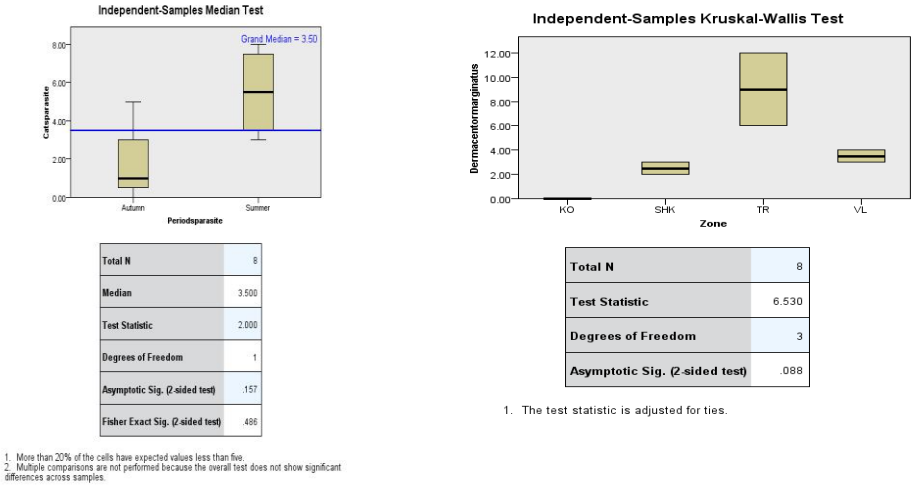

Fig. 1

IV. DISCUSSION

From the tick genera in our country, on companion animals, and mainly on dogs, we were able to identify five genera: *Ixodes*, *Hyalomma*, *Rhipicephalus*, *Haemaphysalis*, and *Dermacentor*. In the regions of Tirana, Shkodra, and Vlora, we identified all five genera: *Ixodes*, *Haemaphysalis*, *Hyalomma*, *Rhipicephalus*, and *Dermacentor*. In the Korça region, we identified four genera: *Ixodes*, *Haemaphysalis*, *Hyalomma*, and *Rhipicephalus*. The genus *Dermacentor* was not found in this region. From the genus *Ixodes*, we identified only the species *Ixodes ricinus* Linnaeus 1758. *Ixodes ricinus*, known as the sheep tick, was observed parasitizing dogs as well. It turned out to be the most frequent tick, with 158 specimens collected. It was most prevalent in the spring and summer seasons. On dogs, this tick was found more frequently on the face and limbs, areas not covered by long fur, but it was also found on the abdomen. In other words, it was found more in body parts that come into contact with grasses and the ground, where it is more commonly found. Of the 37 *I. ricinus* specimens collected in the Shkodra region, 20 were found in the spring and 17 in the autumn. Of the 46 specimens found on dogs in the Tirana region, 31 were found in the summer and 15 in the autumn. The same distribution was observed for the other two regions. From the genus *Haemaphysalis*, we identified the species *Haemaphysalis punctata* (Canestrini & Fanzago, 1877), *Haemaphysalis sulcata* (Canestrini & Fanzago, 1877), and *Haemaphysalis inermis* (Nuttall & Warburton, 1915). *Haemaphysalis punctata* was identified on dogs with almost uniform distribution across regions and tick seasons, with a higher prevalence in the summer. *Haemaphysalis sulcata* was found almost in the same distribution as *Haemaphysalis punctata*. All three *Haemaphysalis* species have a short rostrum, a quadrangular capitulum base, and lack eyes. Their preferred habitat was primarily the perineal region. From the genus *Hyalomma*, we identified the species *Hyalomma marginatum* Koch, 1844 and *Hyalomma anatolicum* Koch, 1844. Both *H. marginatum* and *H. anatolicum* were found in all four regions with uniform distribution across regions and tick seasons. *Hyalomma marginatum* was mostly found on genital areas, while *H. anatolicum* was more frequently found on the inner parts of the body, such as under the shoulders and thighs, and less frequently in the genital region. These species were found in both spring-summer and autumn. *Hyalomma* species are known to be major transmitters of babesiosis in animals. No instances of parasitism from the genus *Boophilus* were identified on companion animals.The genus *Rhipicephalus* was represented by three species: *Rhipicephalus bursa* (Canestrini & Fanzago, 1877), *Rhipicephalus turanicus* Pomerantzev, 1940, and *Rhipicephalus sanguineus* Latreille, 1806. *R. bursa* was present on animals in all four regions, as was *R. turanicus*. *R. sanguineus* was found in all seasons (more frequently in spring) on dogs across all

regions and proved to be the most widespread species on dogs after *I. ricinus*. *R. sanguineus*, known as the dog tick, as well as *R. bursa* and *R. turanicus* (which are more commonly found on small ruminants), are non-selective ticks that were found in abundance in both spring and autumn on dogs. *R. sanguineus* is primarily a dog parasite, although it can occasionally parasitize other animals, but dogs are the primary host for this species.The genus *Dermacentor* (species *Dermacentor marginatus* Sulzer, 1776) was identified on dogs in the Tirana, Vlora, and Shkodra regions. It was found in small numbers, mostly during the summer. This species is characterized by the markings on its back. It is known to transmit babesiosis.In total, we identified 10 species of ticks present in our country. The diversity observed reflects the specific conditions of the Albanian territory, which favor the development and survival of *Ixodidae*. Few territories in the Balkan Peninsula and Southern Europe offer conditions that support such a rich development of ticks as the Albanian regions. The relief is such that it provides favorable conditions for both Mediterranean species and those from cooler areas.Some ticks are exophilic in all of their evolutionary stages, while others are endophilic during the larval and nymph stages but exophilic during the imago (adult) stage. Dogs kept in domestic environments are always in contact with ticks. Endophilic *Ixodidae* are those that live in the habitats of humans and animals. They enter cracks in walls, floors, soil, and the dog kennels. The species from the genus *Hyalomma*, particularly *Hyalomma detritum*, are primarily found in such environments.

V. CONCLUSION

The In dogs with owners across the territory of the Republic of Albania, we identified the tick genera *Ixodes*, *Hyalomma*, *Rhipicephalus*, *Haemaphysalis*, and *Dermacentor*, and from these, 10 species were identified. In the regions of Tirana, Shkodra, and Vlora, we identified 5 genera, while in the Korça region, the genus *Dermacentor* was not found. The number of dogs infested by ticks is significantly higher than that of cats. During the spring-summer period, there is a notably higher intensity of dog infestation compared to the autumn season (largely influenced by environmental conditions). Considerable differences were found in tick infestations between the spring-summer and autumn periods. There is a clear increase in the duration of tick parasitism in dogs. Dogs living without owners in the environment are at a higher risk of infestation by *Ixodidae* ticks and the diseases transmitted by them. In regions where the level of tick infestation in dogs has been higher, veterinary services report a higher number of dogs infected with diseases transmitted by ticks.

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