Occurrence of *Hyalomma*, (Acari: Ixodidae) Koch, 1844 on domestic animal in the Union Territory of Dadra & Nagar Haveli, Indian

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Abstract In response to recent outbreak of Crimean-Congo hemorrhagic fever (CCHF) in Gujarat (India). This investigation was carried out in order to determine the risk of CCHF. The prevalence and abundance of *Hyalomma* (Acari: Ixodidae) were recorded on the domestic animals in the Union territory of Dadra & Nagar Haveli during the period of January to December 2012. Overall, 71 larva and 148 adults belonging to three species of *Hyalomma* viz., *Hyal. anatolicum anatolicum*, *Hyal. detritum*, and *Hyal. marginatum isaaci* were collected from 33 infested domestic mammals (Goats, Cows, Buffalos, Dogs and Cats). The infestation of *Hyal. a. anatolicum* and *Hyal. m. isaaci* (incriminated as the vector of CCHF virus) on cattles in these area may serious implication for human health, considering the fact that these ticks serve as vectors of CCHF. To minimize these dangers, strategic surveillance and control methods could be useful in the control of ticks recorded during the survey.

Keywords *Hyalomma* · Hard ticks · Crimean Congo hemorrhagic fever · CCHFV

Introduction

Numerous genera of ixodid ticks serve both as vector and reservoir for Crimean-Congo hemorrhagic fever virus

(CCHFV) (Hoogstraal 1979) however, ticks in the genus *Hyalomma* are particularly important to the ecology of this virus. In fact, occurrence of Crimean-Congo hemorrhagic fever (CCHF) closely approximates the known world distribution of *Hyalomma* spp. Therefore, exposure to these ticks represents a major risk factor for contracting disease. The genus *Hyalomma* is a small flourishing group of ixodid ticks well adapted to living in arid biotopes. A high degree of adaptation to hot and dry open habitats becomes apparent in the morphology (well developed spherical eyes, high legs), physiology (successful metamorphosis under reduced humidity) and behavior (active search of host) (Kolonin 2007). Principal hosts of most species are various kinds of livestock, and as a result, these ticks usually have extended ranges. Most species are three-host, but there are one-host and two-host species as well. Immature stages mainly feed on mammals and birds, but immature ticks of some species parasitize reptiles (Kolonin 2007). In overall world a total of 27 species of *Hyalomma* are parasitizing the domestic and wild animals, however, only three species (*Hyal. anatolicum*, *Hyal. marginatum*, and *Hyal. nitidum*) are consider as a vector of CCHFV (Kolonin 2007).

Selected Workers have reported the presence of *Hyalomma* in different part of the India as like (Kaiser and Hoogstraal 1964; Miranpuri and Naithani 1978; Geervarghese and Dhanda 1987). Similarly investigation have been done by few investigators in selected state, Jammu Kashmir (Kaul et al. 1990); Punjab (Gill and Gill 1977); Orissa (Kaul et al. 1979); Rajasthan (Kaul et al. 1978; Wattal and Srivastva 1967) Gujarat (Devendra et al. 2012 and Dhaduk et al. 2013) and North Western State (Miranpuri 1988). The available literature indicates, no published report is available on the population ecology of *Hyalomma* infestation in the Union Territory of Dadra & Nagar Haveli.

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Table 1 Showing the population ecological parameters of *Hyalomma* in UT of Dadra & Nagar Haveli During 2012

S. no.	Parameters	<i>Hyalomma</i> sp.
1	Sample size	135
2	Total number of cattle infested	33
3	Prevalence	24.44
4	Mean intensity	6.64
5	Sample mean abundance	1.62
6	Range of infestation	1–9
10	Male, female ratio	1:1.39
11	Adult Nymph ratio	1:0.39
12	Total number of <i>Hyalomma</i> recovered	219

Materials and methods

Present study was conducted retrospectively for a period of January–December during 2012 in UT of Dadra & Nagar Haveli (Latitude $-20^{\circ}2'51''\text{N}$ to $20^{\circ}21'36''\text{N}$, Longitude $-72^{\circ}54'41''\text{N}$ to $73^{\circ}13'13''\text{N}$). During investigation total 135 domestic cattle (50 Goats, 35 Cows, 24 Buffalos, 14 Dogs and 12 Cats) were randomly examined. The whole body of cattle such as ear, hand, and chest, shoulder of neck, under the tail, udder and testis were examined. The *Hyalomma* were collected from each animal in a separate vial and preserved in 70 % alcohol after killing them in 97 part of 70 % alcohol and three part of ether. Labeling for all specimen including location of host, date of collection, environmental data including temperature, relative humidity were recorded at each site. Collection was made through hand collection using tweezers and rubber gloves. The obtained *Hyalomma* was separated according to species, stage, and sex under a dissecting microscope. Identification of the *Hyalomma* was based on the papers of Kaiser and Hoogstraal (1964), Miranpuri and Naithani (1978), Geevarghese & Dhanda (1987) and Walker et al. (2003).

Result and discussion

Twenty-four present livestock were found infested with the three species of *Hyalomma* (*Hyal. a. anatolicum*, *Hyal. detritum* and *Hyal. m. isaaci*) in the different part of the Union Territory of Dadra & Nagar Haveli. A total of 219 specimens (Male = 62, Female = 86 and Nymph = 71) were recovered from 33 infested livestock. Maximum numbers of *Hyalomma* collected from single infested host was nine. The mean intensity of *Hyalomma* on livestock remained 6.64 while the sample mean abundance was 1.62. The population composition shows that female

outnumbered the male. However, population of adult was dominant on nymph. The prevalence of *Hyalomma* on livestock was 24.4 % ($n = 135$). The count of *Hyalomma* suggests that the ticks were present throughout the year with marked peak of abundances during post monsoon period. 26.3 % livestock were found infested with *Hyalomma* in pre-monsoon period, during monsoon period the infestation rate of *Hyalomma* were reported 17.3 %, in post monsoon period 31.1 % livestock were found infested with *Hyalomma* (Table 1).

The CCHFV is maintained in nature predominantly in the *Ixodid* tick vectors, particularly ticks of the genus *Hyalomma* (Labuda and Nuttall 2004 and Watts et al. 1988). CCHFV can persist in the tick throughout its life stages by transtadial transmission, and can be passed onto the offspring by transovarial transmission (Watts et al. 1988). Among domestic animals, cattle, sheep, and goat play an important role in the natural cycle of the virus (Hoogstraal 1979). Approximately 106 tick species belonging to the families Ixodidae and Argasidae are reported to infest domestic, wild, and other animals (Geevarghese et al. 1997). Among the reported species of *Hyalomma*, *Hyal. a. anatolicum*, *Hyal. m. isaaci*, *Hyal. hussaini*, *Hyal. detritum*, *Hyal. kumari*, have been considered the most widely distributed species infesting domestic cattle, almost all the states of India (Ghosh et al. 2006). During present investigation only three species of *Hyalomma* (*Hyal. a. anatolicum*, *Hyal. m. isaaci*, *Hyal.* and *Hyal. detritum*) reported from the Union territory of Dadra & Nagar Haveli.

In present investigation the population of *Hyalomma* is following the manner of seasonal fluctuation described by Haghi et al. 2013. Larval population of *Hyalomma* builds up in monsoon month, but remains dormant under forest litter and becomes suddenly active as a nymph when the litter dries up in post monsoon months (Haghi et al. 2013). The Epidemic of CCHF coincides with nymphal activity; hence, nymphs are considered as the most important stage for human transmission. In *Hyalomma* population, the sex ratio is generally female biased due to unequal longevity (males generally short lived than the female). Recently the presence of CCHFV in *Hyal. a. anatolicum* ticks and livestock were reported in Gujarat and Rajasthan. (Devendra et al. 2012 and Dhaduk et al. 2013). The studies reveal that population ecology of *Hyalomma* were alarming in the contrast of recent outbreak of CCHF in Gujarat (India). Accurate knowledge of the distribution of *Hyalomma* and the monitoring of changes in their distribution are important to define risk areas for CCHF and to establish adequate measures for tick control and the prevention of CCHF. In this context, continuous tick surveillance emerges as a permanent need.

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