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Wild rodents and their ectoparasites in Baluchistan area, southeast of Iran

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Abstract. During 2008-2009 a total of 67 individuals of rodents, *Tetera indica*, *Meriones hurrianae*, *Meriones libycus* and *Gerbillus nanus* were trapped in three areas, Bampor, Daman and Qasre Qand from Iranshahr and Nikshahr districts. There is a significant difference between comparative abundance of four species ($P<0.05$). A total of 1422 ectoparasites collected including 299 mites (21%), 127 fleas (8.9%), 972 lice (68.4%) and 24 ticks (1.7%). Significant findings amongst the ectoparasites is the lice group with three species identified, *Laelaps accuninata*, *Andralaelaps hermophrodita* and *Paracheylaellaps pyriformis* being the first record in the study areas. All four captured genera of rodents are known as main/ potential reservoir hosts of zoonotic cutaneous leishmaniasis. The migration habit of rodents may affect the spatial distribution of parasitic ticks and their transmitted diseases like CCHF, which has been reported in recent years from Sistan and Baluchestan province. Monitoring of rodent populations and their ectoparasites will help to predict the potential of zoonotic arthropod-borne diseases.

INTRODUCTION

Rodents particularly those living close to human habitats play an important role in public health and the economy. The animals transmit zoonotic diseases through their bite, urine and faeces and these include infective agents such as parasites, viruses and bacteria. Protozoan and helminth infections like leishmaniasis, trichinellosis as well as plague, salmonellosis, rat-bite fever, Crimean Congo hemorrhagic fever (CCHF), murine typhus and omsk haemorrhagic fever infections occur as a result of presence of rodents in human living areas (Bell *et al*., 1988; Inokuma *et al*., 2001; Stojecevic *et al*., 2004).

Murine ectoparasites usually live in close association with different types of rodents. The parasites particularly those transmitted to human bear significant deleterious effects on public health, welfare and the economy. Some of the ectoparasites directly cause intense itching, ulcerated skin, loss of hair, skin abrasion and even asthma. Some others are vectors of important pathogenic microorganisms. They can also be serious agents for a number of parasitic zoonoses.

In this study we tried to consider the faunistic determination of ectoparasites collected from captured rodents in Iranshahr and Nikshahr districts from Sistan and Baluchistan province, located near the borderline of Pakistan and Afghanistan.

MATERIALS AND METHODS

Study area

The study area is located in Sistan and Baluchistan province (Fig. 1), southeast of Iran. Rodent collection was carried out in three areas of Bampoor (27° 19' 53 N, 60° 45' 22 E), Daman (27° 25' 60 N, 60° 46' 60 E) from Iranshahr district, and Qasre Qand (26° 24' 83 N, 60° 75' 25 E) from Nikshahr district. The villages in Bampour and Daman districts are 35km west and 35km north of Iranshahr County respectively. Qasre Qand is a semi-urban area 50 Km east of Nikshahr County. All three districts have vast date gardens and farms such as alfalfa, barley and wheat with cattle breeding being the common farm animal among the villagers. During the hot season the cattle are confined to one corner of the farm for more than eight months in a year. The cattle are fed on the common plant *Salsola* spp. which is common in the villages. The nesting material of rodents commonly found in the study area, grass, is of *Atripex* spp.

Rodent Capture and identification

A total of 650 Sherman traps was deployed to trap rodents. To maximize catches, traps were placed on sites where fresh signs of rodent activities (faecal droppings, fresh runaways, nest, burrows, etc.) were found. Thus trappings were randomly carried out with 20-25 traps for each of the regions and continued for 10 months consecutively during 2008-2009. The traps were collected in the early morning and the captured rodents were transported to the laboratory for identification and collection of ectoparasites. In the laboratory the trapped rodent was transferred into a plastic bag and anaesthetized with chloroform.

The morphological parameters of taxonomic importance of the dead animal was measured and recorded. Relevant key was used for identification (Etemad 1978).

Isolation and identification of ecto-parasites

After recording the morphological characters, the fur of anesthetized animal was brushed strongly over a white tray containing water to remove the ectoparasites. The arthropods were then collected using a needle under a stereo microscope and transferred to vials containing 70% alcohol. Collected ectoparasites were cleared in potassium hydroxide/lactophenol and mounted in Canada balsam for microscopical identification.

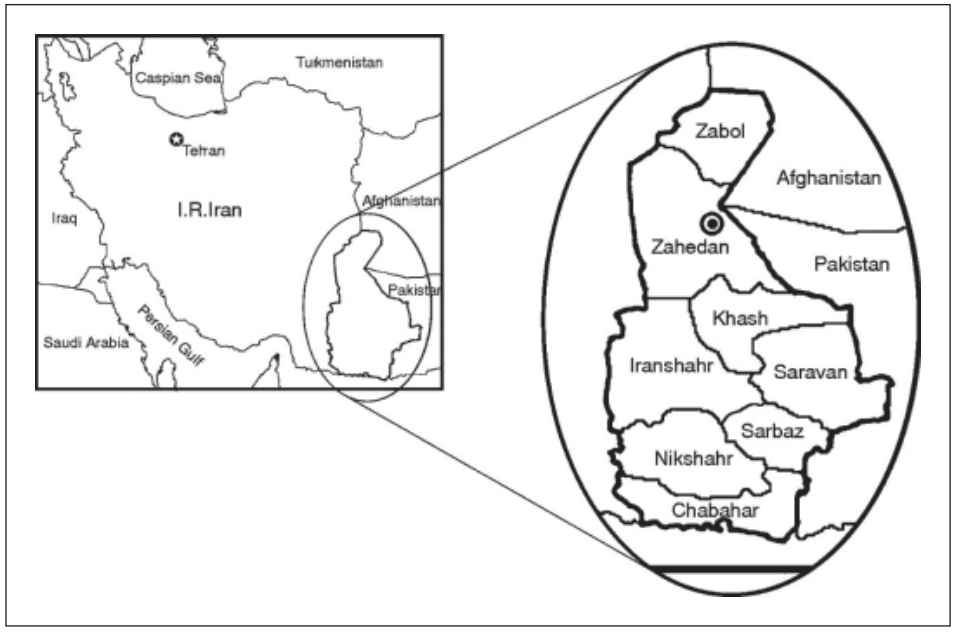

Figure 1. Sistan and Bluchistan Province, Southeast of Iran

RESULTS

During the study period in 2008-2009 a total of 67 individual rodents belonging to the family Muridae and Subfamily Gerbillinae, were captured from different regions of Iranshahr and Nikshahr districts. Four species of rodents (gerbil and jird), *Tatera indica* (55.2%), *Meriones hurrianae* (37.3%), *Gerbillus nanus* (4.5%) and *Meriones libycus* (3%) were identified. There is a significant difference between abundance of the four species ($P<0.05$). The majority of *T. indica* was trapped in Iranshahr, while *M. hurrianae* was only caught in Nikshahr (Table 1).

Amongst the 67 rodents examined, 64 were found infested with four different ectoparasite groups. These were mesostigmatic mites, fleas, lice and ticks. Among the four species of rodents, *Tatera indica* (Indian gerbil) and *M. hurrianae* (Indian desert jird) were found with high parasitic infestation of 89.7% and 8.8% as compared to 0.7% and 0.8% for *M. libycus* (Libyan jird) and *G. nanus* (Baluchistan gerbil) respectively (Table 2).

A total of 1276 individuals of ectoparasites comprised 299 mites, 127 fleas, 972 lice and 24 ticks. The 299 mites belonged to three families, Laelapidae, Cheyletidae and Haemogamasidae of five genera. These are *Laelaps* (18.7%), *Andralaelaps* (56.2%), *Eulaelaps* (1.3%), *Paracheyletta* (2.7%) and *Haemogamasus* (6.4%). Of these, only three genera with each a single species were identified. They are *Laelaps ciccuminata*, *Androlaelaps hermaphrodita* and *Paracheylaelaps pyriformis*. All 127 individuals fleas belonged to a single family, Pulicidae from a single genera with four species identified. These are *Xenopsylla astia* (81.9%), *Xenopsylla nubica* (12.6%), *Xenopsylla hutoni* (3.9%) and *Xenopsylla conformis* (1.6%). The 972 individual lice belonged to a single family, Hoplopleuridae of one genera with a single species, *Polyplax spinulosa* and the 24 individual ticks were from the family, Ixodidae of three genera *Rhipicepephus* (29.2%), *Hyalomma* (58.3%) and *Boophilus* (12.5%) were identified (Table 2).

Table 1. Number of captured rodents (including samples infested with ectoparasites) from study districts in southeastern Iran, 2008-2009

District	Iranshahr		Nikshahr		Total (%)
Rodent	Infested	Non-infested	Infested	Non-infested	
Tatera indica	29	0	8	0	37 (55.2%)
Meriones hurrianae	0	0	22	3	25 (37.3%)
Gerbillus nanus	3	0	0	0	3 (4.5%)
Meriones libycus	2	0	0	0	2 (3%)
Total	34	0	30	3	67 (100%)

Table 2. Number of collected ectoparasites from captured rodents in the studied distriacts, Southeastern Iran, 2008-2009

Host	Ectoparasite									
	Mite		Flea		Lice		Tick		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Tatera indica	254	17.2	117	8.2	907	63.8	7	0.5	1276	89.7
Meriones libycus	2	0.1	2	0.1	0	0	7	0.5	11	0.7
Gerbillus nanus	0	0	0	0	11	0.8	0	0	11	0.8
Meriones hurrianae	52	3.7	8	0.6	54	3.8	10	0.7	124	8.8
Total	299	21	127	8.9	972	68.4	24	1.7	1422	100

DISCUSSION

All four captured genera of rodent species are reservoir or potential hosts of zoonotic cutaneous leishmaniasis in Iran (Yaghoobi-Ershadi *et al.*, 1996; Javadian *et al.*, 1998; Azizi *et al.*, 2011; Kassiri *et al.*, 2011). *Tatera indica* is distributed from southwest to southeast of Iran. Its upper limit is Isfahan and Yazd province in the center of the country (Sedaghat & Salahi-Moghaddam, 2010). *Gerbillus nanus* has similar distribution pattern. *Meriones libycus* has been reported from most parts of the country except for coastal areas of Caspian Sea and Persian Gulf (Hormozgan province) and also in some mountainous area from the western part of Iran, while *M. hurrianae* has so far been reported from Baluchistan area and Hormozgan province in southern part of the country (Fig. 2).

Tatera indica had the highest ecto-parasitic infestation rate with an average of 34.5 parasites on each followed and by *M. hurrianae;* while only few arthropods collected from *M. libyscus* and *G. nanus.* Such exceptionally low parasitic rate could be due to the very small sample sizes examined.

Although there is no organized databank about arthropods of rodents in Iran, however, based on available data it seems to be at least the first report of *L. acuminata*, *A. hermaphrodita* and *P. pyriformis* from this part of the country. Infestation with *Rhipicephalus* and *Hyalomma* was previously reported amongst rodents from southern Iran (Hanafi-Bojd *et al.*, 2007; Kia *et al.*, 2009). Field observations in Senegal showed that adult *Hyalomma* and *Rhipicephalus* ticks are active seasonally with annual and spatial variation that certain

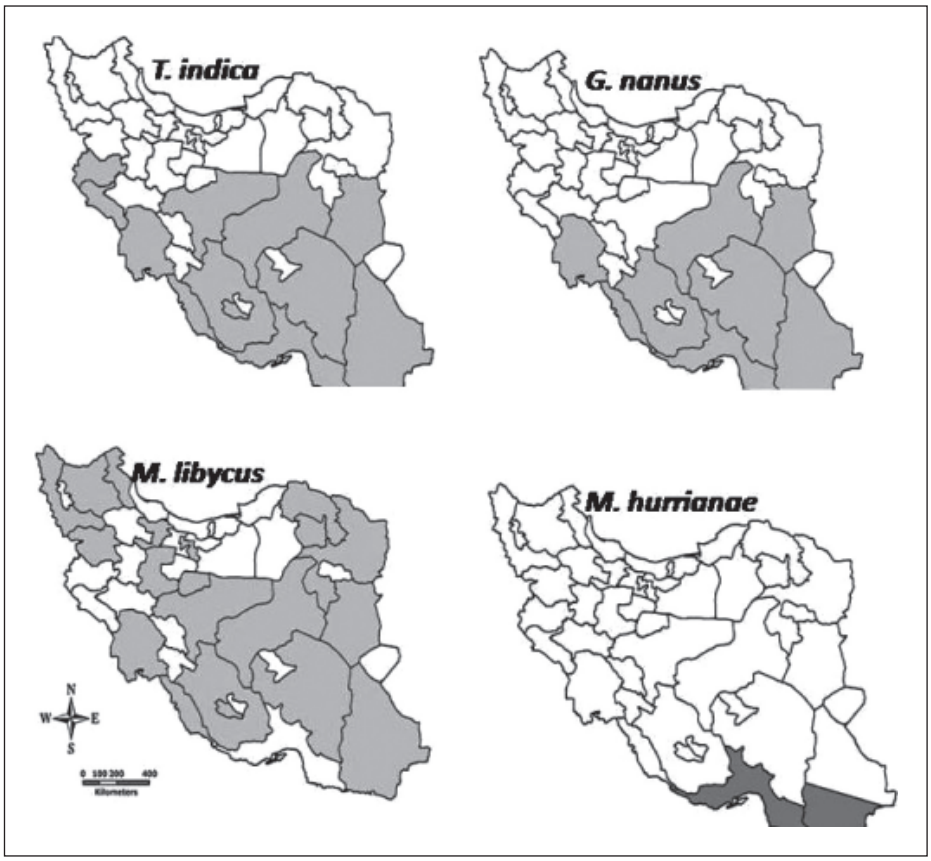

Figure 2. Distribution of *T. indica*, *G. nanus*, *M. libycus* and *M. hurrianae* in Iran (Sedaghat and Salahi-Moghaddam, 2010)

rodents and birds are natural hosts for immature stages, and that adults can be found resting in rodent burrows (Wilson & Digoutte, 1992). The migration habit of rodents therefore may affect the spatial distribution of parasitic ticks and their transmitted diseases like Crimean-Congo Hemorrhagic Fever (CCHF), which has been reported repeatedly in recent years from Sistan and Baluchistan province (Chinikar *et al.*, 2011). This scenario is also true about fleas as vectors of plague which has been endemic in Iran (WHO, 1992). Therefore, the monitoring of rodent populations and their ectoparasites will also help to predict the potential of zoonotic arthropod-borne diseases. Further study of the spatial and temporal distribution on wild and commensal rodents will enable the health authorities to establish an alert prediction system of zoonotic rodent-borne diseases in the area.

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