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Original article

Description and Study of the Extent of the Species of (*Hyalomma dromedarii*) Ticks Among Camels in the City of Sirte, Libya

Ahmed Al-Mashai

Department of Zoology, Faculty of Science, Sirte University, Sirte, Libya
Corresponding email. Ahmedalifeeda@gmail.com

Abstract
The presence of external parasites, such as ticks, is of concern as they are considered pathogens and act as vectors for diseases from one animal to another. This has a detrimental effect on the health of the animals concerned and can also harm meat production. These proteins have been identified in a variety of species, including the camel tick, which is the focus of this study. The objective of this study is twofold: firstly, to ascertain the extent of infection of camels in Sirte City, Libya, and its suburbs with *Hyalomma* ticks; and secondly, to isolate and study the morphology of this species of tick. The present study was conducted from October to December 2024. In the present study, a total of 162 camels residing in the suburbs of Sirte, Libya, were the subject of a comprehensive examination. Tick samples collected from infected camels were preserved in 70% ethanol and transferred to the Zoology Laboratory, Faculty of Science, University of Sirte. Following a thorough examination with the naked eye and under a microscope, the subjects were described and photographed. The results indicated that 105 camels were infected with *Hyalomma dromedarii*, out of a total of 162 camels that were examined. The male *Hyalomma* dromedarii is smaller than the female, and the scutum covers the entire dorsal surface of the body, while the female is flattened in shape, and the scutum covers only the anterior part of the dorsal surface of the body. Out of a total of 162 camels examined in the suburbs of Sirte, the results showed that 105 camels were infected with hard ticks of the *Hyalomma dromedarii* species.
Keywords. Ectoparasites, *Hyalomma dromedarii*, Scutum, Ticks.

Introduction

Tics have a harmful effect on the health of animals and humans through the diseases that ticks transmit to animals in all countries of the world. These diseases negatively affect the economic situation of countries and cause great losses in livestock. There are currently approximately 867 species of ticks that cause various harms to animals and humans [1]. Ticks are hosts that transmit many species of pathogenic microorganisms. Ticks are also obligatory ectoparasites that infect many animal species. Ticks rank second after mosquitoes in transmitting diseases and pathogens to animals and humans. Spotted fever is a disease that is characterized by being transmitted by ticks. This disease is transmitted by approximately 27 species of ticks. Different species of ticks also transmit Lyme disease and human granulocytic anaplasmosis, which are among the most widespread diseases [2].

Ticks are distributed across the globe, causing damage and losses to animal production as well as to humans. To address this issue, various insecticides have been employed by different countries; however, this has resulted in the emergence of resistant tick species and concomitant environmental contamination. Scientific research has demonstrated that vaccines represent the most effective method of combating ticks, and they are also more environmentally friendly than the use of chemical pesticides, which have deleterious effects on the environment [3].

Ticks are a class of blood-sucking arthropods that act as vectors for diseases that can cause death in humans and animals. Ticks are distinguished by a multitude of morphological characteristics and physiological processes that facilitate the selection of an appropriate host, the process of blood-sucking, sexual reproduction, and survival in diverse environments [4].

The hard tick *Hyalomma dromedarii* is one of the most common ectoparasites that infects camels. It is adapted to live in desert areas and feeds by sucking the blood of the host. The tick may be exposed to resistance by the host's defense system, which leads to the tick being rejected and then dying. The tick's saliva contains a mixture of biologically active compounds that enable it to suck the blood of the host [5].

The recent proliferation of ticks and the consequent increase in infection rates across the globe can be attributed to a combination of environmental and climate changes, as well as human activities. The genus *Hyalomma* poses a significant threat to public health on a global scale, primarily due to its role as a vector for diseases such as Crimean-Congo haemorrhagic fever virus in humans and theileriosis in cattle [6]. *Hyalomma dromedarii* is an ectoparasite that infects camels, feeds on their blood, and affects their health [7].

Molecular analysis has demonstrated that camels and ticks act as significant reservoirs for Q fever, posing a considerable threat to both animals and humans. Furthermore, molecular analysis is a more accurate method for comparing *H. dromedarii* and H. excavatum than immunological analyses [8].

The utilisation of pesticides and chemical medications for the elimination of ticks is a costly endeavour. Moreover, these chemicals have the potential to be present in animal meat and milk, which can have a detrimental effect on human health [9].

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The dissemination and adaptation of ticks to diverse ecological niches, in conjunction with the shifting geographical distribution of ticks belonging to the genus *Hyalomma*, are subjects of concern. This is primarily since this genus functions as a vector host for numerous pathogens that affect both humans and animals [10].
The objective of this study is twofold: firstly, to ascertain the extent of camel infection with hard ticks of the *Hyalomma dromedarii* species, and secondly, to provide a detailed description of the structure of this species of tick.

Materials and methods

In this study, a total of 162 camels were examined on the outskirts of the Libyan city of Sirte from October to December 2024. The ticks of the genus *Hyalomma dromedarii* were observed with the naked eye.
The external tick samples were placed in tubes containing 70% ethanol and transferred to the Zoology Laboratory, Faculty of Science, University of Sirte.
The tick samples were subjected to a process of washing with distilled water, followed by a period of slight drying. Once the tick samples had been drained, clove oil was added to the samples to clarify them.
The tick specimen was then placed on a glass slide, and its different parts were examined under a microscope at various magnifications.

Results

The present study was conducted from October to September 2024 in the suburbs of the city of Sirte, Libya, which is 400 km east of the capital, Tripoli. The survey on camels in the suburbs of the city revealed that 105 out of a total of 162 camels were infected with *Hyalomma dromedarii* (Figure 1).

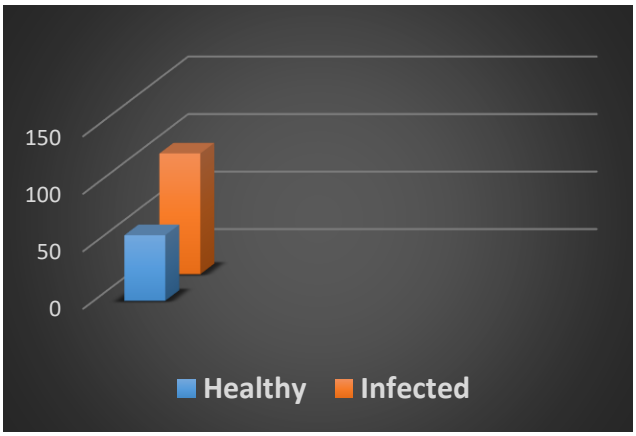

Figure 1. The prevalence of Hyaloma dromedarii in Camels in the study area

Hard ticks are characterised by the presence of a solid plate, known as the scutum, which covers the entire dorsal surface of the male. In contrast, the scutum only covers the anterior portion of the female.
The genital opening of the male is located in the anterior part of the body between the coxae of the second pair of legs and is mediated by the genital groove (Figure 2, 5).
The posterior region of the male is flattened, and the anus is located in the middle of the posterior part of the body and is located in the middle of the anal groove (Figure 2).
The male is distinguished by the possession of three pairs of anal plates. The first pair is of considerable size and surrounds the anal opening; this pair is known as the adanal plates. The second pair is smaller in size and is referred to as the accessory adanal plates. The third pair is located at the posterior end of the body and is designated as the subanal plates (Figure 2, 6, 7).
The regions of the head, thorax, and abdomen are observed to be restless. The tick (Ixodida) is a four-legged creature with piercing mouth parts that are used both to absorb nutrients and to pierce the skin of its host. It possesses a pair of chelicerae, a pair of palps, and a hypostome, all of which are located at the front of the creature's body. The eyes of the tick are located on the side ridge of the scutum (Figure 4).
The female is characterised by a flattened and oval morphology, with the scutum covering only the anterior end of the body. The genital opening is situated in the medial aspect of the genital groove, positioned between the coxae of the second pair of legs. The anal opening is located in the middle of the anal groove and is situated in the posterior region of the body (Figure 8, 9, 10, 11, 12). In contrast, the female does not possess anal plates.

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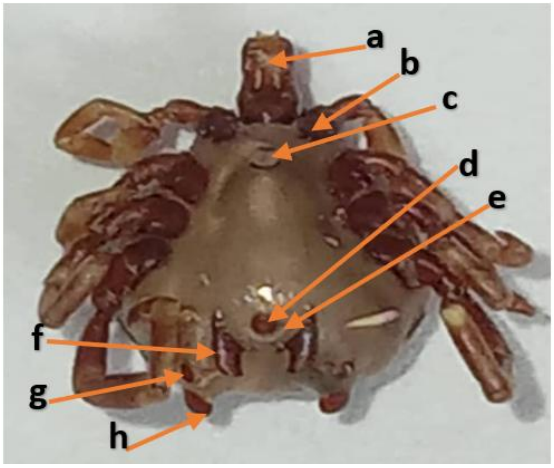

Figure 2: Ventral view of male Hyalomma dromedarii. a: Hypostome, b: Coxae, c: Genital aperture, d: Anal opening, e: A nal groove, f: Adanal plates, g: Accessory adanal plates, h: Subanal plates

Figure 3: Dorsal region of male Hyalomma dromedarii

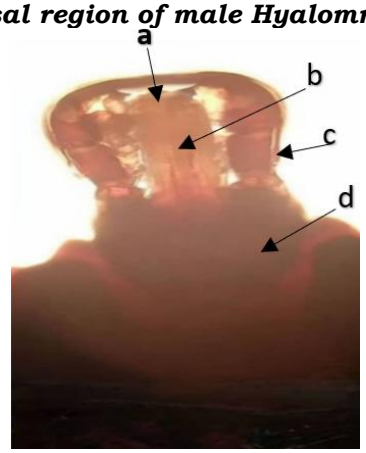

Figure 4: Anterior end of the Hyalomma dromedarii. a: Hypostome, b: Chelicera, c: Palp, d: Scutum

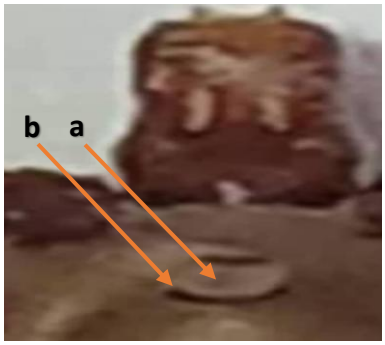

Figure 5: Anterior region of the male Hyalomma dromedarii. a: Genital opening, b: Genital groove

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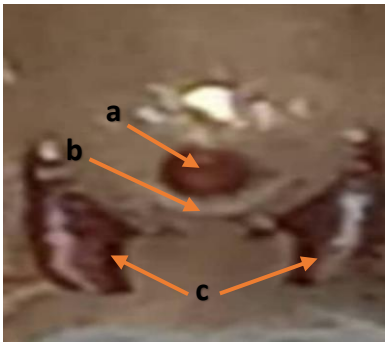

Figure 6: Posterior region of the male Hyalomma dromedarii. a: Anal opening, b: Anal groove, c: Subanal plates

Figure 7: Posterior end of the male Hyalomma dromedarii showing the pair of subanal plates

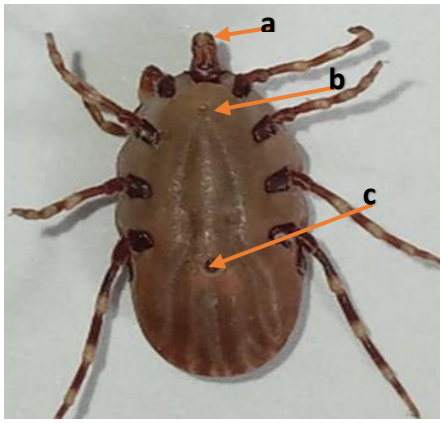

Figure 8: Abdominal view of the female Hyalomma dromedarii a: Capituli, b: genital opining, c: Anal opining

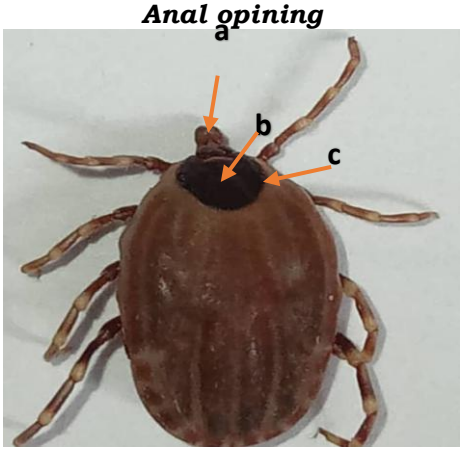

Figure 9: Dorsal region of male Hyalomma dromedarii a: Capituli, b: scutum, c: Eys

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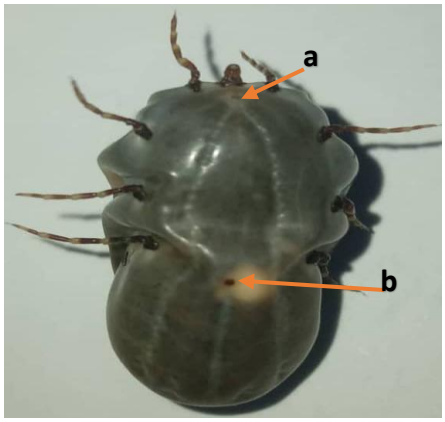

Figure 10: Ventral view of a flattened female
a: Genital opining, b: Anal opining

Figure 11: Dorsal view of a flattened female

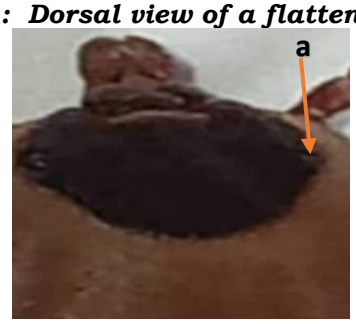

Figure 12: The anterior region of the female shows the eyes on either side of the scutum
a: Eys

Discussion

Tick-borne rickettsiosis has been documented in several North African countries, including Mauritania, Morocco, Algeria, Tunisia, Libya, and Egypt [11].

Hyalomma dromedarii ticks are among the most prevalent tick species in the Middle East. A study on the subject has shown their presence and widespread distribution on camels throughout the year, despite weather fluctuations and the regular monthly use of pesticides. Consequently, there is an imperative to identify an efficacious solution for the eradication of ticks [12].

Garlic oil and rosemary oil have been proven effective in controlling *Hyalomma dromedarii* ticks and are considered a safe and effective alternative to chemical insecticides [13].

The prevalence of camel ticks (*H. dromedarii*) in Pakistan was documented to be approximately 27.4% [14]. Citrus peel oil proved efficiency as an alternative, eco-safe, biodegradable, and low-cost acaricide useful in tick control in the veterinary field [15]. The severity of tick infestation was examined in 140 Arabian camels in the Medina and Qassim regions of the Kingdom of Saudi Arabia. The results demonstrated that 106 camels were infected with *Hyalomma dromedarii* ticks, with an infection rate of 84.5% [16].

1000ticks were collected from 100 examined camels. These ticks belong to three genera: *Hyalomma*, *Amblyomma*, and *Rhipicephalus*. The genus *Hyalomma* had four species, the most common of which was *Hyalomma dromedarii* with 55.4%, followed by *H.excavatum* 22%, *H. impeltatum* 11.6% and then *H. rufipes* 2.8% [17].

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Hyalomma dromedarii ticks are widespread in Saudi Arabia and are considered a vector for many pathogens in animals and humans. Knowing the bacteria carried by ticks is important for identifying and tracking the causes of known diseases as well as new diseases in camels [18].
The *Hyalomma dromedarii* tick is adapted to living in a desert environment and is a widespread parasite of camels. The salivary glands of this tick are an important source of numerous compounds whose biological activities interact with the host's system and activities. Females of this species feed for longer periods than males and therefore require more blood [19].
A study was conducted on 217 camels infected with ticks in southeastern Iran, and 426 tick samples were collected during the tick activity period from April 2009 to March 2010. The tick species were as follows: *Hyalomma dromedarii* (84.7%), *Hyalomma marginatum* (8.7%), *Hyalomma anatolicum excavatum* (5.4%), and *Hyalomma anatolicum anatolicum* (1.2%) [20].
Hyalomma dromedarii and *Hyalomma schulzei* are the most common parasites of camels. *Hyalomma dromedarii* ticks can complete their life cycle in three or two hosts, and the two-host life cycle is the most common. Camels are the primary host for adults, and nymphs and larvae can use the same host, which is camels. Nymphs and larvae can parasitize other animals such as foxes, rodents, hedgehogs, and birds [21].
A study conducted in southern Algeria revealed the presence of 2,544 ticks on the bodies of 57 animals, including goats, sheep, cattle, and dogs, during the period spanning from March 2019 to February 2020. Two species of ticks were described. The first species demonstrated consistent activity throughout the year and was comprised exclusively of adults. In contrast, the second species exhibited activity during the spring and summer months, comprising both nymphs and adults [22].
In a study on ticks in the Tataouine region of Tunisia, 1902 ticks, all of the genus *Hyalomma*, were collected from 406 camels between April 2018 and October 2019. The tick species were identified as: *H. impeltatum* (41.1%), *H. dromedarii* (32.9%), *H. excavatum* (25.9%), and *H. marginatum* for a single specimen [23].
A study conducted on the prevalence of hard ticks in Arabian camels (*Camelus dromedaries*) in Aswan Governorate revealed that 1060 camels were infected out of 1190 camels examined, yielding an infection rate of 89% [24].
Following a thorough examination of 580 camels and the collection of 3,526 ticks, the results indicated the presence of six species of the genus *Hyalomma* [25].

Conclusion

A total of 162 camels were examined in the suburbs of Sirte, with the results showing that 105 camels were infected with hard ticks of the *Hyalomma dromedarii* species.

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