

Short Communication

**Abnormal life cycle of *Hyalomma dromedarii* (Acari: Ixodidae)
on single-humped camels in Semnan, North-East of Iran**

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Received 09 November 2015; accepted 14 April 2016

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ABSTRACT

Hyalomma dromedarii (*H. dromedarii*) is a very characteristic tick with a cosmopolitan distribution, which is closely associated with camels. It is well adapted to extreme dryness of habitat and to camel hosts. In this study, we studied rural husbandry of one-humped camels (dromedaries) in a village in South-West of Semnan (Biabanak). A total of 163 ticks (94 adults and 67 nymphs) were found on two camels by palpation all over the body. All the found ticks were nymphs and adults of *H. dromedarii*. Almost all the adult ticks were unattached and moving on the camels' wool. They were not engorged and their body colour varied from light to dark brown. Nymphal ticks were engorged or engorging and some were molting. It was concluded that these ticks were living as one-host ticks on the camels at this site. This finding probably explains why *H. dromedarii* follows different types of life cycles to survive unfavorable conditions.

Keywords: Camel, *Hyalomma dromedarii*, One-host, Semnan, Tick

Le cycle de vie anormal d'*Hyalomma dromedarii* (Acari: Ixodidae) sur les dromadaires de la province de Semnan (Nord Est iranien)

Résumé: *Hyalomma dromedarii* (*H. dromedarii*) est une tique cosmopolite très caractéristique et répandue chez les dromadaires. Ce parasite est particulièrement bien adapté aux conditions extrêmement arides et au milieu particulier des Camélidés. Dans cette étude nous avons étudié un élevage de dromadaires situé au Sud Ouest de Semnan (Biabanak). Un total de 163 tiques (94 adultes et 67 nymphes) ont été détectées sur tout le corps de deux dromadaires par palpation. Toutes les tiques collectées appartenaient à l'espèce *H. dromedarii*. Presque toutes les tiques se trouvaient en surface, se déplaçant librement à travers les poils des deux dromadaires. Elles n'étaient pas engorgées de sang et leurs couleurs déclinées du marron clair au marron foncé. Par contre, les nymphes étaient totalement ou partiellement engorgées, arrivant pour certaines au stade de la mue. Il en a été conclu que ces tiques utilisées la même hôte lors des différents stades de leur cycle de vie (*one-host ticks* ou tique à hôte unique). Ces résultats expliquent probablement la particularité des différents types de cycle de vie d' *H. dromedarii*, lui permettant de survivre dans des conditions non favorables.

Mots clés: Dromadaire, *Hyalomma dromedarii*, Hôte Unique, Semnan, Tique

INTRODUCTION

Hyalomma dromedarii (*H. dromedarii*) can behave as three-, two-, or one-host species Apanaskevich et al.

(2008). It is believed that the two-host life cycle is the most common one among this species (Guglielmone et al., 2013). In fact, one-host life cycle was only observed in experimental studies. It is reported that *H.*

dromedarii behaved as a one-host tick on rabbits, with adults moving to a new position shortly after molting and remaining unattached for a day or two (Sabelis and Bruin, 2009). ELGhali (2005) reported that *H. dromedarii* on sheep and cattle is a three-host tick and 60% of them changed to two-host life cycle when fed on rabbits. Ouheli (1994) pointed out that this tick is a three-host species changing to two-host as their density on the host becomes high. Alahmed (2003) reported that this tick behaved as a two-host tick when fed on rabbits. Recently, Elghali and Hassan (2010) found that this tick behaved as a two-host tick when fed on camels in Northern Sudan. In the present study, we reported *H. dromedarii* having one-host cycle in one-humped (dromedary) camels in Biabanak, a small village in South-West of Semnan, Iran.

MATERIALS AND METHODS

In July 2012, 163 ticks were collected from two one-humped camels in a rural area of Semnan, Iran. Biyabanak is situated in South-West of Semnan, a hot and dry area (average maximum and minimum temperatures at sampling time were 39.9 °C and 27 °C, and its geographical coordinates are 35 ° 24' 41" North, 53 ° 16' 1" East; Figure 1).



Figure 1. The locality where the fieldwork was carried out in Semnan province, Iran

Although the camels' body was entirely infested by ticks, roughly 10% of the ticks were collected because

the camels were agitated by the infestation. The collected ticks were kept in 70% ethanol with 10% glycerine and were transferred to a laboratory for identification. In primary identification using a guide letter (Walker *et al.*, 2003), all the collected ticks were identified as *H. dromedarii*.

RESULTS AND DISCUSSION

The collected ticks comprised of 94 adults (48 males and 46 females) and 67 nymphs of *Hyalomma* species. Almost all the adult ticks were running on the camel's wool and were not engorged, and their body colour varied from light to dark brown. Nymph ticks were engorged or engorging and were molting (Figures 3, 4).



Figure 2. Subanal plate's alignment in *H. dromedarii* (20×)

The isolated ticks from the camels were nymphs and adults of *H. dromedarii*. Given that the ticks were isolated only from one part of the body (the neck), it appears that the total number of ticks on the two camels was reaching hundreds. According to the morphological characteristics, the genus and species of the ticks was *H. dromedarii*.

Differential diagnosis. The males of *H. dromedarii* are easily distinguished from other *Hyalomma* ticks because their subanal plates are aligned outside the adanal plates. In our specimens, which were unfed, this feature was very distinctive. Adanal plates have rounded ends (Figure 2); the adanal plates also have a characteristic shape with both long margins strongly curved in parallel. The males resemble *Hyalomma*

detritumdetritum and *Hyalomma detritumscupense* in having four posterior ridges on the scutum (Figure 3).



Figure 3. Four posterior ridges in the posterior region of the scutum of male *H. dromedarii* (15×).

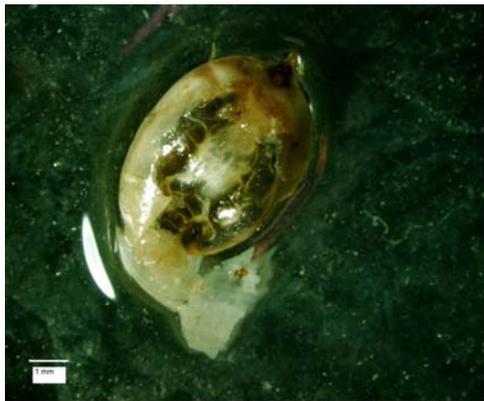


Figure 4. Molting from a nymph to an adult male *H. dromedarii* (6.5×).

The genital aperture posterior lips of the female tick have a distinctly narrow V shape. However, of the various species of *Hyalomma* described by (Walker et al., 2003), it is the only species with this feature; all the others are broader even if as with *H. detritum* they are described as V shaped. The genital aperture with preatrial fold is slightly convex. Female *Hyalomma impeltatum*s have similar genital apertures, but the posterior margin of their scutum is distinctly sinuous compared to the slightly sinuous margin in *H. dromedarii*. Almost all the isolated ticks had yellow legs, which is a characteristic of *H. dromedarii*. However, all the ticks were still in the post-molt

developmental phase and were not fully hardened, so the color may not be representative. We found *H. dromedarii* as a one-host life cycle tick in the one-humped camels in Biabanak, South-West of Semnan, Iran. It is believed that the two-host life cycle is the most common one for this species (Guglielmone et al., 2013). As two-host ticks, the larvae may feed and molt to nymphs on small mammals or hares and the adults feed on large herbivores. We observed engorged nymphs and unfed adult ticks together. It appears that *H. dromedarii* has a one-host life cycle in this situation. As of yet, there is no report of one-host life cycle of *H. dromedarii* on camels. In fact, the only report belongs to an experimental study on rearing *H. dromedarii* on rabbits (Sabelis and Bruin, 2009). In the pre-delyp period, *Hyalomma* ticks collected from camels are commonly known as *H. dromedarii* or the camel *Hyalomma* (Walker et al., 2003). It is a very characteristic tick closely associated with camels (the one-humped dromedary) after which it is named. *H. dromedarii* is common wherever camels appear (e.g., in Iran (Ranjbar-Bahadori, 2003; Nabian et al., 2009), Pakistan (Walker et al., 2003), Turkmenistan, southern Tajikistan, and Uzbekistan (Matyashov, 1996; Rasulov, 2007). In fact, the geographic range of *H. dromedarii* extends from Iran and Afghanistan through Iraq and North Africa (Zelege and Bekele, 2004; Nabian and Rahbari, 2008). Many *Hyalomma* species are capable of diverse life cycles, varying with host, geographical region, environment, season, and unusual climatic conditions such as extreme cold, heat, or dryness. Normally, *H. dromedarii* has a two-host or three-host life cycle. Types of feeding in *H. dromedarii* is combination of both ditropic and telotropic behaviors (Walker et al., 2003). Abdelrahman (2012) considered *H. dromedarii* as a three-host tick that may follow a two-host life cycle under unfavorable conditions. In order to avoid desiccation, larvae molt quickly and reattach as nymphs on the same host. ELGhali (2005) reported that *H. dromedarii* was a three-host tick on sheep and cattle, and 60% of them changed to two-host life cycle when fed on rabbits. Alahmed (2003) also

reported that this tick behaved as a two-host tick when fed on rabbits. Nonetheless, Sabelis and Bruin (2009) reported that *H. dromedarii* behaved as a single-host tick on rabbits. Ouheli (1994) mentioned that *H. dromedarii* was a three-host tick changing to a two-host life cycle when their density on the host grows higher. Elghali and Hassan (2010) reported that under field conditions, *H. dromedarii* behaved completely as two-host ticks.

In conclusion, we found that *H. dromedarii* has a one-host life cycle in the one-humped camels. This finding probably explains why *H. dromedarii* follows different types of life cycles to survive unfavorable conditions. Moreover, *H. dromedarii*, as one-host ticks, provide the opportunity for tick control in camels by being vaccine candidate (El Hakim et al., 2011).

Ethics

I hereby declare all ethical standards have been respected in preparation of the submitted article.

Conflict of Interest

The authors declare that they have no conflict of interest.

Acknowledgments

The authors would like to thank Professor Walker for his kind contribution to differential diagnosis and for reviewing the manuscript.

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